



DEPARTMENT OF CHEMISTRY

COURSE PLAN – PART I			
Name of the programme and specialization	M.Sc.(Chemistry)		
Course Title	Organic Chemistry- Reaction Mechanisms and Their Types		
Course Code	CH601	No. of Credits	3
Course Code of Pre-requisite subject(s)	Nil		
Session	July 2019	Section (if, applicable)	
Name of Faculty	Dr. G C Nandi	Department	Chemistry
Official Email	nandi@nitt.edu	Telephone No.	7034458790
Name of Course Coordinator(s) (if, applicable)	Dr. V. M. Biju		
Official E-mail	vmbiju@nitt.edu	Telephone No.	+91-9443843076
Course Type (please tick appropriately)	<input checked="" type="checkbox"/> Core course	<input type="checkbox"/> Elective course	

Syllabus (approved in BoS)

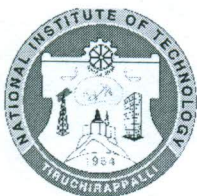
Unit 1: Definition of reaction mechanism, transition state theory, kinetics, qualitative picture. Substituent effects, linear free energy relationships, Hammett equation and related modifications. Basic mechanistic concepts like kinetic vs thermodynamic control, Hammond postulate, Curtin-Hammett principle, isotope effects, general and specific acid-base catalysis, and nucleophilic catalysis.

Unit 2– Reactivity, structural and solvent effects, substitution in SN1, SN2, SNi. Neighboring group participation -Norbonyl and bridgehead systems, substitution at allylic and vinylic carbons, substitution by ambident nucleophiles. Reactive intermediates-Carbenes, nitrenes, radicals, ylides-Formation, stability and their applications.

Unit 3: Electrophilic, nucleophilic and free radical addition. Stereochemistry and orientation of the addition. Hydrogenation, Halogenation, hydroxylation, hydroboration. Addition to carbonyl compounds- 1,2 and 1,4-addition, benzoin, Knoevenagel, Stobbe and Darzen glycidic ester reactions. Stereochemistry of Aldol and Michael addition reactions- Felkin- Ahn Model

Unit 4: E1, E2, E1CB- mechanism, stereochemistry, orientation of double bonds Hofmann, Zaitsev, Bredts rule-pyrolytic elimination, Chugaev reaction. Oxidation and reduction: Reduction using hydride reagents, LiAlH₄, NaBH₄ and other organoboranes: chemo - and stereoselectivity, Catalytic hydrogenation (homogenous and heterogeneous catalysts) Swern and Dess-Martin oxidations, Corey-Kim oxidation, PCC, KMnO₄ oxidations.

Unit 5: Aromaticity and Antiaromaticity, Huckel's rule, annulenes and heteroannulenes.



fullerenes (C₆₀). Other conjugated systems, Chichibabin reaction. Aromatic electrophilic substitution: Orientation, reactivity, and mechanisms. Substitution in thiophene and pyridine. Aromatic nucleophilic substitution, SN Ar, benzyne, SN1. Aromatic Nucleophilic substitution of activated halides.

COURSE OBJECTIVES

1. To provide a detailed information regarding basics of reaction mechanism, Linear Free Energy Rel. etc.
2. To familiarize the students about various types of reactions and intermediates.
3. To provide a comprehensive knowledge about stereo chemical aspects of various types of reactions
4. To introduce them about various types of elimination reactions, reagents for organic transformations.
5. To understand the concept of aromaticity and reactions of aromatic compounds.

MAPPING OF COs with POs

Course Outcomes Upon completing the course the student will be able to	Programme Outcomes (PO) (Enter Numbers only)
1. understand the linear free energy relationship, stability of the compounds.	1,2
2. Familiarize about the different types of intermediates and their reactivities and can understand the nucleophilic substitution and related reactions in detail.	1,2,3,4
3. Solve various problems regarding reactions involving C-C multiple bonds and elimination reactions	1,2,3,4
4. Get a detailed aspects of aromaticity and selected reactions of heterocyclic compounds	1,2,3,4

COURSE PLAN – PART II

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.

