SANKALCHAND PATEL UNIVERSITY
।। अथातो ज्ञानजिज्ञासा ।।

Ph. D. Program
(July-2019 Batch)

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

Objectives of course: To learn an advanced organic chemistry including heterocyclic compound, supramolecular chemistry and nanotechnology, they synthesis the novel heterocyclic and supramolecules based compounds & nano-particles and their application in different fields.

To provide the basic knowledge & concepts of the sustainable and green chemistry for the synthesis of novel compound by green synthesis.

Learning outcomes: To understanding the novel synthesis and development of organic compounds with the help of nanotechnology, with the emphasis on the application in medicinal chemistry, life sciences. Students can able to design, perform, and interpret synthetic experiments and get 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 & bridged hetrocycles, Classification of hetrocyclic compounds, Synthesis reactivity and aromatic character of following Heterocycles, (1)Furan, Pyrrole, Thiophene, Pyrazole, Imidazole, Indole, Pyrimidine, Pyridine and quinoline (2) Condensed hetrocycles: Benzofuran, benzothioazole, 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 fields.	1	25
2	**Superamolecular Chemistry** Introduction of supramolecar chemistry Synthesis of supramolecules such as Calixarene, calixresorcinarene, oxacalixarene, crown ether and Superamolecular based heterocyclic assemblies.	1	25
3	**Nanotechnology** What is nanotechnology? Classification of Nano-structured materials. Nano-scale Architecture. Synthesis of Nanomaterials: Top down –ball	1	25

	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.		
4	**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

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 & others, Organic Chemistry, Oxford University.
8. Advanced organic chemistry, Part B –F. A Carey and R. J. Sundberg, 5th edition (2007)

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Ph. D. Program
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Subject Code: 1RI3000103	**Subject Title: Essentials of Disciplinary Research Subject-2** **Subject Sub-Title: Advanced Instrumental Analysis**
Pre-requisite Subject	**Advanced Instrumental Technique**

Objectives of course: To separation, identification and purification will be done on the basis of instrumental analysis, which is widely applied in industry, chemistry, biochemistry, environment science. These techniques are based on principles of spectroscopy and chromatographic techniques. 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 analytical chemistry at advanced level, make aware with recent analytical technique, use of technique in laboratory, synthesis and analysis of materials, and their properties. To 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**
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 ^{1}HNMR, ^{13}C NMR, MASS Spectroscopy, FTIR Spectroscopy, UV Spectroscopy, Florimetry, Structure interpretation	1	50

	by FTIR, NMR, MASS and UV spectroscopy. Application of this instrumental technique for the interpretation of Novel synthesized compounds.		

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 Spectroscopyby 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-. Inter science, 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 Mittle fehldt and Philip Stremple, second Edition, Elsevier Science, 1997.
14. Modern HPLC for practicing scientists by Michael W. Dong, Wiley Inter science, 2006.