Name of Institute: Indus Institute of Sciences, Humanities & Liberal Studies
Name of Faculty: Dr. Nikunj Valand

Course code: MCH0302
Course name: Advanced Concept in Organic Reactions

Pre-requisites: B. Sc. Chemistry

Credit points:

L	T	P	C
4	0	0	4

Offered Semester: III

Course Coordinator (week's XX - XX)

Full Name: Dr. Nikunj Valand
Department with sitting location: Science and Humanities Department,
4th Floor, Faculty Room, Bhanvar Building.
Telephone: EXT: 3425
Email: nikunjvaland.gd@indusuni.ac.in
Consultation times: Friday 3.20 pm to 4.15 pm

Course Lecturer (week's xx - XX)

Full name: Dr. Nikunj Valand
Department with sitting location: Science and Humanities Department,
4th Floor, Faculty Room, Bhanvar Building.

Telephone: EXT: 3425
Email: nikunjvaland.gd@indusuni.ac.in
Consultation times: Friday 3.20 pm to 4.15 pm

Students will be contacted throughout the session via mail with important information relating to this Course.

Course Objectives

By participating in and understanding all facets of this Course a student will:

1) To understand the basic fundamental theoretical knowledge of different pericyclic reactions in detail.
2) To learn about the various mechanism of pericyclic reactions.
3) To achieve additional knowledge about various conformational analysis of organic compounds.
4) To study the various oxidative and reductive reactions of organic reactions.
5) To recognize the stereo-chemistry based applicability of various hetero atoms containing organic compounds.
6) To understand the stere-ochemistry of various pericyclic reactions and mechanism.

Course Outcomes (CO)

After the successful completion of the course, students will be able to;

1) CO 1: Explain different theories of pericyclic reaction. [BT-1]
2) CO 2: Describe the mechanism of various pericyclic reactions. [BT-2]
3) CO 3: Analyse the different conformations of organic compounds. [BT-4]
4) CO 4: Differentiate between the various oxidative and reductive processes of organic chemistry. [BT-1]
5) CO 5: Explain the stereo-chemistry of the compounds containing nitrogen, sulphur and phosphorus.[BT-1]
6) CO 6: Analyse the stereo-chemistry of different pericyclic reactions. [BT-4]

Course Outline

(Key in topics to be dealt)

- **Pericyclic Reactions I**
- **Electrocyclic & sigmatropic reactions**
- **Pericyclic Reactions II**
- **Cycloaddition reactions**
- **Conformational analysis**
- **Oxidation and reduction**

Method of delivery

(**Face to Face lectures**, Active Learning Techniques, PowerPoint Presentations)

Study time

(How many hours per week including class attendance)

4 hours per week

CO-PO Mapping (PO: Program Outcomes)

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO 1	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	-	-	-	-	-	-	-	-	-
CO 6												

Bloom's Taxonomy and Knowledge retention (For reference)

(Bloom's taxonomy has been given for reference)

