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

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	CHEMISTRY OF FIRES AND EXPLOSIVES	**Module Delivery**	
Module Type	CORE	☒**Theory** ☒**Lecture** ☒**Lab** ☐**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code			
ECTS Credits	6		
SWL (hr/sem)			
Module Level	3rd Year (Third Stage)	**Semester of Delivery**	2
Administering Department	Forensic Science	**College**	College of Science
Module Leader	Shahad Fadhel Ali	**e-mail**	shahad_f@nahrainuniv.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	Ph. D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	
Laboratory Staff			**Laboratory Staff**

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 course aims to teach students the following: 1- Provide students with a scientific understanding of combustion chemistry and energetic reactions. 2- Explain the chemical and physical principles governing fires and explosions. 3- Develop the ability to analyze combustion processes and flame behavior. 4- Introduce radical chain mechanisms and chemical kinetics involved in combustion. 5- Relate combustion chemistry to forensic fire and explosion investigation. 6- Enhance analytical and problem-solving skills in fire and explosion scenarios.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	بعد إكمال المادة، يكون الطالب قادرًا على: 1. Define combustion and distinguish between its major types. 2. Explain the fire triangle and fire tetrahedron concepts. 3. Describe radical chain reactions involved in combustion. 4. Apply chemical kinetics principles to combustion systems. 5. Interpret flame structure, soot formation, and fire behavior. 6. Analyze flashover, backdraft, and burn patterns in forensic investigations. 7. Evaluate factors affecting ignition, flame propagation, and explosion hazards. 8. Use combustion chemistry concepts in fire scene reconstruction.
Indicative Contents المحتويات الإرشادية	

	• Fundamentals of combustion chemistry. • Oxidation-reduction processes in combustion. • Fire triangle and fire tetrahedron. • Complete and incomplete combustion. • Premixed and diffusion flames. • Free radicals and chain reactions. • Chemical kinetics and Arrhenius equation. • Activation energy and ignition delay. • Flame structure and combustion zones. • Soot formation and flame color. • Laminar and turbulent flames. • Flashover and backdraft phenomena. • V-pattern interpretation. • Fire development stages. • Applications in forensic fire investigation.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Learning Strategies :** • Encouraging students to take organized notes during lectures. • Providing practical questions and problem-solving exercises. • Active participation in group discussions and collaborative activities. • Utilizing textbooks, online resources, and supplementary materials to enhance learning. • Providing constructive feedback on assignments and assessments. • Reviewing helps students understand their strengths and areas for improvement.

	Teaching Strategies: • Interactive lectures. • Group discussions. • Case-study analysis of fire incidents. • Problem-solving exercises. • Use of diagrams, videos, and forensic examples. • Student presentations and assignments.

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
	Midterm Exam	2 hr	10% (10)	7	LO # 1-7

Summative assessment	**Final Exam**	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Combustion Chemistry
Week 2	Definition and Types of Combustion
Week 3	Fire Triangle and Fire Tetrahedron
Week 4	Redox Processes and Energy Release in Combustion
Week 5	Complete and Incomplete Combustion
Week 6	Combustion Systems: Premixed and Diffusion Combustion
Week 7	Free Radicals and Radical Chain Mechanisms
Week 8	Initiation, Propagation, and Termination Reactions
Week 9	Chain Branching and Hydrocarbon Oxidation
Week 10	Chemical Kinetics of Combustion
Week 11	Rate Laws, Arrhenius Equation, and Activation Energy
Week 12	Factors Affecting Reaction Rate and Ignition Delay
Week 13	Flame Structure and Combustion Zones
Week 14	Laminar and Turbulent Flames, Soot Formation
Week 15	Flashover, Backdraft, and V-Pattern Analysis
Week 16	Fire Development Stages and Forensic Fire Investigation

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	

Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Introduction to Combustion – Stephen R. Turns. • Combustion – I. Glassman & R. Yetter. • Forensic Fire Scene Reconstruction – David J. Icove. • Kirk's Fire Investigation – John D. DeHaan.	
Recommended Texts		
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