Course Specification

(Postgraduate Programs)

Course Title:	**Bioactive Natural Compounds**
Course Code:	**BIO-6000**
Program:	**Master of Science in Applied Biology (Cell and Molecular Biology)**
Department:	**Biology**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**1**
Last Revision Date:	*Pick Revision Date.*

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A. General information about the course:

1. Course Identification:

1. Credit hours: (Lecture 2 + Lab 0)				
2. Course type				
A.	☐University	☐College	☐ Department	☒ Track
B.	☐ Required		☒ Elective	
3. Level/year at which this course is offered: (undetermined level)				
4. Course General Description:				

This course describes the use of biologically active natural substances or molecules, including its relevance to bioscience and biotechnology. Classification of bioactive molecules, their necessity and purpose, and interpretation of their pharmacological activity are included. The course encompasses topics such as the origin of naturally occurring products, and the expression of activity of natural pharmaceutical drugs, basic chemical biology, and basic medicinal chemistry. The course topics include general applications of bioactive natural products and phytochemicals used in pharmaceuticals to treat numerous disease conditions. These natural chemicals protect against cancer through antioxidant and pro-oxidant actions and combat cancer via apoptosis and necrosis as well as modulation of the immune system. In addition, the course content describes trending topics including the antibacterial and antifungal effects of plant metabolites from tropical medicinal plants, molecular mechanistic actions, and the role of natural bioactive compounds as anti-diabetic agents, marine sources of pharmacological effects such as anti-cardiovascular, anti-coagulant, anti-obesity, bone growth, and healing. The course topics also provide basic knowledge regarding the natural biomaterials employed in genetic engineering.

5. Pre-requirements for this course (if any)**:**

None

6. Co-requisites for this course (if any)**:**

None

7. Course Main Objective(s):

This course aims to offer students a thorough comprehension of various classifications of secondary metabolites, commonly known as natural compounds, produced by diverse plants, marine macro-organisms, and microbes. Additionally, the course explores the potential pharmaceutical applications of these natural compounds. Moreover, this

educational module offers students the opportunity to gain expertise in the methods of extraction, purification, and determination of structure, as well as performing bioassays to evaluate the biological characteristics of marine natural substances. The course objectives encompass the role of natural bioactive compounds in treating diabetes, cancer, cardiovascular diseases, and their activity as anticoagulants.

2. Teaching Mode: (mark all that apply)

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

3. Contact Hours: (based on the academic semester)

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

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

Code	Course Learning Outcomes	Code of CLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Outline the common bioactive natural compounds	K1	-Lectures -Tutorials	-Assignments -Class participation -Data search -Written exams

Code	Course Learning Outcomes	Code of CLOs aligned with the program	Teaching Strategies	Assessment Methods
1.2	Describe the general applications of bioactive natural compounds	K2	-Lectures -Tutorials	Assignments -Class participation -Data search -Written exams
1.3	Explain the major molecular mechanistic pathways of natural compounds	K3	-Lectures -Tutorials	Assignments -Class participation -Data search -Written exams
2.0	Skills			
2.1	Relate the chemistry of bioactive natural products to their applications	S1	-Lectures -Class discussions	-Class participation -Presentations -Data search -Written exams
2.2	Design and conduct research work on a bioactive natural compound in the area of cell and molecular biology by employing lab skills and convenient methods	S2	-Guided lab work	Presentations -Reports
2.3	Interpret and analyze the research results using critical	S3	-Group discussions	-Presentations -Reports

Code	Course Learning Outcomes	Code of CLOs aligned with the program	Teaching Strategies	Assessment Methods
	thinking and the appropriate analytical methods			
3.0	Values, autonomy, and responsibility			
3.1	Share in the discussion of scientific issues and submit the research data professionally via oral presentations and written formats	V1	-Group discussion	- Presentations -Reports
3.2	Perform the assigned work independently and collaborate effectively in a teamwork	V2	-Demonstrations of teamwork	Presentations -Reports
3.3	Adhere to the ethical rules and research principles while conducting research work in molecular biology	V3	-Lectures -Tutorials	-Reports

