Course Specification
(Bachelor)

Course Title:	Chemistry of Natural Products
Course Code:	CHM 1421
Program:	Bachelor of Science in Chemistry
Department:	Chemistry
College:	Science
Institution:	Imam Mohammed Ibn Saud Islamic University
Version:	2024 V 1
Last Revision Date:	13 October 2024

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A. General information about the course:

-1. Course Identification

1. Credit hours: 2 (2 Lectures, 0 Tutorials, 0 Lab)					
2 (2 Lectures, 0 Tutorials, 0 Lab)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 7 / Year 4					
4. Course general Description:					
The course covers introduction to natural product chemistry; classification of natural products, isolation techniques and physiochemical data, the acetate pathway (fatty acids and polyketides), the shikimate pathway (aromatic amino acids and phenylpropanoids), the mevalonate (terpenoid and steroids), alkaloids, proteins and amino acid derivatives, lipids and fatty acids, and carbohydrates.					
5. Pre-requirements for this course (if any)**:**					
CHM1321 Heterocyclic Chemistry					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					

At the end of this course the student will be able to:

- **To study of carbohydrates and natural products in point of view from many disciplines.**
- **To Promote understanding of the significance of natural products in terms of their biosynthesis, and biological activity and in life.**
- **To outline the occurrence, the isolation, and structure elucidation**
- **To develop hands-on skills of using laboratory tools and be able to isolate and elucidate the chemical structure of isolated natural products.**

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**30**	**100%**
2	E-learning	**0**	**0**
3	Hybrid • Traditional classroom • E-learning	**0**	**0**
4	Distance learning	**0**	**0**

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**30**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)**	**0**
Total		30

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**To recall functional groups of organic chemistry and their importance in the biosynthesis.**	**K1; K3**	▪ Two hours are weekly containing lectures, , and Oral Discussion. ▪ A Private study including home exam.	▪ Quizzes Assignments ▪ Oral Discussion ▪ Participation.
1.2	**To recognize the structure and molecular classification of a representative number of compounds belonging to the main classes of natural products.**	**K1; K3**	▪ Two hours are weekly containing lectures and group discussion ▪ Discussion activities	▪ Quizzes Assignments. • Oral Discussion marks
1.3	**To list relevance of selected natural compounds and some chemical elaboration and outline the structure activity relationship.**	**K3**	▪ Two hours are weekly for lectures activities ▪ Think and talk about Natural Products Chemistry	▪ Quizzes ▪ Home exam ▪ Oral Discussions.
2.0	Skills			
2.1	**To explain different synthetic strategies**	**S1; S2**	• Lectures activity,	▪ Questions in Lectures.

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	pathways in natural products biosynthesis		Think and talk about the Biosynthesis of natural products	▪ Short Quizzes and Exams. ▪ Participation ▪ Oral Discussion, ▪ Home Exam.
2.2	**To predict the bioactivity, properties and chemical structure of some natural products.**	**S1; S2; S3**	Introduce some examples on the bioactivity properties of some natural products	• Questions in Lectures. • Short Quizzes and Exams.
2.3	**To summarize different situations and problems in isolation of specific natural products group**	**S1; S3**	• Lectures, and Group discussion • Brainstorming Exercises	▪ Questions in Lectures. ▪ Short Quizzes and Exams.
3.0	Values, autonomy, and responsibility			
3.1	**To show intellectual and scientific integrity during assignments and projects**	**V1; V2**	• Group Discussion and Assignments.	▪ Oral Tests and Assignments Marks

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction:** Occurrence, origin, main groups of natural products, impact of natural products in medicine.	**3**
2.	**Alkaloides:** Introduction, Hagnauer system of classification, Physicochemical properties of alkaloids, Methods of isolation, Biosynthesis of alkaloids.	**4**
3	**Terpenes and Terpinoids:** Introduction, Isoprene rule, Carbon-carbon bond formation in terpene biosynthesis, Classification of Terpenes, Heme Biosynthesis, some examples of terpenes synthesis.	**4**
4	**Flavonides:** Purpose and delivery of Favonides in plants, Types of Flavonides, Flavonides biosynthesis, Chemical analysis of Flavonides, Legnin, Complexation and Reduction/Oxidation Reactions of Selected Flavonoids with Iron and Iron Complexes.	**4**
5	**Glycosides and Tannines:** Nomenclature, Anthracene glycosides, Anthracene and anthranols, Structure of Saponines, Coumarin glycosides.	**3**
6	**Protein and amino acids:** Classification of Amino Acids, Stereochemistry of Amino Acids, Acid-Base Behavior of Amino Acids, Synthesis and Reactions of	**4**

	Amino Acids, Peptides, Peptide Bond Formation. Insulin, Solid-Phase Peptide Synthesis.	
7	**Lipids and Fatty acids:** Introduction, Structures, Biological Functions of Lipids, Fatty Acid Naming Systems, Trans Fatty Acids, Wax, Major Types of Lipids, Phosphatidylcholine, Ether Lipids, Sialic Acid, Saponification and Methylation.	4
8	**Carbohydrates:** Introduction, Monosaccharides, Nomenclature of Monosaccharides, Amino sugars, Modified Monosaccharides, Ketoses, Structure and stereochemistry of glucose, Cyclic structure of monosaccharides, Reactions of monosaccharides, Formation of Osazones, Relative Sweetness of Some Carbohydrate and Artificial Sweeteners, Cellulose, Heparin with other examples.	4
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Attendance, Participation, Home Exams	All the semester	20 %
2.	Midterm Exam 1	Around 6th & 7th week	20 %
3.	Midterm Exam 2	Around 11th & 12th week	20 %
4.	Final Exam	Around 16-17th week	40 %
5.	Total		100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	▪ Chemist***ry of Natural Products***, Bhat, Sujata V., Nagasampagi, Bhimsen A., Sivakumar, Meenakshi Jointly published with Narosa Publishing House 2005, XXX., ISBN: 978-3-540-40669-3. ▪ ***The Chemistry of Natural Products***, Thomson, R.H. Springer, 2nd ed. 1993, **ISBN-10:** 9401049505
Supportive References	• **Medicinal Natural Products: A Biosynthetic Approach,** Dewick, Paul M., Wiley India Pvt Ltd; Third edition, 2011. ISBN-10: 8126532963.
Electronic Materials	• **Blackboard**
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Each of the classroom should be equipped with a whiteboard and a projector, with a maximum of 20 students.**
Technology equipment (projector, smart board, software)	**The rooms and laboratories are equipped with data show, Smart Board, WI-FI access.**
Other equipment (depending on the nature of the specialty)	**None**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of Students' assessment	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course report.
	Students	**Indirect:** Second examiner checklist-Course report.
Quality of learning resources	Faculty (Academic Advisory)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	Course Responsible	Direct: Exams - Course e-Portfolio. Indirect: Second examiner checklist-Course report.
	Program Leaders	Indirect: Exams.

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	COUNCIL OF DEPARTMENT OF CHEMISTRY
REFERENCE NO.	7 (NO. 2/3)
DATE	29/3/1446 - 2/10/2024