

| GANPAT UNIVERSITY | | | | | | | | | |
|---|--|-------|--------------|----|-------------------------------------|-----------|-----------|-----------|-------|
| FACULTY OF SCIENCE | | | | | | | | | |
| PROGRAMME | | M.Sc. | | | Branch/Spec. | | Chemistry | | |
| SEMESTER | | IV | | | Version | | 2.0.0.0 | | |
| Effective From Academic Year | | | 2018 | | Effective for the batch Admitted in | | | July-2018 | |
| Subject Code | MCHE4HTC | | Subject Name | | Heterocyclic Chemistry | | | | |
| Teaching Scheme | | | | | Examination Scheme (Marks) | | | | |
| Per Week | Lecture | | Practical | | Total | | CE | SEE | Total |
| | L | Tu | P | Tw | | | | | |
| Credit | 04 | - | - | - | 04 | Theory | 40 | 60 | 100 |
| Hours | 04 | - | - | - | 04 | Practical | - | - | - |
| Pre-requisites | | | | | | | | | |
| Before studying heterocyclic chemistry, all students have basic knowledge of elements, functionalization, oxidation, reduction, organic chemistry name reaction/mechanism and nomenclature of organic compounds. | | | | | | | | | |
| Learning Outcome | | | | | | | | | |
| After completion of the course you will | | | | | | | | | |
| <ul style="list-style-type: none"> ✓ Be familiar with the structures of important classes of heterocyclic aromatic organic compounds. ✓ Classify simple heterocyclic aromatic compounds, Properties, methods of synthesis and reactions. ✓ General methods for ring synthesis and application of such N, O and S containing hetero molecules ✓ The student will get familiar with particular properties and reactions for the most important heterocycles as well as different systems of nomenclature. | | | | | | | | | |
| Theory Syllabus | | | | | | | | | |
| Unit | Content | | | | | | | | Hours |
| 01 | Introduction of Heterocyclic, Carbocyclic Chemistry, and Nomenclature of heterocyclic compounds. Three membered Heterocyclic Compounds with one and two hetero atom Preparation, Chemical Reactions and properties of: Aziridines, Oxiranes, Azirines, Thiirenes, Diaziridines, Oxaziridines, Diazirines. Four membered heterocyclic compounds with one hetero atoms Preparation, Chemical Reactions and properties Azetidine, Oxetanes, Thietanes, Oxetanones, Azetidines | | | | | | | | 15 |
| 02 | Five membered heterocyclic compounds Preparation, Chemical Reactions and properties of Pyrrole, Furan, Thiophenes, Pyrazole, Oxazoles, Isoxazoles, Imidazole. Six membered heterocyclic compounds Preparation, Chemical reaction and properties of: Pyrylium salts, Pyridines, Pyridazines, Cinnolines, Payrazines. | | | | | | | | 15 |
| 03 | Benzene fused Bicyclic ring system Preparation, Chemical Reactions and properties of : Indole, Isoindoles, Indolizines, Dibenzopyrroles, Benzfuran, Isobenzofuran, Benzthiophenes, Isobenzothiophenes, Isoquinolines, Acridines, Phenanthridines. | | | | | | | | 15 |
| 04 | Miscellaneous heterocyclic compounds; Preparation, Chemical Reactions and properties of Phthalazine, Pyrimidine, Quinazolines, Pyrazine, Quinoxalines, Azepines, Oxepines, Thiepins, Benzimidazole, Benzpyrazoles, Benzoxazole. | | | | | | | | 15 |
| Reference Books | | | | | | | | | |
| <ol style="list-style-type: none"> 1. 'Heterocyclic chemistry', K. Bansal. 2. 'An introduction to the chemistry of Heterocyclic compds', R.H.Acheson. 3. 'Chemistry of Heterocyclic compounds', J.J. Trivedi. 4. 'Heterocyclic chemistry', R.R. Gupta, M.Kumar & V. Gupta, <i>Springer</i>. | | | | | | | | | |

5. 'The chemistry of Heterocycles', T. Eicher & S. Hauptmann.
6. 'Heterocyclic chemistry', J.A. Joule, K. Mills & G.F. Smith.
7. 'Comprehensive Heterocyclic chemistry', A. R. Katritzky and C. W. Rees.
8. 'Heterocyclic chemistry', T. L. Gilchrist.

