Department of Chemistry
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE			
Course Title	**Organic Chemistry- Reaction mechanisms and their types**		
Course Code	**CH 601**	**No. of Credits**	**3 (Theory)**
Department	**Chemistry**	**Faculty**	**Dr. S. Velmathi**
Programme	**M.Sc.(Chemistry)**		
Pre-requisites Course Code	**NIL**		
Course Coordinator(s) (if, applicable)	**Dr. S. Velmathi**		
E-mail	**velmathis@nitt.edu**	**Telephone No.**	**2503640**
Course Type	☑ **Core course** ☐ **Elective course**		

COURSE OVERVIEW

This course is offered to I year M.Sc.(Chemistry) students. This 3 credit course is for theory. Three theory classes will be conducted per week.

COURSE OBJECTIVE

To introduce the basic principles involved in writing reaction mechanisms for aliphatic and aromatic nucleophilic, electrophilic substitution, elimination, addition, oxidation and reduction reactions, Physico chemical aspects of reaction mechanism and theories of aromaticity.

COURSE OUTCOMES (CO)

Students would become familiar with the:

- ✓ Kinetics and thermodyanamic factors involved in the reaction
- ✓ reaction mechanism of important nucleophilic and electrophilic substitution reactions (Aliphatic and aromatic)
- ✓ Addition to C=C and C=X bonds, Oxidation and reduction reactions and reagents used
- ✓ Elimination reaction-mechanism and stereochemistry
- ✓ Theories of aromaticity

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	**Week**	**Topic**	**Mode of Delivery**
1	I week of August	**<u>Unit-I</u>** Reaction mechanism: Definition of reaction mechanism, transition state theory, kinetics, qualitative picture. Basic mechanistic concepts like kinetic vs thermodynamic control	C&T, PPT
2	II week of August	Substituent effects, linear free energy relationships, Hammett equation and related modifications.	C&T, PPT

3	III week of August	Hammond postulate, Curtin-Hammett principle isotope effects, general and specific acid-base catalysis, and nucleophilic catalysis.	C&T, PPT
4	IV week of August	**Unit-II** Aliphatic Nucleophilic Substitution– reactivity, structural and solvent effects, substitution in S_N1, S_N2, S_Ni.	C&T, PPT
5	I week of September	Neighboring group participation -Norbornyl and bridgehead systems, substitution at allylic and vinylic carbons, substitution by ambident nucleophiles.	C&T, PPT
6	II week of September	Reactive intermediates-Carbenes, nitrenes, radicals, ylides-Formation, stability and their applications.	C&T, PPT
7	III week of September	**Unit-III** Addition to carbon-carbon multiple bonds. Electrophilic, nucleophilic and free radical addition. Stereochemistry and orientation of the addition.	C&T, PPT
8	IV week of September	Hydrogenation, Halogenation, hydroxylation, hydroboration. Addition to carbonyl compounds-1,2 and 1,4-addition	C&T, PPT
9	I week of October	Benzoin, Knoevenegal, stobbe and Darzen glycidic ester reactions. Stereochemistry of Aldol and Michael addition reactions- Felkin- Ahn Model	C&T, PPT
10	II week of October	**Unit-IV** Elimination Reactions: E1, E2, E1CB-mechanism, stereochemistry, orientation of double bonds Hofmann, Zaitsev, Bredts rule-pyrolytic elimination	C&T, PPT
11	III week of October	Chugaev reaction. Oxidation and reduction: Swern and Dess-Martin oxidations, Corey-Kim oxidation, PCC, $KMnO_4$ oxidations.	C&T, PPT
12	IV week of October	Reduction using hydride reagents, $LiAlH_4$, $NABH_4$ and other organoboranes: chemo - and stereoselectivity, Catalytic hydrogenation (homogenous and heterogeneous catalysts)	C&T, PPT
13	I week of November	**Unit-V** Theories of Aromaticity: Aromaticity and Antiaromaticity, Huckel's rule, annulenes and heteroannulenes, fullerenes (C60). Other conjugated systems, Chichibabin reaction.	C&T, PPT
14	II week of November	Aromatic electrophilic substitution: Orientation, reactivity, and mechanisms. Substitution in thiophene and pyridine.	C&T, PPT
15	III week of November	Aromatic nucleophilic substitution, S_N Ar, benzyne, S_N1. Aromatic Nucleophilic substitution of activated halides	C&T, PPT

COURSE ASSESSMENT METHODS				
S.No.	**Mode of Assessment**	**Week/Date**	**Duration**	**% Weightage**
Theory				
1	Assignment/Quiz/ seminar	II week of Sep	Depends on the activity	5
2	Test I	22.09.2016	60 minutes	20
3	Assignment/Quiz/ seminar	IV week of Oct	Depends on the activity	5
4	Test II	10.11.2016	60 minutes	20
5	End semester	IV week of Nov	3 hours	50
Theory = Total (100)				

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

Text Books:

1. M. B. Smith, J. March, March's Advanced Organic Chemistry, John Wiley & Sons, 6th Edn, 2007
2. R. R. Carey and R. J. Sundburg, Advanced Organic Chemistry, Part A and Part B, Springer, 5th Edn, 2007

References:

1. Peter Sykes, A guide book to mechanism in Organic chemistry, Orient-Longmens, 6th Edn, 1996.
2. E. J. Eliel, Stereochemistry of Carbon Compounds, John Wiley, 1997
3. P. Y. Bruice, Organic Chemistry. Pearson Education, 3rd edition, 2006

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

1. Feedback from students during class committee meetings.
2. Anonymous feedback through questionnaire at the end of the semester.

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

1. 75% attendance is compulsory for Theory component.
2. Theory:
   A. For those who missed Test I and Test II due to genuine reasons, retest will be conducted during the III week of November 2016.

ADDITIONAL COURSE INFORMATION

The faculty will be available for consultation at times as per the intimation by the faculty.

Coordinator _____ **CC-Chairperson** _____ **HOD** _____