## Sultan Qaboos University College of Science, Department of Chemistry

# CHEM 6622 Aspects of Organic Synthesis Fall 2023

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### **Course Description**:

This course is an elective organic synthesis course for postgraduate students. It is aimed at teaching the students some modern method of organic synthesis. Topics include methods for formation of carbon-carbon single bonds, carbon-carbon double bonds and carbon-carbon triple bonds. Other topics are pericyclic reactions, radical and carbene chemistry, functionalization of alkenes, oxidation and reduction methods in synthesis. Retrosynthetic analysis and possible bond disconnections will be applied within these topics. Later in the course, strategies and tactics for organic synthesis will be taught through retrosynthetic analysis of natural products.

#### Aims:

On successful completion of the course, the student will be able to:

- Understand the principles involved in designing synthetic routes in organic chemistry
- recognize and be able to apply key reactions in designing their own syntheses
- understand the different reactivities of common aromatic heterocycles, and the methods used for their synthesis
- recognize the specific factors influencing the success of routes to cyclic compounds
- know the most frequently used methods for the synthesis of cyclic compounds, and their relative merits
- Plan a retrosynthetic analysis of a synthetic target
- Recognize pericyclic reactions
- Acquire knowledge in protecting-group chemistry
- Recognize different synthetic routes of a certain target
- Plan a multi-step synthetic sequence of a certain natural product based on careful retrosynthetic analysis

## **Course Content:**

- Survey of functional group inter-conversions
- Design of a synthesis
- > The Disconnection Approach: choosing a disconnection, One- and two group C-X
- Two Group Disconnections: Diels-Alder reactions, syntheses of 1,1 to 1,6-dioxygenated compounds, and other di-functional compounds
- C-C Disconnections: carbon-carbon bond forming reactions, Enolate formation under conditions of kinetic and thermodynamic control, Use of enolates of specific configuration in aldol processes.
- Strategies and Tactics for Ring Synthesis: cyclisation vs annulation approaches to cyclic organic molecules. Examples of some cyclizations and annulations.
- > Common definitions in asymmetric synthesis and stereochemistry
- Selected examples of stereoselective synthesis
- Selected Synthesis: examples of total syntheses of simple natural products and compounds of medicinal interest or industrial importance. revision and application of key principles in synthesis

#### Assessment:

Exam I:	25%
Exam II:	25%
Final Exam:	50%

# **References:**

- "Organic Synthesis: the disconnection approach ", 4th Edition by S. Warren, Wiley,
- "Advanced Organic Chemistry: reactions, mechanism and structure", J. March, Wiley, 4th ed., 1992.
- "Designing Organic Syntheses: a programmed introduction to the synthon approach", S. Warren, Wiley, 1978.
- "Guidebook to Organic Synthesis", R.K. Mackie, D.M. Smith and R.A. Aitken, Addison Wesley Longman, 3rd ed., 1999.
- "Selectivity in Organic Synthesis", R.S. Ward, Wiley, 1999.
- "Some Modern Methods of Organic Synthesis", W. Carruthers, Cambridge, 3rd ed., 1987.