| GANPAT UNIVERSITY | | | | | | | | | |
|---|--|-------|--------------|----|-------------------------------------|-----------|-----------|-----------|-------|
| FACULTY OF SCIENCE | | | | | | | | | |
| PROGRAMME | | M.Sc. | | | Branch/Spec. | | Chemistry | | |
| SEMESTER | | IV | | | Version | | 2.0.0.0 | | |
| Effective From Academic Year | | | 2018 | | Effective for the batch Admitted in | | | July-2018 | |
| Subject Code | MCHE4OCR | | Subject Name | | Organic Chemistry Reactions | | | | |
| Teaching Scheme | | | | | Examination Scheme (Marks) | | | | |
| Per Week | Lecture | | Practical | | Total | | CE | SEE | Total |
| | L | Tu | P | Tw | | | | | |
| Credit | 04 | - | 0 | 0 | 04 | Theory | 40 | 60 | 100 |
| Hours | 04 | - | 0 | 0 | 04 | Practical | - | - | - |
| Pre-requisites | | | | | | | | | |
| Before studying organic chemistry, all students have basic knowledge of organic and reaction mechanism, molecular structure, rearrangement, catalyst and knowledge related to UG level chemistry. | | | | | | | | | |
| Learning Outcome | | | | | | | | | |
| After the successful completion of the course, students will be able to understand | | | | | | | | | |
| <ul style="list-style-type: none"> ✓ Organic reaction and mechanism pathways. ✓ Nucleophilic and electrophilic reaction mechanisms, catalyst and rearrangements reactions. ✓ Organic reagents and coupling reactions | | | | | | | | | |
| Theory Syllabus | | | | | | | | | |
| Unit | Content | | | | | | | | Hours |
| 01 | Reaction path way and effect of structure on reactivity: Homolytic and Heterolytic fission, different types of arrow notation, Electrophile and Nucleophile substitution reactions. Organic Name Reactions and applications: 1. Horner-Wordwoth-Emmons reaction, 2. Mukaiyama reaction 3. Debner-Miller reaction 4. Duff reaction, 5.HVZ reaction, 6. Noyari reaction 7. Nencki reaction 8.Norrish reactions. | | | | | | | | 15 |
| 02 | Organic Coupling reactions and applications: 1. Stille coupling 2. Suzuki coupling 3. Sonogashira coupling 4. Chan-Lam coupling 5. Fukuyama coupling 6. Glaser coupling 7. Hay coupling 8. Hiyama coupling 9. Cadiot-Chodkiewicz coupling 10. Kumada Coupling | | | | | | | | 15 |
| 03 | Miscellaneous reactions and applications: 1. Barbier-Wieland, 2. Barton reaction, 3. Sarett oxidation, 4. Bouveault reaction, 5. Schotten-Baumann reaction, 6. Elbs-persulphate reaction, 7. Darzen reaction, 8. Hantzsch reaction, 9. Grubb's reaction, 10. Knoevenagel reaction, 11. Leukart reaction, 12. Michael addition reaction, 13. Mitsunobu reaction, 14. Reformatsky reaction, 15. Appel reaction. | | | | | | | | 15 |
| 04 | Rearrangements & Uses of Selective Reagents: Rearrangements: Reaction mechanism–nature of migration, migratory aptitude, memory effects. A detailed study of the following rearrangements: Baeyer-villiger, 2. Wagner-Meerwein, 3. Demjanov, 4. Neber, 5. Baker Venkatraman 6. Newman-Kwart. Uses of Selective Reagents: 1. Dess Martin Periodinane, 2. Sodium Cyanoborohydride, 3. Lithium diisopropylamide, 4. Crown ethers, 5. Dicyclohexylcarbodiimide, 6. Ceric | | | | | | | | 15 |

ammonium nitrate, 7. Wilkinson's catalyst.

Reference Books

1. Reaction Mechanism and Problems in Organic Chemistry – P. Chattopadhyay, Asian Book Pvt Ltd, New Delhi (2003).
2. A Text Book of Organic Chemistry – R.K.Bansal, New Age International (P) Ltd. 4th edition (2003).
3. Advanced Organic Chemistry, Part B – F. A. Carey & R. J. Sundberg, Plenum Press (2007).
4. Organic Chemistry by G. Marc. Loudon, Oxford University Press (2002).
5. Organic Reaction Mechanism (II edition) – V.K. Ahluwalia, R.K. Parasar.
6. Reaction Mechanism and Reagents in Organic Chemistry – Gurdeep R. Chatwal.
7. Organic Chemistry by Morrission and Boyd, prentice hall of India pvt ltd (6th edition), (2003)
8. Organic Chemistry – I.L.Finar 6th edition (low price), Pearson Education (2003).
9. Advanced Organic Chemistry (IV edition) – Jerry March.
10. Reactive Intermediates in Organic Chemistry – J.P. Trivedi, University granthNirman Board.
11. Organic Chemistry by T.W. Graham solimn, Craig B. Fryble, low price 8th edition, John Wiley & Sons, inc.
12. Organic Chemistry by V.K.Ahluwalia, MadhuriGoyal, Narosa Publishing House, (2000).
13. Organic Synthesis (2nd edition) by M.B. Smith, Mcgraw-Hill, Inc. (2001).
14. Some Modern Methods of Organic synthesis (4th edition), W.Carruthers, Cambridge University Press (2004).
15. Organic Cehmsitry – Structure and Reactivity by SeyhanEge, A.I.T.B.S. Publishers and Distributors. 3rd edition (1998).
16. Organic Chemistry by J. Mcmurry, Asian Books Pvt. Ltd., 5th edition (2001). Organic Synthesis – Strategy and Control by Paul Wyatt & Stuart Warren, John Wiley & Sons, (2007).
17. Principles of Organic Synthesis by R.O.C Norman, J.M. Coxon, CRC Press, (3rd edition) (2009).
18. Organic Chemistry by J. Clayden, N. Greeves, S. Warren, P. Wothers, Oxford University Press (2000).
19. Comprehensive Organic Synthesis, Vols 1-9, B.M. Frost & I Fleming. Pergamon (1991).

