Course Specification

(Postgraduate Programs)

Course Title: Molecular Biology of Forensic DNA Analysis
Course Code: BIO 6107
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

Table of Contents

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 provides a study of DNA analysis applied to criminal forensics. The course will cover basics of DNA structure and function, DNA extraction, quantification, amplification, separation, development of DNA profiling methods, and current DNA typing techniques related to DNA forensics. New developments in the field of forensic DNA analysis will also be examined.					
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 history and current state of forensic biological testing and the role of a forensic biologist in a forensic investigation. The student will also understand the role that the scientific method plays in a forensic biological investigation. 2. Develop competency in the use of equipment and techniques typically employed in a forensic biology laboratory. 3. Know the different types of biological evidence encountered in a forensic investigation and the analyses of each. 4. Learn the proper methods for the handling of biological evidence. 5. Know the various peer-reviewed journals in forensic science and various important journal articles dealing with forensic biological testing.					

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 forensic and the biological molecular methods	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	Describe the underpinning science applicable to forensic science and the role	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
	of molecular biology techniques		Concept Maps Standard Method Inductive Method Self-Learning Cooperative Learning Field Visits	Class assignments Homework Short research/reports Summaries Presentations
1.3	State The methods of forensic investigation and law relevant to forensic science and its relationship of biological sciences	K3, K4	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
1.4	List Application of understanding in areas of forensic chemistry and forensic biology	K1, K4	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
2.0	**Skills**			
2.1	Explain practical techniques in forensic science	S1	Practical Application Microteaching Modeling and Simulation Project-Based Learning Discovery Learning Collaborative	Observation / Rating Scales Practical Tests Self-Assessment Peer Assessment

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
			Learning	
2.2	Analyze knowledge of forensic practices to investigations and cases	S1, 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	Evaluate technical and theoretical information	S3, S4	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 appropriate tools and use in a correct manner	V1	Modeling Dialogue and discussion Self-learning Collaborative learning	Observation Self-assessment Peer assessment Achievement file
3.2	Show ability to communicate effectively with class mates and teaching staff	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.	Nucleic Acid Extraction	3

2.	DNA Quantitation	3
3.	Amplification by PCR	3
4.	DNA Electrophoresis	3
5.	Detection Methods	3
6.	Variable-number tandem repeat (VNTR) Profiling	3
7.	Autosomal Short Tandem Repeat Profiling	3
8.	Sex Chromosome Haplotyping and Gender	3
9.	Identification, Single Nucleotide Polymorphism Profiling	3
10	Mitochondrial DNA Profiling	3
Total		**30**

No	List of Laboratory Topics	Contact Hours
1.	DNA extraction from different biological samples using the Chelex method.	3
2.	DNA extraction using the salting-out method.	3
3.	DNA extraction from different biological samples using organic methods.	3
4.	DNA extraction from different biological samples using a solid-phase.	3
5.	Qualitative and quantitative analysis of DNA samples using agarose, UV spectrophotometer, and fluorimeter.	3
6.	Qualitative and quantitative analysis of DNA samples using Real-time PCR	3
7.	PCR amplification of DNA samples and gel electrophoresis of PCR products	3
8.	DNA Sequence Analysis	3
9.	Mitochondrial DNA sequencing and data analysis	3
10.	DNA Data analysis and reporting	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	Forensic Biology, Richard Li, Second edition, 2021. ISBN: 9781032098791. Molecular Forensics, Ralph Rapley and David Whitehouse 2007. ISBN: 978-0-470-02495-9.
Supportive References	None
Electronic Materials	None
Other Learning Materials	None

2. Educational and Research Facilities and Equipment Required:

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**