

Subject Code: 1RI3000102	Subject Title: Essentials of Disciplinary Research Subject-1 Subject Sub-Title: Advanced Organic Chemistry
Pre-requisite Subject	Advanced Organic Chemistry

Objectives of course: By using this advanced organic chemistry like heterocyclic compound, nanoparticle, student synthesis the novel heterocyclic compounds & nanoparticle and their application in different field.

To provide the basic knowledge & concepts of the green chemistry, synthesis of novel compound by green synthesis.

Learning outcomes: Understanding the principles of chromatographic techniques, with the emphasis on the application in chemistry, biochemistry. Updating the recent developments in the field of Chromatography. Students can able to design, perform, and interpret chromatographic experiments results for biochemical, and sensor applications.

Teaching Scheme (Credit Distribution)				Assessment Scheme (Weightage)	
Lecture	Tutorial	Practical	Credit	Hall Exam	Continuous Evaluation
4	--	--	4	60%	40%

Continuous evaluation is based on assignments/quiz/presentation/small projects as per the supervisor instructions.

Subject Contents			
Unit	Topic	No. of Lecture	Weightage %
1	Heterocyclic chemistry Systematic nomenclature of monocyclic fused and bridged heterocycles, Classification of heterocyclic compounds, Synthesis reactivity and aromatic character of following Heterocycles (1) Furan, Pyrrole, Thiophene, Pyrazole, Imidazole, Indole, Pyrimidine, Pyridine and quinoline (2) Condensed heterocycles: Benzofuran, benzothiazole, benzoimidazole, benzothiophene, quinoline, benzoxazole, (3) 1,2,3-triazole, 1,2,4-triazole, 1,2,4-oxadiazole, 1,3,4-oxadiazole, Quinolone, Quinazoline Application of heterocyclic compound in various field.	1	25
2	Green Chemistry Introduction, principles of green chemistry, Different approaches to green synthesis: Microwave and Ultrasound assisted organic synthesis, Solid phase and aqueous phase Organic synthesis. Green synthesis/reaction, Green starting materials, Green reagents, Green solvents and reaction conditions Green catalysis. Application	1	25
3	Supramolecule Calix[4]arene, Calix[8]arene, calyx[4]resorcinarene, crown ether,	1	25

	oxacalixarene, Supramolecular based heterocyclic assemblies.		
4	Nanotechnology What is nanotechnology? Classification of Nano-structured materials. Nano-scale Architecture. Synthesis of Nanomaterials: Top down –ball milling; Bottom up co-precipitation, sol-gel, electro deposition, using natural nano-particles chemical vapor deposition. Introduction of fullerene chemistry. The Carbon Nanotube New Forms of Carbon –Types of Nanotubes Formation of Nanotubes Application of Carbon Nanotubes.	1	25

List of References:

- 1 Green Chemistry: Theory and Practice. P.T. Anastas and J.C. Warner. Oxford University Press.
2. Green Chemistry: Introductory Text. M. Lancaster Royal Society of Chemistry (London).
3. Introduction to Green Chemistry. M.A. Ryan and M. Tinnesand, American Chemical Society (Washington)
- 4 E. V. Anslyn and D. A. Dougherty, Modern Organic Chemistry, University Science, 2005.
2. A. Pross, Theory and Physical Principles of Organic Reactivity, John Wiley, 1995.
3. A. Rauk, Orbital Interaction Theory of Organic Chemistry, John Wiley, 1994.
4. F. A. Cotton, G. Wilkinson, C. A. Murillo and M. Bochmann, Advanced Inorganic Chemistry, 6th edition, Wiley, 1999.
5. March J. Advanced Organic Chemistry: Reactions, Mechanisms and Structure, Wiley-India
6. Joule J. A. and Mills K. Heterocyclic Chemistry, Wiley-blackwell.
7. Clayden, Greeves, Warren & Wothers, Organic Chemistry, Oxford University.
8. Advanced organic chemistry, Part B –F. A Carey and R. J. Sundberg, 5th edition (2007)

Subject Code: 1RI3000103	Subject Title: Essentials of Disciplinary Research Subject-2 Subject Sub-Title: Advanced Instrumental Technique
Pre-requisite Subject	Advanced Instrumental Technique

Objectives of course: Separation and Spectroscopic techniques are the basis of instrumental analysis widely applied in industry, chemistry, biochemistry, environment science. These techniques are based on principles of chemistry. Therefore in this module we shall study the principles on which these techniques are based and acquire the basic skills necessary to use the techniques. To provide the basic knowledge & concepts of the Analytical chemistry. To provide overview of the application of analytical chemistry in applied field to the students.

Learning outcomes: To impart knowledge and training in chemistry at advanced level, make aware with recent analytical technique, use of technique in laboratory, synthesis and analysis of materials, and their properties.

Teaching Scheme (Credit Distribution)				Assessment Scheme (Weightage)	
Lecture	Tutorial	Practical	Credit	Hall Exam	Continuous Evaluation
2	--	--	2	60%	40%

Continuous evaluation is based on assignments/quiz/presentation/small projects as per the supervisor instructions.

Subject Contents			
Unit	Topic	No. of Lecture	Weightage %
1	Chromatography: TLC, HPTLC, Ion exchange, Ion chromatography (Principles, Working Applications in separation, purification and identification. Advanced Application, High performance liquid Chromatography, Gas chromatography HPLC, (Principle, theory, instrumentation and applications of high performance liquid chromatography (HPLC) and its comparison with other chromatography. Advanced applications. Gas Chromatography GC principle, theory, types of columns, packed columns, Capillary columns, Bonded phase columns,, detector types and applications in pharmaceutical analysis. Head space gas chromatography; Pyrolysis gas chromatography; GC-MS, TGA, DTA, DSC, TEM, SEM, DLS, AFM Instrument and their application	1	50
2	Spectroscopy: Instrumentation of ^1H NMR, ^{13}C NMR, MASS Spectroscopy, FTIR Spectroscopy, UV Spectroscopy, Florimetry, Structure interpretation by FTIR, NMR, MASS and UV spectroscopy. Application of this instrumental technique for the interpretation of Novel synthesized compounds.	1	50

List of References:

1. "Analytical Chemistry" by Gary D. Christian, 6th Edition, John Wiley and Sons Inc. New Jersey.
2. Thin Layer chromatography. By E. Stahi.
3. HPTLC by Dr. P.D. Sethi.
4. Practical Aspects of Gas Chromatography/Mass Spectroscopy by Gordon M. Message, John Wiley & Sons, 1984.
5. High performance liquid chromatography by Dr. P.D. Sethi.
6. "Quantitative Chemical Analysis" by Daniel C. Harris, 5th Edition, W.H. Freeman and Company, New York.
7. Principles of Instrumental Analysis D. A. Skoog and J. L. Loary, W. B. Saunders.
8. Fundamentals of Analytical Chemistry by D.A. Skoog, D. M. West and F. J. Holler, W. B. Saunders.
9. A Practical handbook of preparative HPLC by Donald Wellings, Elsevier, 2006.
10. Pharmaceutical analysis by Dr. S. Ravi Sankar
11. Modern Practice of Gas Chromatography by Robert L. Grob and Eugene F. Barry, 3rd edition, Wiley-Interscience, 1995
12. Basic Gas Chromatography by Harold M. McNair, James M. Miller, John Wiley and Sons, 2008.
13. Analytical gas Chromatography by Walter Jennings, Eric Mittlefehldt and Philip Stremple, second edition, Elsevier Science, 1997.
14. Modern HPLC for practicing scientists by Michael W. Dong, Wiley Interscience, 2006.