

Catalytic Asymmetric Synthesis - Web course

COURSE OUTLINE

Catalytic asymmetric synthesis provides an effective method for the construction of optically active compounds. This course contains eleven modules covering the recent developments in asymmetric catalytic synthesis. The Synthetic and mechanistic aspects will be described.

Detailed Course Plan

Module No	Module Topic	No. of Classes
Module 1	Reactions using Chiral Lewis Acids and Bronsted Acids	4
Module 2	Carbon-Carbon Bond-Forming Reactions	5
Module 3	Synthesis via C-H Activation	3
Module 4	Carbon-Heteroatom Bond-Forming Reactions	3
Module 5	Oxidation Reactions	6
Module 6	Hydrogenation Reactions	3
Module 7	Reactions in Nonconventional Conditions	3
Module 8	Hydrosilylation of Carbon-Carbon Double bonds and Related Reactions	3
Module 9	Carbonylation Reactions	3
Module 10	Organocatalysis	3
Module 11	Enzyme Catalyzed Reactions	4
	Total	40

Course material

Sl. No.	Topic	Lecture hours
	Module 1	



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Chemistry and Biochemistry

Pre-requisites:

1. Organic Chemistry Background

Coordinators:

Prof. T. Punniyamurthy
Department of
Chemistry IIT Guwahati

1.1	Bronsted Acid-Assisted Lewis Acid	4
1.2	Lewis Acid-Assisted Lewis Acid	
1.3	Lewis Acid-Assisted Bronsted Acid	
1.4	Bronsted Acid-Assisted Bronsted Acid	
Module 2		
2.1	Ene and Cycloadditions	5
2.2	Alkene Metathesis	
2.3	Carbometallations and Carbocyclizations	
2.4	Conjugate Addition	
2.5	Allylic Substitutions with Carbon Nucleophiles	
Module 3		
3.1	Metal Carbenoid Insertion	3
3.2	Metal Nitrenoid-Mediated Reactions	
3.3	Direct C-H Oxidation	
Module 4		
4.1	Allylic Substitution	3
4.2	Addition to Alkenes and Allenes	
4.3	Aziridination of Alkenes and other Reactions	
Module 5		
5.1	Oxidation of Alcohols	6
5.2	Epoxidation	
5.3	Sulphoxidation	
5.4	Baeyer-Villger Oxidation	
5.5	Dihydroxylation	
5.6	Aziridination	

	Module 6	
6.1	Reactions of Alkenes	3
6.2	Reactions of Ketones	
6.3	Reactions of Imines	
	Module 7	
7.1	Reactions in Water	3
7.2	Microwave-Assisted Reactions	
7.3	Synthesis in Alternative Reaction Media	
	Module 8	
8.1	Hydrosilylation of Alkenes and Related Compounds	3
8.2	Hydroboration of Alkenes	
8.3	Hydroalumination and Hydrostannylation of Alkenes	
	Module 9	
9.1	Hydroformylation	3
9.2	Alkoxy carbonylation and Related Reactions	
9.3	Co- and Terpolymerization of Alkenes with CO	
	Module 10	
10.1	Reactions Involving Enamine, Iminium and Photoredox Activation	3
10.2	Asymmetric Acid-Base Bifunctional Catalysis	
10.3	Asymmetric Phase-Transfer and Ion Pair Catalysis	
	Module 11	
11.1	Acylation of Alcohols and Amines	4
11.2	C-C Bond-Forming Reactions	
11.3	Hydrolytic Reactions	
11.4	Reduction and Oxidation	

References:

1. Catalytic Asymmetric Synthesis, 3rd ed, Ed: I. Ojima, John Wiley & Sons, New Jersey, 2010.
2. Transition Metal Catalysis for Fine Chemicals, Eds: C. Bolm, M. Beller, Wiley, Weinheim, 1998.