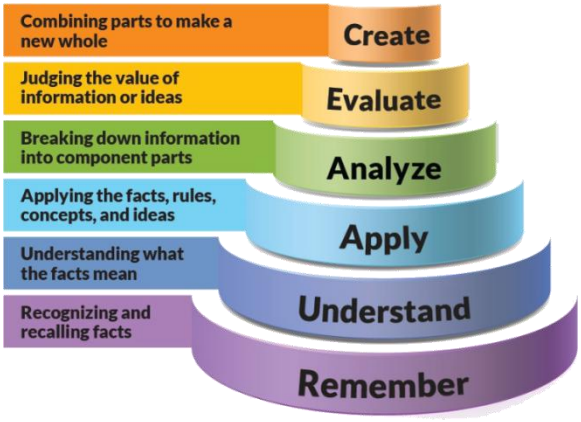


Figure 1: Blooms Taxonomy

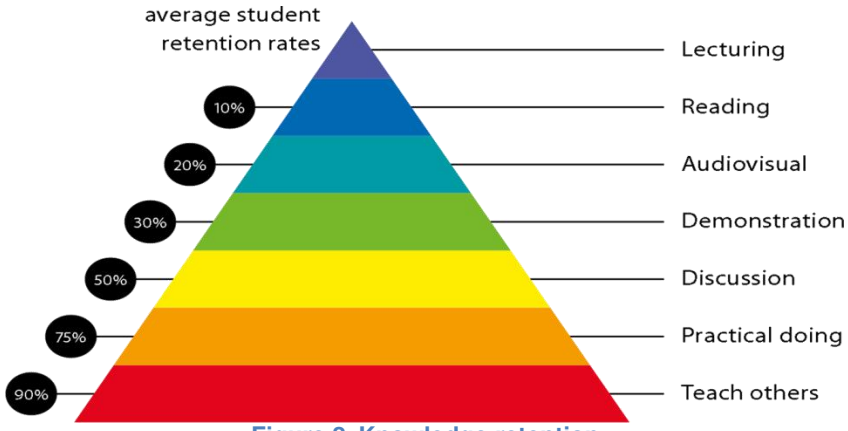


Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Department of Chemistry Post Graduate Capabilities
Informed Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	**1 Professional knowledge, grounding & awareness:-** Students will gain knowledge about organic chemistry subjects in both areas i.e. theory as well as practical's. Professionally students will know how organic chemistry is important in our daily life as well as to build up any industry. Students will be having knowledge/ awareness about chemicals' and reagents, such as how to use them and how hazardous they are for the environment.
Independent learners Engage with new ideas and ways of thinking and critically analyse issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and	**2 Information literacy, gathering & processing:-** Student's will be able to identify the problems happening in the society as well as in the industry such as photochemistry,

evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	electrocyclic reactions, cycloaddition reaction, conformational analysis, oxidation and reduction as well as the formation of molecule complexation from the industries etc. with this basic information they will be having the ability to gather the possible solutions.
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	**4 Problem solving skills:** Organic Chemistry education provides students with the tools to solve many problems based on Chemistry. This means that students should be able to apply the scientific method: define a problem clearly, develop testable hypotheses, design and execute experiments, analyse data using appropriate statistical methods, and draw appropriate conclusions. Students should be able to integrate knowledge across chemical sub disciplines and apply this knowledge to solve problems. In the laboratory, in addition to the characteristics described above, students should understand the fundamental uncertainties in experimental measurements.
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	**5 Written communication:-** Students should be able to retrieve specific information from the chemical literature, critically evaluate technical articles, and manage many types of chemical information. Students should be able to develop proficiency with electronic searching of appropriate technical databases, including structure-based searching.
	6 Oral communication:- Students should orally able to use communication technology such as computerized presentations as well as software for word processing, chemical-structure drawing, writing review articles on any related topic, poster preparation and research paper presentation to any conferences.
	7 Teamwork:- Students should be able to solve scientific problems often involving working in disciplinary and multidisciplinary teams. This is especially true in industry and increasingly in academic settings. Students should learn to work productively with a diverse group of peers in classroom and laboratory activities. Students should be able to lead portions of an activity or be effective followers, as dictated by the situation. Peer- and self-

	assessment is often an effective way to evaluate student contributions to group activities.
Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	**10 Sustainability, societal & environmental impact:** With this course students will know/ aware/ learn about the sustainable use of the organic reagents while performing the laboratory experiments. Students will be able to understand various photochemical reactions happening in the environment and their participation in global warming. So they will be having capabilities/ knowledge how to tackle/ deal with different types of organic pollutants coming from the organic laboratory and industry.

Practical work: NA

(Mention what practical work this Course involves)_M.Sc. Organic Chemistry _SEM-3

Lecture/tutorial times

(Give lecture times in the format below)

Monday-09:55 to 10:50 AM
Tuesday-01:20 to 02:15 PM
Thursday-01:20 to 02:15 PM
Friday-01:20 to 02:15 PM

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

Details of referencing system to be used in written work

1. Pericyclic reactions, Ian Fleming, oxford
2. Advance organic chemistry, Jerry March and Michael B. Smith, 6th edition, 2007, Wiley interscience john wiley & sons, inc., publication
3. Advance organic chemistry: part A & B, Carey and Sundberg
4. Photochemistry and pericyclic reactions, Jagdamba Singh, Jaya Singh,
5. Modern methods of organic synthesis, 4th edition, W. Carruthers , Iain Coldham, Cmbridge.
6. Organic chemistry, 2nd edition, J. Clayden, N. Greeves, S. Warren, Oxford university press
7. Organic chemistry, 7th edition, R. T. Morrison, R. N. Boyd, S. K. Bhattacharjee, Pearson
8. Peter Sykes, Longman: A GuideBook to Mechanism in Organic Chemistry.

