



**FORMAN CHRISTIAN COLLEGE, LAHORE**  
**DEPARTMENT OF CHEMISTRY**  
**CHEM 465: Natural Products and Medicinal Chemistry**

**Teacher Information**

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**Course Information**

Course: CHEM 465 Natural Products and Medicinal Chemistry

Credits hours: 3+1(Theory + Lab)

**Course Contents**

“Natural products as secondary metabolites: definition, classification and their medicinal importance; a general review and advances in terpenoids, alkaloids, flavonoids, and steroids focusing on isolation techniques, structural elucidation, and physiological activities”.

**Course Objectives**

Study of natural products constitute a core field of modern organic chemistry. They have a great medicinal and industrial importance and have vast research, employment, and entrepreneurship prospects. The objectives of this course are summarized as follows:

1. To equip the students with the foundational knowledge of natural products and their various classes based on structures, occurrence, and applications.
2. To familiarize the students of various methodologies and techniques used for isolation and extraction of natural products from plants.
3. To empower the students with knowledge of spectroscopic techniques (IR, Mass, NMR) used for structure elucidation of natural products.
4. To apprise the students about the ongoing research in the field of natural products and prospects.
5. To familiarize students with the job and entrepreneurship opportunities in the field of natural products.

**Learning Outcomes**

At the end of this course, students are expected to:

1. Have ample knowledge of natural products and their various classes, and their industrial importance, and job and entrepreneurship prospects.
2. Know various methods and techniques (conventional and modern) used for extraction and isolation of natural products from plants.
3. Know how to use spectroscopic data to elucidate structures of natural products, total or partial syntheses of some representative natural products,
4. Know the research opportunities in the field of natural products and be able to design research projects in the field.
5. Be able to make concrete contributions to the field of natural products to make innovations and solve human problems.

**Reading material:** Medicinal Natural Products: A Biosynthetic Approach, 3rd Edition. Paul M. Dewick; Flavonoids: Chemistry, Biochemistry and Applications Edited by Øyvind M. Andersen and Kenneth R. Markham; A Fragrant Introduction to Terpenoid Chemistry by Charles S Sell, Quest International, Ashford, Kent, UK. Online material will also be used.

**The Evaluation/Examination**

1. Quizzes 10%
2. Assignments 10%
3. Presentations 10%
4. Midterm Examination 20%
5. Final Examination 20%
6. Class participation 5%
7. Lab activities/Projects 25%

**Attendance**

A student must be regular and punctual. He/she should normally attend all classes as per the university policy.

**Dishonesty and plagiarism** will not be tolerated. Assignments must be a product of a student's own effort.

**Week-wise breakup of the course**

<b>Week</b>	<b>Topics and learning/ teaching activities</b>
<b>1</b>	Explaining the course objectives, learning outcomes and expectations, and the evaluation and assessment criteria. Introduction, definition, classification, and medicinal importance of natural products.
<b>2</b>	Methods and techniques used in the field of natural products (conventional techniques).
<b>3</b>	Methods and techniques used in the field of natural products (modern techniques). Quiz
<b>4</b>	Qualitative analysis tests; estimation methods for contents and bioactivities. Terpenoids, definition and classification, myrcene. Assignment
<b>5/6</b>	Spectroscopic techniques for structure elucidation of natural products: basic concepts and application. Quiz
	<b>Mid Term</b>
<b>7</b>	Presentations by students.
<b>8/9</b>	Biosynthesis of natural products. Quiz
<b>10/11</b>	Study of specific terpenoids, such as myrcene, citral, geraniol, alpha-pinene, limonene, menthol; structure elucidation and synthesis. Assignment
<b>12</b>	Alkaloids, definition and classification, extraction of alkaloids.
<b>13</b>	Study of some specific alkaloids, such as those containing pyrrole, pyridine, tropane, quinoline, isoquinoline and indole rings. Assignment
<b>14</b>	Flavonoids: various types; bioactivities, such as antioxidant and radical scavenging.
<b>15</b>	Mechanism of antioxidant action; some specific flavonoids, such as quercetin, rutin; medicinal activities. Quiz
<b>16</b>	<b>Recapping the course + Feedback; Final examination</b>

**Hard work has no replacement!**