	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title		**Module Delivery**	
Module Type	CORE	☐**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code			
ECTS Credits	8		
SWL (hr/sem)			
Module Level		**Semester of Delivery**	
Administering Department		**College**	
Module Leader		**e-mail**	
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims
أهداف المادة الدراسية

The primary aims of this module are to equip undergraduate life science students with the knowledge and skills necessary to perform, interpret, and present toxicological analyses within a legal and quality-controlled framework.

1. **1. Scientific & Analytical Aims**

A1. Laboratory Principles: To establish a thorough understanding of the requirements for operating a forensic and clinical toxicology laboratory, including **accreditation** standards, **quality control** procedures, and method **validation** processes.

A2. Core Methodology: To master the theoretical basis of key analytical separation and detection techniques, specifically **Gas Chromatography–Mass Spectrometry (GC-MS) and HPLC**, and to understand their application for drug and poison screening and confirmation.

A3. Chemical Interpretation: To analyze the **pharmacology and chemical mechanisms** of various toxicants—including alcohol, volatile compounds (e.g., ethylene glycol), natural toxins (plant/animal), and prescription drugs—to explain their effects on the human body.

2. **Medico-Legal & Interpretive Aims**

A4. Data to Conclusion: To develop critical thinking skills necessary to interpret complex toxicological data, including the evaluation of BAC calculations, the identification of **synergistic drug effects**, and the ability to recognize potential **false-positive** or unusual analytical results.

A5. Legal Context: To gain a fundamental understanding of the **U.S. legal system** (civil and criminal law) as it pertains to the presentation of scientific evidence in cases involving drug-impaired driving, overdose, and toxic torts (occupational exposure).

A6. Professional Practice: To prepare students for the professional aspects of forensic science by learning how to draft a legally

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. **1. Analytical Methodology & Quality Assurance** **MLO 1.1: Compare and contrast** the principles, advantages, and limitations of common toxicological screening (e.g., Immunoassays) and confirmatory techniques (e.g., GC-MS, HPLC). **MLO 1.2: Design and evaluate** a basic laboratory quality control system, including understanding the roles of CRMs, method validation, CLIA guidelines, and the critical importance of maintaining the **Chain of Custody**. **MLO 1.3: Analyze and interpret** instrumental output (e.g., chromatograms) to determine the identity and concentration of a substance, distinguishing between quantitative and qualitative results. 2. **Pharmacology & Toxicology** **MLO 2.1: Explain** the distinct mechanisms of toxicity for major classes of compounds, including volatile organic compounds (e.g., ethanol, ethylene glycol) and natural toxins (e.g., ricin, fungal poisons). **MLO 2.2: Calculate and interpret** blood/serum ethanol concentration (BAC) and describe the physiological and behavioral effects of alcohol at various levels of intoxication. **MLO 2.3: Predict and describe** the impact of drug interactions, specifically the **synergistic effects** of combining alcohol with common prescription medications. 3. **Case Analysis & Interpretation** **MLO 3.1: Evaluate** toxicology results in the context of specific case scenarios (e.g., drug overdose, DUI, occupational exposure), and recognize potential sources of error such as contamination or false-positive findings. **MLO 3.2: Apply** scientific data to address medico-legal questions related to drug toxicity, post-mortem toxicology, and liability claims

	(toxic torts/workers' compensation).
	4. Legal & Professional Communication **MLO 4.1: Summarize** the structure of the U.S. legal system and the fundamental differences between civil and criminal proceedings relevant to forensic toxicology. **MLO 4.2: Prepare** a comprehensive, clear, and scientifically defensible **Toxicology Report** suitable for submission to legal counsel. **MLO 4.3: Demonstrate** the communication skills required to function effectively as an **expert witness** during depositions and courtroom testimony, including responding to cross-examination on analytical limitations and data uncertainty.
Indicative Contents المحتويات الإرشادية	The Indicative Contents for the Forensic Toxicology course can be shortened into the following major units: **1. Analytical Science & Quality Control** This unit covers the **organization and accreditation** of toxicology labs, all aspects of **quality control QC**, and the core analytical techniques. Topics include: • Principles of **Immunoassays** (screening) and **GC-MS/HPLC** (confirmation). • Detailed analysis of **ethanol** and other volatile compounds (e.g., **ethylene glycol**), including BAC determination and enzymatic methods. • Protocols for method validation and handling **unusual results** (e.g., false-positives, carry-over).
	2. Specific Toxicants and Mechanisms This unit explores the toxicology of various substances through case studies. Topics include: • The chemistry and toxicity of **plant poisons** (e.g., **Jimson Weed, Ricin**) and **animal toxins** (e.g., Bufotenin). • The effects of common **prescription drugs** and the dangers of combined **alcohol and drug synergy** in overdose cases.
	3. Medico-Legal Practice and Testimony This unit focuses on the application of science in the courtroom and professional practice. Topics include: • Overview of the **U.S. legal system** (civil vs. criminal law). • The professional process: **writing a legally defensible Toxicology**