9. Stereochemistry of Organic Compounds by Ernest L. Eliel, Samuel H. Wilen, wiley & sons, inc., publication.
10. Stereochemistry of Organic Compounds: Principles and Applications by D. Nasipuri, New age International Publishers

Text books

1. Organic Synthesis: Special Techniques V. K. Ahluwalia and Renu Aggarwal.
2. Organic reaction mechanism: V. K. Ahluwalia and Rakeshkumar Parashar, Narosa.
3. Organic Chemistry: Clayden, Greeves and Warren (Oxford)
4. Organic reactions and their mechanism by P. S. Kalsi

Additional Materials: NA

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Theory

CIE (60 marks)

1. Mid semester Examination = 40 marks
2. Attendance = 5 marks
3. Presentation = 5 marks
4. Assignment = 10 marks (2 assignments)

Total = 60 marks

ESE (40 marks)

1. Theory Exam = **40 marks**

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 50% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e. mid semester or end semester) of semester concerned. Students must make them available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 50% marks to clear the concerned components.

Practical Work Report/ Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day.

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment

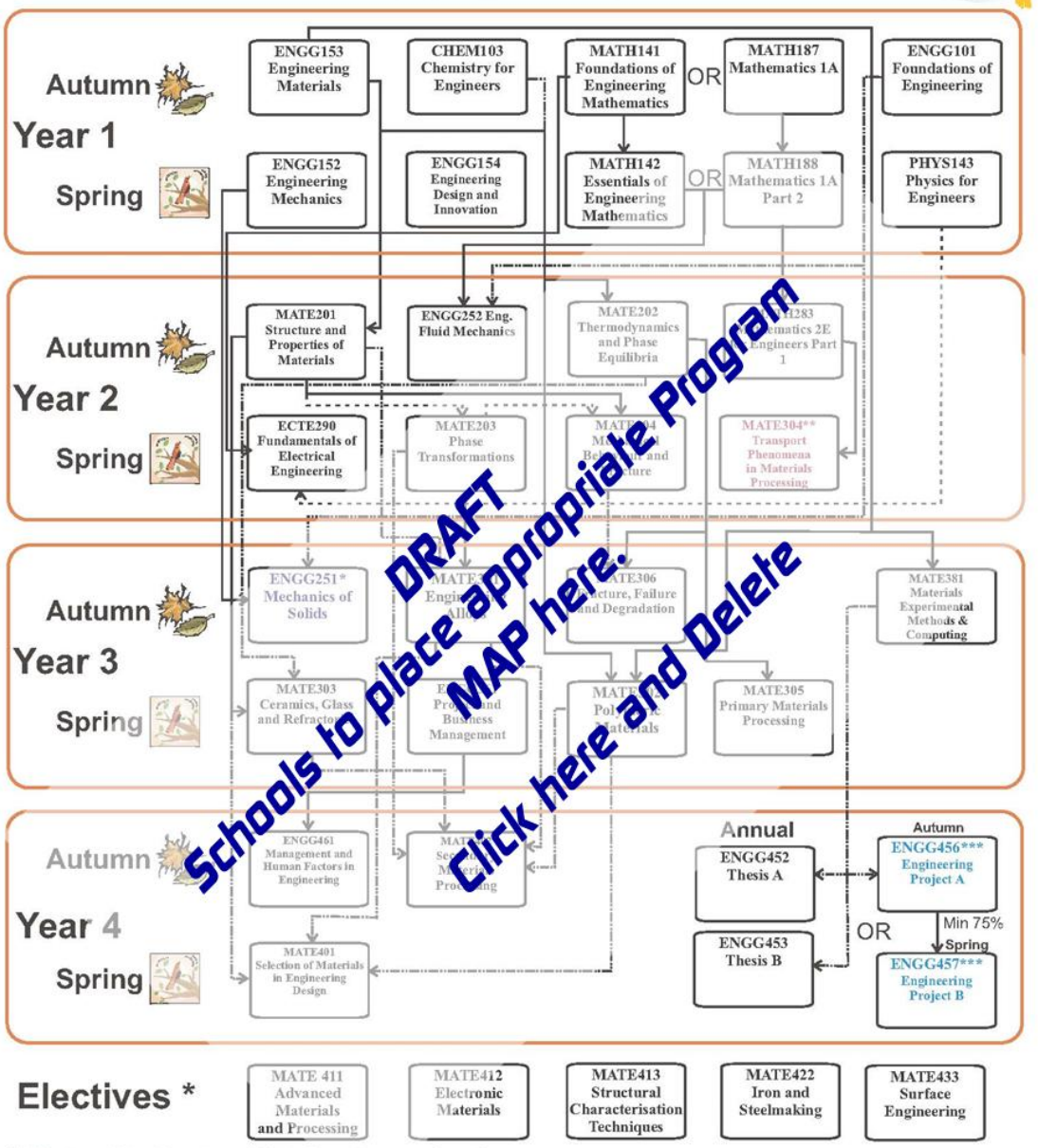
Course schedule (subject to change)
(Mention quiz, assignment submission, breaks etc as well in the table under the Teaching Learning Activity Column)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	**Unit-I** **Pericyclic Reactions I:** General introduction, Theories of pericyclic reactions: FMO, Woodward-Hoffmann rules, Huckel-Mobius rules.	1 & 2	
	Weeks 2	Electrocyclic reactions: Ring opening and closing reactions of 4n and 4n+2 system	1 & 2	
	Week 3	Cation (Nazarov reaction) and anion type molecules; small ring opening. Sigmatropic reactions: [1, n]. [2, 3] – SeO_2, Somellet-Haouser	1 & 2	
	Week 4	Wittig, Mislow Evans rearrangement, [3, 3]-Cope, Claisen, Claisen-Cope, Aza-Cope; [5, 5]	1 & 2	
	Week 5	**Unit-II** **Pericyclic Reactions II:** Cycloadditions:. [2+2] thermal and photochemical.	1 & 2	
	Week 6	[4+2]-Diels-Alder reactions, diene and dienophile nature; Inter, intra and	1 & 2	