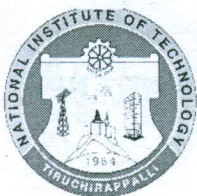
COURSE TEACHING AND LEARNING ACTIVITIES

(Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	II week of August	Unit 1: Definition of reaction mechanism, transition state theory, kinetics, qualitative picture. Substituent effects, linear free energy	C&T, PPT



		relationships, Hammett equation and related modifications.	
2	III week of August	Basic mechanistic concepts like kinetic vs thermodynamic control, Hammond postulate, Curtin-Hammett principle, isotope effects, general and specific acid-base catalysis, and nucleophilic catalysis.	C&T, PPT 11
3	IV week of August	Reactivity, structural and solvent effects, substitution in SN1, SN2, SNi.	C&T, PPT 91
4	I week of September	Neighboring group participation - Norbornyl and bridgehead systems, substitution at allylic and vinylic carbons, substitution by ambident nucleophiles.	C&T, PPT 81
5	II week of September	Reactive intermediates-Carbenes, nitrenes, radicals, ylides-Formation, stability and their applications.	C&T, PPT
6	III week of September	Electrophilic, nucleophilic and free radical addition. Stereochemistry and orientation of the addition. Hydrogenation, Halogenation, hydroxylation, hydroboration.	C&T, PPT
7	IV week of September	Addition to carbonyl compounds- 1,2 and 1,4-addition, benzoin,	C&T, PPT
8	I week of October	Knoevenegal, stobbe and Darzen glycidic ester reactions.	C&T, PPT
9	II week of October	Stereochemistry of Aldol and Michael addition reactions- Felkin-Ahn Model, E1, E2, E1CB-mechanism, stereochemistry, orientation of double bonds Hofmann, Zaitsev, Bredts rule-pyrolytic elimination, Chugaev reaction.	C&T, PPT
10	III week of October	Oxidation and reduction: Reduction using hydride reagents, LiAlH ₄ , NABH ₄ and other organoboranes:	C&T, PPT



		chemo – and stereoselectivity, Catalytic hydrogenation (homogenous and heterogeneous)	
11	IV week of October	Swern and Dess-Martin oxidations, Corey-Kim oxidation, PCC, KMnO ₄ oxidations. Aromaticity and Antiaromaticity, Huckel's rule, annulenes and heteroannulenes, fullerenes (C ₆₀). Other conjugated systems,	C&T, PPT
12	I week of November	Chichibabin reaction. Aromatic electrophilic substitution: Orientation, reactivity, and mechanisms.	C&T, PPT
13	II week of November	Substitution in thiophene and pyridine. Aromatic nucleophilic substitution, S _N Ar, benzyne, S _N I. Aromatic Nucleophilic substitution of activated halides	C&T, PPT

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	CT-1	III week of September	1 h	20
2	CT-2	IV week of October	1 h	20
3	Assignment	I week of November	--	10
4	Compensation Assessment*	II week of November	1h	20
5	Final Assessment *	I week of December	3h	50

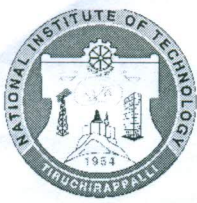
*mandatory; refer to guidelines on page 4

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

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

COURSE POLICY (including compensation assessment to be specified)

1. CT-1, CT-2 and another Assignment will be taken as regular assessment.
2. Compensation assessment is for those students who missed Test I or Test II due to genuine reasons



3. Compensation assessment will be conducted during the II week of Nov 2019.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

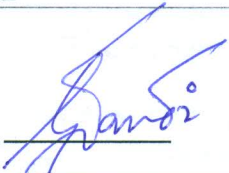


- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

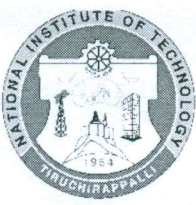
ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

FOR APPROVAL

Course Faculty  CC- Chairperson  HOD 



Guidelines

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.