C. Course Content:

No	List of Topics	Contact Hours
1.	**An Introduction to Bioactive Natural Products and General Applications:** -Bioactive Natural Compounds: Distribution and Geographical Sources -Phytochemistry of Bioactive Natural Compounds	4
2.	**Metabolites from Plant Sources:** Comparison of Secondary Metabolites with Primary Metabolites Alkaloids ; Saponins; Phenolic Compounds; Terpenes and Terpenoids; Carbohydrates;Lipids; Glycosides	4
3.	**General Applications of Bioactive Natural Products**: -Traditional Medicine -Plant Polysaccharides in Pharmaceutical Applications	4
4.	**The Role of Phytochemicals in Cancer Prevention and Cure:** -Role of Phytochemicals in Cancer Prevention via Antioxidant Activity -Role of Phytochemicals in Cancer Prevention Via Pro-Oxidant Activity -Role of Phytochemicals in Cancer Cure Via Apoptosis Induction -Role of Phytochemicals in Cancer Cure Via Necrosis Induction	4
5.	**Natural Compounds Extracted from Medicinal Plants and Their Immunomodulatory Activities:** Plant-Derived Bioactive Compounds as Immunomodulators: Curcumin and Colchicine	2
6.	**Antibacterial and Antifungal Plant Metabolites from Tropical Medicinal Plants:** Target for Antimicrobial Agents and Resistance Mechanisms Tropical Plants with Relevant Antibacterial Activities	2
7.	**Antimicrobial Application of Phytoconstituents from Turmeric and Garlic:** -Phytochemistry of Turmeric: Antimicrobial Applications of Phytoconstituents from Turmeric -Phytochemistry of Garlic: Antimicrobial Mechanism of Phytochemicals of Garlic	2
8.	**Therapeutic Properties and Molecular Mechanisms of Carvacrol (Origanum vulgare):** -Extraction and Isolation of Carvacrol: Biosynthesis of Carvacrol -Anticancer Effect of Carvacrol and the Related Mechanism of Actions -Role of Natural Bioactive Compounds as Antidiabetic Agents	2
9.	**Mechanisms of Action of Antidiabetic Bioactive Substances**	2

10.	**Biological Activities of Marine Products and Nutritional Importance:** Marine Sources for Pharmacological Effect Anti-cancer.; Anti-Cardiovascular Effect ;Anti-coagulant Activity ; Anti-obesity ;Bone Growth and Healing	2
12.	**Cardiac Tissue Engineering:** A Role for Natural Biomaterials	
13.	**Extraction of Bioactive Natural Compounds**	2
Total		**30**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Midterm exam-1**	5th week	20 %
2.	**Midterm exam-2**	10th week	20%
3.	**Assignments, Participation, Reports, data search, Attendance, presentations**	Throughout the course duration	20 %
4.	**Final Exam**	16th week	40 %

*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	-Dilipkumar P, Nayak A K. (2021). Bioactive Natural Products for Pharmaceutical Applications. Advanced Structured Materials, Vol. 140. ISBN: 978-3-030-54027-2 (eBook) https://doi.org/10.1007/978-3-030-54027-2 -Sinha RP, Hader DP.(2020) Natural Bioactive Compounds, Technological Advancements. ISBN: 978-0-12-820655-3 https://www.sciencedirect.com/book/9780128206553/natural-bioactive-compounds
Supportive References	https://2u.pw/mqlCs8f
Electronic Materials	
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (Projector, smart board, software)	Projector and Smartboard
Other equipment (Depending on the nature of the speciality)	

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of students' assessment	Faculty	Direct
Quality of learning resources	Faculty	Indirect
The extent to which CLOs have been achieved	Faculty	Direct
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**BIOLOGY DEPARTMENT COUNCIL**
REFERENCE NO.	**23**
DATE	**23/8/1445**