		heterocyclic addition reaction with region and stereoselectivity.		
	Week 7	[3+2]-dipolar cycloaddition, introduction of different dipoles, their reactions dipolarophiles (inter, intra) cyclo-additions reactions of more than six electrons.	1 & 2	
	Week 8	Group transfer reactions: Ene reactions, diimide (N_2H_2), syn_β-elimination.	1 & 2	
	Week 09	**Unit-III** **Conformational analysis:** Confirmation at cyclic systems: Conformation of cyclohexane, mono and disubstituted cyclohexane, heterocyclic compounds.	3 & 6	
	Week 10	Five and six membered heterocycles, stereoelectronic effects, fused bicyclic system, decalin, dodecalin, polyclin system, perhydrophenanthrene, bridged systems-conformation of sugars.	3 & 6	
	Week 11	Steric strains due to unavoidable crowding, stereochemistry of the compounds containing nitrogen, sulphur and phosphorous.	3 & 6	
	Week 12	**Unit-IV** **Oxidation and reduction:** Introduction, different oxidation processes, hydrocarbons-alkenes, aromatic rings, saturated C-H group (Activated and inactivated).	4	
	Week 13	Alcohols, diols, aldehydes, ketones, amines, hydrazine and sulphides.	4	
	Week 14	Introduction, different reductive processes, hydrocarbons-alkanes, alkenes, alkynes and aromatic rings Carbonyl compounds- aldehydes, ketones, acids and their derivatives, epoxides, nitro, nitroso, azo and oxime groups.	4 & 5	
	Week 15	Preparation and properties and application of pd and Ti compounds as organometallic agents.	5	

PROGRAM MAP for Bachelor of Engineering (Materials Engineering)

DEGREE - 2012



* Note: Students will take three electives
Some electives are only offered every 2nd year

ENGG251* Note: Full time students entering Year 3 in 2012 will need to take one elective in Autumn as they have already completed ENGG251

MATE304** Note: Full time students entering Year 3 in 2012 will need to take MATE304 in Spring of their 4th year or take it in 2012 and defer another subject to Spring 2012

ENGG456***Note: If ENGG456 Engineering Project A (6cp) is done instead of a thesis, a student needs to complete 4 electives and is not eligible for honours