Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2023-2024

Course Handout Part II

11-08-2023

In addition to part I (the 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**

1. Course Description:
The initial portions of this course emphasize applications of important reagents and reactions in organic synthesis; the later portion of the course deals with disconnection or *synthon* approach. In the *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: M. B. Smith & Jerry March, Advanced Organic Chemistry, John Wiley & Sons, 6th edition, 2012.

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

Reference Books:

R1: J. Clayden, Greeves, Warren & Wothers, Organic Chemistry, Oxford University Press, 1st edition, 2000.

R2: G. S. Zweifel and M. H. Nantz, The Modern Organic Synthesis: An Introduction. Wiley, 2nd edition, 2017.

R3: Carruthers and Coldham, Modern Methods of Organic Synthesis. Cambridge, 4th edition, 2004.

4. Course Plan:

Lec.	Learning	Topic(s) to be Covered	Learning Outcomes	Chap(s).

No.	Objectives			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	$NaBH_4$, LAH, DIBAL, BH_3, Birch reduction, Swern oxidation, OsO_4, O_3, DMP, *m*-CPBA, $Ti(^iOPr)_4$, Lindlar catalyst, NBS, $NaIO_4$	Define and consolidate new oxidative and reductive reagents to be used in various organic synthesis	**TB1**: 15-13; **R2:** 4; Class notes
6-9	Organometallic reagents	Grignard reagents, organolithium reagents, organocuprates, organozinc reagents, organoboranes, organosilicon reagents, organotin compounds	Define the various organometallic reagents to be used in organic synthesis	**R2:** 7; Class notes
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, **R1:** 48; Class notes
13	Introduction of disconnection approach	Basic principles of disconnection approach in organic synthesis	Define retrosynthesis and the basis for the mathematical approach toward 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. **SS**: self-

	s	Reactions, Summary of 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 **(SS).**		study
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**	**Remarks**
Midsemester Test	90 min.	30	11/10 - 4.00 - 5.30PM	**Closed Book**
Class tests*	15 min.	20	Continuous	**Closed Book**
Assignment[#]		10		**Open Book**
Comprehensive Examination	180 min.	20 % Closed book + 20 % Open book	13/12 AN	**Partially Open Book**

*Six class tests will be conducted at regular intervals. The best five will be considered.

Makeup is not permissible for class tests.

[#]One home assignment would be given, and each student is expected to submit **a handwritten report** (approx 8-10 pages) on the assigned topic.

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

6. **Chamber Consultation Hour**: Friday, 09th hour (4-5 PM)
7. **Make-up policy:** Makeup would be considered only for **genuine reasons (*hospitalization with appropriate documentary proof),*** and any other extreme emergency situations.
8. **Notice**: All notices concerning the course will be displayed on the chemistry notice board / 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 based on a student's overall performance in each of the components listed in item no. 5. For **mid-semester grading**, progress made by a student up to that point will be evaluated.

Instructor-in-Charge

Organic Chemistry – III