| GANPAT UNIVERSITY | | | | | | | | | |
|---|--|-------|--------------|----|-------------------------------------|-----------|-----------|-----------|-------|
| FACULTY OF SCIENCE | | | | | | | | | |
| PROGRAMME | | M.Sc. | | | Branch/Spec. | | Chemistry | | |
| SEMESTER | | IV | | | Version | | 2.0.0.0 | | |
| Effective From Academic Year | | | 2018 | | Effective for the batch Admitted in | | | July-2018 | |
| Subject Code | MCHE4DSA | | Subject Name | | Disconnection Approach | | | | |
| Teaching Scheme | | | | | Examination Scheme (Marks) | | | | |
| Per Week | Lecture | | Practical | | Total | | CE | SEE | Total |
| | L | Tu | P | Tw | | | | | |
| Credit | 04 | - | 0 | 0 | 04 | Theory | 40 | 60 | 100 |
| Hours | 04 | - | 0 | 0 | 04 | Practical | - | - | - |
| Pre-requisites | | | | | | | | | |
| Before studying Advanced Organic Chemistry, all students have basic knowledge of organic chemistry, Nomenclature, Spectroscopy, reaction mechanism and green Chemistry and knowledge related to UG level chemistry. | | | | | | | | | |
| Learning Outcome | | | | | | | | | |
| After the successful completion of the course, students will be able to understand | | | | | | | | | |
| <ul style="list-style-type: none"> ✓ Disconnection of organic moieties. ✓ Two group disconnection of organic moiety. ✓ Name reactions and disconnections. ✓ Protecting group Protection of organic functional groups. | | | | | | | | | |
| Theory Syllabus | | | | | | | | | |
| Unit | Content | | | | | | | | Hours |
| 01 | <p>Disconnection approach Principle of protection of hydroxyl, amino, carbonyl, carboxylic acid with different reagents and their deprotection, synthetic equivalent groups, synthetic analysis and planning, control of stereochemistry. An introduction to synthesis, and synthetic equivalents, disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesis one group C-X and two group C-X disconnections, chemo-selectivity, reversal and polarity.</p> | | | | | | | | 15 |
| 02 | <p>Two group disconnection: Disconnections in 1,3-dioxygenated skeletons, preparation of α,β-unsaturated carbonyl compounds, 1,3-dicarbonyls, 1,5-dicarbonyls and use of Mannich Reaction.</p> | | | | | | | | 15 |
| 03 | <p>Two group disconnections: Disconnection and synthesis of 2-hydroxycarbonyl compounds, 1,2-diols, 1,4 and 1,6-dicarbonyl compounds. Pericyclic reactions: Disconnections based on Diels-Alder reaction and its use inorganic synthesis</p> | | | | | | | | 15 |
| 04 | <p>Disconnection and Synthesis of acyclic and cyclic hetero compounds: Synthesis of ethers, amines, nitrogen and oxygen containing five and six membered heterocycles. Protecting groups: Protection of organic functional groups, protecting reagents and removal of protecting groups.</p> | | | | | | | | 15 |

| Reference Books |
|---|
| 1. Organic synthesis: the disconnection approach by Stuart Warren (Wiley student edition) 1 st edition |
| 2. Organic synthesis: the disconnection approach by Stuart Warren (Wiley student edition) 2 nd edition |
| 3. Organic chemistry- Clayden, Greeves, Warren and Wothers (oxford press) |