	Report. • Mastering the role of the **Expert Witness** during deposition and cross-examination. • Case studies involving **DUI/breathalyzer challenges**, **Toxic Torts**, and Workers' Compensation issues.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1- تقسيم الطلاب إلى عدة مجموعات وتشجيعهم على العمل كفريق واحد 2- وضع عدة اختبارات لتفعيل روح المنافسة 3- استخدام اليوتيوب في عدة محاضرات لجذب الطلاب للمادة 4- طلب الكثير من الواجبات المنزلية من الطلاب للتأكد من عدم دراسة المواد بشكل جيد

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction and Historical Perspectives**.Historical Perspectives in Toxicology: Toxicology, Poison, Industrial Revolution, Effect of Insurance Industry on Homicides.
Week 2	**The Clinical Toxicology Laboratory**. Organization of the Clinical Toxicology Laboratory: Guidelines (CLIA), Accreditation, Procedure Manual, Quality Control, Validation of New Methods.
Week 3	**Analytical Techniques I: Drug Screening.** Drug Screens: Drug Testing, Immunoassays, Gas Chromatography–Mass Spectrometry (GC-MS).
Week 4	**Analysis of Volatiles: Ethanol.** Serum/Blood Ethanol: Headspace Gas Chromatograph, Enzymatic Assay, Blood Alcohol Concentration (BAC).
Week 5	**Analysis of Volatiles: Other Toxic Alcohols**. Ethylene Glycol: Mechanism of Toxicity, Clinical Symptoms, Diagnosis, Laboratory Monitoring, Treatment.
Week 6	**Unusual Results and Case Studies**. Unexpected and Unusual Results; Unusual Requests: False-Positive Ethanol Levels, Carry-Over Cocaine, Nonalcoholic Beer and Blood Alcohol Levels.
Week 7	**Natural Toxins I: Plant Poisons.** Plant Toxins: Jimson Weed (Case Report), Castor Bean (Ricin), Mushroom Poisoning (Case Report on Liver Necrosis/Regeneration)
Week 8	**MID EXAM**
Week 9	**Natural Toxins II: Animal and Other Poisons**. Animal Toxins: Ten Most Poisonous Animals, Bufotenin and Mental Disorders (Case Report)
Week 10	**The Legal Context of Forensic Science**. U.S. Legal System: Overview of Civil and Criminal Law, Types of Courts, Lawyers and the Legal Profession, The Jury (study case)
Week 11	**The Toxicologist in the Courtroom.** Toxicology Report, Deposition, and Court Testimony: The Process of Laboratory Analysis, Steps to Writing a Good Toxicology Report, Preparation for Deposition, Expert Witness, Cross-Examination
Week 12	**Case Studies: Alcohol Intoxication.** False-Positive Blood Alcohol & Breathalyzer Tests: Falsely Elevated Alcohol Measurements by Enzymatic Methods, Contamination, Accuracy of Intoxilyzer/Dragger Alcotest
Week 13	**Case Studies: Blood and Breath Alcohol.** Alcohol and Drugs, Drug Overdose: Synergistic Toxicity of Alcohol and Prescription Medications (Wellbutrin, Valium, Naproxen, Prozac), Toxicity of OxyContin, Klonopin, Percocet, Alprazolam
Week 14	**Case Studies: Drugs, Synergy, and Overdose**. Toxic Torts and Workers' Compensation: Chlorpyrifos Toxicity (Pesticides), Chloroform Burns, Toxicity of Sennosides, Toxicity of Aviation Fuels, Platinum Salts and Occupational Asthma
Week 15	**Case Studies: Liability and Occupational Exposure.** Toxic Torts and Workers' Compensation: Chlorpyrifos Toxicity (Pesticides), Chloroform Burns, Toxicity of Sennosides, Toxicity of Aviation Fuels, Platinum Salts and Occupational Asthma
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**FORENSIC TOXICOLOGY: MEDICO-LEGAL CASE STUDIES** **by** **Kalipatnapu N. Rao** © 2012 by Taylor & Francis Group, LLC	
Recommended Texts	CASARETT AND DOULL'S TOXICOLOGY THE BASIC SCIENCE OF POISONS Seventh Edition By Curtis D. Klaassen, Ph.D.	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي