Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2021-2022

Course Handout Part II

20-08-2021

In addition to 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 : ***KVG Chandra Sekhar***
Instructor : *Tanmay Chatterjee, Nandikolla Adinarayana,*

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, 6th ed., 2012.

TB2: Stuart Warren: Organic Synthesis: The Disconnection Approach: John Wiley & Sons, 2004.

Reference Books:

R1: Carruthers and Coldham, Modern Methods of Organic Synthesis, Cambridge, 4th edition, 2004.

R2: Fuhrhop and Li, Organic Synthesis: Concepts and Methods; Wiley, 3rd edition, 2014.

4. Course Plan:

Lec. No.	Learning Objectives	Topic(s) to be Covered	Learning Outcomes	Chapter in the Text Book
1	Introduction	Organic synthesis and its	Relate the importance of	Class notes

		applications	various organic compounds, their synthesis and uses	
2-5	Common organic reagents	$NaBH_4$ (**SS**), LAH (**SS**), DIBAL, BH_3, Birch reduction, Swern oxidation, OsO_4, O_3 (**SS**), DMP, *m*-CPBA (**SS**), $Ti(^iOPr)_4$, Lindlar catalyst, NBS (**SS**), $NaIO_4$ (**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 reterosynthesis 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 disconnections	Two Group C-X Disconnections, Reversal of Polarity, Cyclisation Reactions, Summary of		**TB2:** 6-9, 17-28

		Strategy, Amine Synthesis, Diels-Alder Reactions, 1,3-Difuntionalised Compounds and α,β-Unsaturated Carbonyl Compounds, Control in Carbonyl Condensations, 1,5-Difuntionalised Compounds, Michael addition and Robinson annelation, Use of Aliphatic Nitro Compounds in Synthesis, 1,2-Difuntionalised compounds, FGA and its Reverse, Reconnections, 1,4- and 1,6-Difuntionalised 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	**TB2:** 29, 30, 34, 36, 37
39-40	Synthesis of heterocyclic compounds	Aromatic Heterocycles		**TB2:** 39

5. Evaluation scheme:

Component	**Duration**	**Weightage (%)**	**Date and Time**	**Nature of Component**
Midsemester Test	90 min	30	22/10/2021 3.30 - 5.00PM	**Closed Book**
Class tests*	25 min	20	Continuous	**Closed Book**
Assignment[#]		10		**Open Book**
Comprehensive Examination	120 min	20 % Closed book + 20 % Open book	24/12 FN	**Partially Open Book**

*Six class tests will be conducted at regular intervals. Best four will be considered. **Make Up is not permissible for class tests.**

[#]One home assignment would be given and each student is expected to submit **(last week of Oct) a handwritten scanned report (5 %)** (approx 7-8 pages) on the assigned topic. Online VIVA (5 %) will

also be conducted based on the assignment.

Note: *Active and regular participation in the class discussions is expected from each student.*

6. **Chamber Consultation Hour**: To be announced through a notice.

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