| GANPAT UNIVERSITY | | | | | | | | | |
|------------------------------|----------|----|--------------|----|-------------------------------------|-----------|-----------|-----|-------|
| FACULTY OF SCIENCE | | | | | | | | | |
| PROGRAMME | M.Sc. | | | | Branch/Spec. | Chemistry | | | |
| SEMESTER | IV | | | | Version | 2.0.0.0 | | | |
| Effective From Academic Year | | | 2018 | | Effective for the batch Admitted in | | July-2018 | | |
| Subject Code | MCHE4PRO | | Subject Name | | Project Work-IV | | | | |
| Teaching Scheme | | | | | Examination Scheme (Marks) | | | | |
| Per Week | Lecture | | Practical | | Total | | CE | SEE | Total |
| | L | Tu | P | Tw | | | | | |
| Credit | 08 | | - | 0 | 08 | Theory | - | - | - |
| Hours | 08 | | | | 08 | Practical | - | 200 | 200 |

| GANPAT UNIVERSITY | | | | | | | | | |
|--|--|----------|-----------|--------------|-------------------------------------|---------------------|-----------|-----------|-------|
| FACULTY OF SCIENCE | | | | | | | | | |
| PROGRAMME | | M.Sc. | | | Branch/Spec. | | Chemistry | | |
| SEMESTER | | IV | | | Version | | 2.0.0.0 | | |
| Effective From Academic Year | | | 2018 | | Effective for the batch Admitted in | | | July-2018 | |
| Subject Code | | MCHE4PRA | | Subject Name | | Practical Module-IV | | | |
| Teaching Scheme | | | | | Examination Scheme (Marks) | | | | |
| Per Week | Lecture | | Practical | | Total | | CE | SEE | Total |
| | L | Tu | P | Tw | | | | | |
| Credit | - | - | 06 | 0 | 06 | Theory | - | - | - |
| Hours | - | - | 12 | 0 | 12 | Practical | - | 200 | 100 |
| Pre-requisites | | | | | | | | | |
| Before performing these practical, students should have basic knowledge of laboratory chemicals, Inorganic Dyes & Organic compounds and their properties, name reactions and rearrangements, working knowledge of computer and synthetic organic chemistry. | | | | | | | | | |
| Learning Outcome | | | | | | | | | |
| Practical knowledge of multi steps synthesis of organic molecules. | | | | | | | | | |
| <ul style="list-style-type: none"> ✓ Organic synthesis based on name reactions and rearrangements ✓ Knowledge of synthesis and properties of dyes. ✓ Synthesis of organic compounds using green synthetic methods. ✓ Synthesis of dyes and purification. | | | | | | | | | |
| Theory Syllabus | | | | | | | | | |
| Unit | Content | | | | | | | | |
| 01 | Heterocyclic compound Synthesis of heterocyclic compound (any five) Organic Estimation Estimation of organic compounds and chromatographic separations (any five) | | | | | | | | |
| 02 | Synthesis based on Rearrangement and name reactions: Synthesis of compounds using Mannich reaction, Hofmann reaction, benzyl benzoic acid rearrangement, Pinacol-pinacolone rearrangement, reformatsky reaction, benzidine rearrangement etc Multi steps synthesis: a) Phthalic anhydride – Phthalimide – Anthranillic acid. b) Acetophenone – Oxime – Acetanilide. c) Phthalic anhydride – o-benzoyl benzoic acid - anthraquinone. d) Aniline- Acetanilide- p-Nitroacetanilide-p-Nitroaniline-p-phenylenediamine e) Acetanilide – p-Bromoacetanilide – p-Bromoaniline. Other preparations based on theory | | | | | | | | |
| 03 | Computer assisted experiments: Draw the structure of simple aliphatic, aromatic, heterocyclic compounds with different substituent. Use of different File format, Find the different notation like SMILE coding etc., Get the correct IUPAC name and predict the ¹ HNMR signals with help of computer. Superimposition analysis of compounds. Use of chemistry software's i.e. Chemdraw, Chems sketch, Reference manager etc. | | | | | | | | |

Reference Books

1. 'Comprehensive Heterocyclic chemistry', A. R. Katritzky and C. W. Rees. 'Heterocyclic chemistry',
2. T. L. Gilchrist. Elementary Practical Organic Chemistry Part-I Small Scale Preparations by A. I. Vogel.
3. Elementary Practical Organic Chemistry Part-II Qualitative Organic Analysis by A. I. Vogel.
4. Elementary Practical Organic Chemistry Part-III Quantitative Organic Analysis by A. I. Vogel.
5. Practical Pharmaceutical Chemistry by A. H. Bakett, Volume I & II.
6. Comprehensive Practical Organic Chemistry Qualitative Analysis by Ahluwalia & Aggarwal.
7. Organic Quantitative Analysis by Vogel's (ELBS)
8. Comprehensive Practical Organic Chemistry Preparation and Quantitative Analysis by Ahluwalia & Aggarwal.
9. 8. Practical Physical Chemistry by J. B. Yadav.