



**Summer Term -2022**

**Course Handout Part II**

**28-05-2022**

In addition to the part I (general handout for all courses appended to the timetable) this portion gives specific details regarding the course.

Course No. : CHEM F311  
Course Title : Organic Chemistry III  
Instructor-in-charge : **Anupam Bhattacharya**  
Instructor : Tanmay Chatterjee

**1. Course Description:**

This course emphasizes on applications of important reagents and reactions in organic synthesis and disconnection or *synthon* approach. In *disconnection* or *synthon* approach the target molecule is broken down by a series of disconnections into possible starting materials followed by synthesis.

**2. Scope and Objective of the Course:**

The aim of this course is to familiarize students with various common organic reagents, expose them to some of the important transition metal catalyzed organic reactions and retrosynthetic analysis and enable the student to design the synthesis of various organic compounds using appropriate reagents.

**3. Text Book:**

**TB1:** Michael B. Smith & Jerry March, Advanced Organic Chemistry, John Wiley & Sons, 6<sup>th</sup> ed., 2012.

**TB2:** Stuart Warren: Organic Synthesis: The Disconnection Approach: John Wiley & Sons, 2<sup>nd</sup> ed. 2008.

**Reference Books:**

**R1:** Carruthers and Coldham, Modern Methods of Organic Synthesis, Cambridge, 4<sup>th</sup> edition, 2004.

**R2:** Fuhrhop and Li, Organic Synthesis: Concepts and Methods; Wiley, 3<sup>rd</sup> edition, 2014.

**4. Course Plan:**

Lec. No.	Learning Objectives	Topic(s) to be Covered	Learning Outcomes	Chap(s). No(s).
----------	---------------------	------------------------	-------------------	-----------------

1	Introduction	Organic synthesis and its applications	Relate the importance of various organic compounds, their synthesis and uses	Class notes
2-5	Common organic reagents	NaBH <sub>4</sub> (SS), LAH (SS), DIBAL, BH <sub>3</sub> , Birch reduction, Swern oxidation, OsO <sub>4</sub> , O <sub>3</sub> (SS), DMP, <i>m</i> -CPBA (SS), Ti( <sup>i</sup> OPr) <sub>4</sub> , Lindlar catalyst, NBS (SS), NaIO <sub>4</sub> (SS)	Define and consolidate new oxidative and reductive reagents to be used in various organic synthesis	TB1: 15-13; Class notes, SS: self-study
6-9	Organometallic reagents	Grignard reagent (SS), organolithium reagents (SS), organocuprates (SS), organozinc reagents, organoboranes, organosilicon reagents, organotin compounds	Define the various organometallic reagents to be used in organic synthesis	Class notes, SS: self-study
10-12	Transition metal catalyzed organic reactions	C-C bond forming reactions (Suzuki, Heck, Negishi, Sonogashira, Stille reaction), C-N bond forming reactions (Buchwald-Hartwig reaction)	Define various bond forming reactions and their application based name reactions in organic synthesis	TB1: 13-12, 13-10, class notes
13	Introduction of disconnection approach	Basic principles of disconnection approach in organic synthesis	Define retrosynthesis and basis for mathematical approach towards synthesizing organic compounds	TB2: 1
14-16	Synthesis of aromatic Compounds	Basic Principles: Synthesis of Aromatic Compounds, The Order of Events	Use retrosynthetic analysis to work out and compare alternative syntheses of complex organic compounds. Outline important classical and modern reactions used in organic synthesis. Discuss how reaction conditions influence the outcome of important reactions with respect to regioselectivity, stereospecificity and stereoselectivity.	TB2: 2, 3
17-24	One group C-X and C-C disconnections	One Group C-X Disconnections, Chemoselectivity Synthesis of Alcohols, General Strategy of Choosing Disconnection, Stereoselectivity, Synthesis of Carbonyl Compounds, Regioselectivity, Alkene Synthesis, Use of acetylenes for synthesis.		TB2: 4, 5, 10-16
25-31	Two group C-X and C-C disconnection	Two Group C-X Disconnections, Reversal of Polarity, Cyclisation		TB2: 6-9, 17-28

	s	Reactions, Summary of Strategy, Amine Synthesis, Diels-Alder Reactions, 1,3-Difunctionalised Compounds and $\alpha,\beta$ -Unsaturated Carbonyl Compounds, Control in Carbonyl Condensations, 1,5-Difunctionalised Compounds, Michael addition and Robinson annelation, Use of Aliphatic Nitro Compounds in Synthesis, 1,2-Difunctionalised compounds, FGA and its Reverse, Reconnections, 1,4- and 1,6-Difunctionalised Compounds, Strategy of Carbonyl Disconnections.		
32-38	Ring synthesis (saturated heterocycles)	Introduction to Ring synthesis, Synthesis of three, four, five and six membered Rings and general strategy of Ring Synthesis	Use disconnection approach for synthesis of ring compounds and apply all the principles learnt already in synthesizing various aromatic heterocycles	<b>TB2:</b> 29, 30, 34, 36, 37
39-40	Synthesis of heterocyclic compounds	Aromatic Heterocycles		<b>TB2:</b> 39

#### 5. Evaluation scheme:

Component	Duration	Weightage (%)	Date and Time	Nature of Component
Midsemester Test	90 min	35	23/06 3.30 - 5.00PM	<b>Closed Book</b>
Class tests	25 min	25	Continuous	<b>Closed Book</b>
Comprehensive Examination	180 min	20 % Closed book + 20 % Open book	20/07 AN	<b>Partially Open Book</b>

#### 6. Chamber Consultation Hour:

**7. Make-up policy:** Make up would be considered only for very **genuine reasons (hospitalization with appropriate documentary proof)**, and any other extreme emergency situations which would be decided by the team of instructors.

**8. Notice:** All notices concerning the course will be displayed on CMS.

**9. Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**10. Final grading** will be done on the basis of the overall performance of a student in each of the components as listed in item no. 5. For **mid-semester grading**, progress made by a student up to that point of time would be evaluated.

**Instructor-in-Charge**

**Organic Chemistry – III**

