Course Specification

(Postgraduate Programs)

Course Title: Forensic Biological Instruments Analysis
Course Code: BIO 6105
Program: Executive Master of Forensic Science
Department: Biology and Chemistry
College: Science
Institution: Imam Mohammad Ibn Saud Islamic University
Version: 1
Last Revision Date: 29 September 2024

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A. General information about the course:

1. Course Identification:

1. Credit hours: 3 (2 lectures, 2 laboratories, 0 tutorials)					
2. Course type					
A.	☐University	☐College	☒ Program	☐Track	
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 2 l Year 1)					
4. Course General Description:					
This course focuses on the molecular and chromatographic techniques commonly used and useful in forensic research and practice. The main focus will be on understanding the principles and basic concepts of different instruments including spectrophotometric; chromatographic and DNA analysis techniques. Students will learn the data analysis and how to utilize these instruments to detect low concentration levels. Additionally; student will expose to instrumentation settings to get more information and confirmation on the results. Students will learn about modern molecular and toxicological subjects and advance techniques in both fields.					
5. Pre-requirements for this course (if any)**:**					
None					
6. Co-requirements for this course (if any)**:**					
None					
7. Course Main Objective(s):					
At the end of the course, the students will be able to 1. Understand the basic principles of different molecular and toxicological techniques. 2. Acquire knowledge about the different spectrophotometric, chromatographic and molecular techniques used in the analysis of chemical and biological substances including: DNA, proteins, amino acids, drugs or metals. 3. Understand the detailed methods of sample selection, handling, storage and data interpretations.					

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	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**	30
3.	**Field**	-
4.	**Tutorial**	-
5.	**Others (specify)……**	-
	Total	60

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Outline the basic principles of different molecular and toxicological techniques	K1	Interactive Lecture Discussion and Dialogue Mind Maps Concept Maps Standard Method Inductive Method Self-Learning Cooperative Learning Field Visits	Written tests Class discussion questions Class assignments Homework Short research/reports Summaries Presentations
1.2	List substantial and up to date core knowledge of broad areas in basic	K1, K2	Interactive Lecture Discussion and Dialogue Mind Maps	Written tests Class discussion questions

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	biology, chemistry, DNA analysis, instrumentation theory, analysis and use		Concept Maps Standard Method Inductive Method Self-Learning Cooperative Learning Field Visits	Class assignments Homework Short research/reports Summaries Presentations
2.0	**Skills**			
2.1	Explain advanced understanding of a range of technical and conceptual approaches used in forensic laboratories	S1	Practical Application Microteaching Modeling and Simulation Project-Based Learning Discovery Learning Collaborative Learning	Observation / Rating Scales Practical Tests Self-Assessment Peer Assessment
2.2	Design, carry out, and interpret crime scene scenarios that generate new knowledge that can be used to solve crime scenes and scientific situations	S2	Practical Application Microteaching Modeling and Simulation Project-Based Learning Discovery Learning Collaborative Learning	Observation / Rating Scales Practical Tests Self-Assessment Peer Assessment
2.3	Develop skills in the systematic evaluation of scientific data	S2, S3	Practical Application Microteaching Modeling and Simulation Project-Based Learning Discovery Learning Collaborative Learning	Observation / Rating Scales Practical Tests Self-Assessment Peer Assessment
3.0	**Values, autonomy, and responsibility**			
3.1	Appraise working within the group to	V1	Modeling Dialogue and	Observation Self-

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	reach the desired result		discussion Self-learning Collaborative learning	assessment Peer assessment Achievement file
3.2	Use computer programs for analyzing and processing the experimental data	V2	Modeling Dialogue and discussion Self-learning Collaborative learning	Observation Self-assessment Peer assessment Achievement file

C. Course Content:

No	List of Lecture Topics	Contact Hours
1.	Introduction	1
2.	Toxicological Applications	1
3.	Spectrophotometric principles	2
4.	Sample preparation in toxicology	2
5.	Principles of substance separation, TLC, HPLC, GC	2
6.	Capillary electrophoresis CE, Atomic Absorption spectroscopy	2
7.	Forensic applications and interpretations	2
8.	Molecular and DNA applications	2
9.	DNA Extraction samples and product	2
10	Principle of PCR, Applications of PCR	2
11.	Gel electrophoresis	2
12.	Mutation detection	2
13.	Real time PCR principles, RT-PCR Applications	2
14.	DNA finger print principles, DNA sequencing techniques	2
15.	Applications in forensic science	2
16.	Mitochondrial DNA, Forensic application of Mitochondrial DNA	2
Total		30

No	List of Laboratory Topics	Contact Hours
1.	Electrophoresis techniques for DNA, RNA and Proteins	3
2.	Using and programing of Thermal Cycler	3
3.	Introduction to 3500 Genetic Analyzer and data collection software	3
4.	Using and programing of Next generation Sequencer (Ion-Torrent)	3
5.	Using and programing of Next generation Sequencer (Illumina)	3
6.	Practical aspects of UV, Perform UV analysis	3
7.	Practical aspects of HPLC and Perform HPLC analysis	3
8.	Practical aspects of HS-GC and Perform HS-GC analyses	3
9.	Practical aspects of GC-MS and Perform GC-MS analysis	3
10.	Practical aspects of LC-MS/MS and Perform LC-MS/MS analysis	3
Total		30

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, oral test, oral presentation, group project, essay, and Attendance	During the semester	30%
2.	Midterm Exam	8th week	30%
3.	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	Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch, 7th Ed., 2018. , ISBN-13: 978-1305577213 Quantitative Chemical Analysis Daniel C. Harris; Charles A. Luc, 10 th, Ed ISBN-13: 978-1319164300.
Supportive References	None
Electronic Materials	None
Other Learning Materials	None

2. Educational and Research Facilities and Equipment Required:

Items	Resources

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms and Laboratories
Technology equipment (Projector, smart board, software)	Projector and Smart board
Other equipment (Depending on the nature of the specialty)	Forensic Science-related instruments, including safety cabinet, centrifuges, incubators, thermal cyclers, trans-illuminators, gel electrophoresis apparatus

F. Assessment of Course Quality:

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

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**Department of Biology Council**
REFERENCE NO.	**Meeting No. 6**
DATE	**29/9/2024**