

	Ministry of Higher Education and Scientific Research - Iraq University of Warith Al-Anbiyaa College of Advanced Technologies Department of Refrigeration and Air Conditioning Techniques Engineering	
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<u>Mechanical Design</u>		Module Delivery
Module Type	<u>C</u>		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☒ Seminar
Module Code	<u>HVAC305</u>		
ECTS Credits	<u>5</u>		
SWL (hr/sem)	<u>125</u>		
Module Level	<u>3</u>	Semester of Delivery	
Administering Department	M.SC-HVAC	College	Advanced Technologies
Module Leader	Ali Hammoudi Alwazir	e-mail	ali.ham@uowa.edu.iq
Module Leader's Acad. Title	.Lec..	Module Leader's Qualification	M.S.C
Module Tutor	None	e-mail	E-mail
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	31 / 08/2026	Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	HVAC206	Semester	4
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims	1. Learning the design process of mechanical components, for different design considerations, such like strength, stiffness, and stability. 2. Transfer real life mechanical systems to analytical models and analyze them and deal with design codes and standards. 3. To be able to solve open-ended design problems, cope with decision making and satisfy competing objectives. 4. Use and integrate the fundamentals studied previously towards the goal of analyzing and designing mechanical components to achieve satisfactory levels of safety and life. 5. To improve competence in multi-axis stress analysis. 6. To obtain a knowledge in the use of the proper failure theories under steady and variable loadings. 7. To develop the design skills of mechanical components under steady and variable loadings.
Module Learning Outcomes	Upon completion of the course, students should be able to: 1. Apply basic design principles applicable to components as listed in the core content. 2. Conceptualise, design and calculate simple stresses in mechanical components. 3. Design and calculate working stress and factor of safety in mechanical components. 4. Design and calculate stresses in composite bars and thermal stresses in mechanical components. 5. Perform relevant and applicable calculations for torsional and bending stresses in mechanical components. 6. Identify the principal stresses and principal planes in mechanical components. 7. Apply theories of failure to achieve satisfactory levels of safety for mechanical components. 8. Design and calculate variable stresses and stress concentration in mechanical components. 9. Perform relevant and applicable calculations to design the shaft. 10. Perform relevant and applicable calculations to design the keys, splines and

	couplings. 11. Perform relevant and applicable calculations to design the riveted joints. 12. Perform relevant and applicable calculations to design the welded joints. 13. Perform relevant and applicable calculations to design the pressure vessels. 14. Perform relevant and applicable calculations to design the power screws.
Indicative Contents 	Indicative content includes the following: General Procedure in Machine Design, Classifications of Machine Design, Material Strength and Stiffness, Simple Stresses, Working Stress, Selection of Factor of Safety, Stresses in Composite Bars, Stresses due to Change in Temperature. [10 hrs] Torsional and Bending Stresses in Machine Parts, Shafts in Series and Parallel [3 hrs] Determination of Principal Stresses for a Member Subjected to Bi-axial Stress, Theories of Failure Under Static Load [5 hrs] Cyclic Stresses, Fatigue and Endurance Limit, Factor of Safety for Fatigue Loading, Theoretical Stress Concentration Factor, Fatigue Stress Concentration Factor, Combined Steady and Variable Stress [4 hrs] Material Used for Shafts, Design of Shafts, Shafts Subjected to Twisting Moment Only, Shafts Subjected to Bending Moment Only, Shafts Subjected to Combined Twisting Moment and Bending Moment, Shafts Subjected to Axial Load in addition to Combined Torsion and Bending Loads [4 hrs] Design of keys and Splines, Effect of Keyways, Types of Shafts Couplings [5 hrs] Riveted Joints, Failures of a Riveted Joint, Efficiency of a Riveted Joint, Design of Longitudinal Butt Joint for a Boiler, Design of Circumferential Lap Joint for a Boiler, Riveted Joint for Structural Use [5 hrs] Types of Welded Joints, Basic Weld Symbols, Strength of Transverse Fillet Welded Joints, Strength of Parallel Fillet Welded Joints [5 hrs]

	Classification of Pressure Vessels, Hoop and Longitudinal Stress, Spherical Shells, Compound Cylindrical Shells [4 hrs]
	Types of Screw Threads, Efficiency of Threaded Screws, Efficiency of Self-Locking Screws [3 hrs]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Assessment is based on hand-in assignments, Written exam, Quizzes, Tutorial, Seminars, Reports.
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Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem)	88	Structured SWL (h/w)	6
Unstructured SWL (h/sem)	37	Unstructured SWL (h/w)	4
Total SWL (h/sem)	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20% (20)	3,7,9,13	LO #1-13
	Assignments	1	10% (10)	7	LO # 5,12
	Seminar	2	10% (10)	4,11	LO # 10,12
	Midterm Exam	2 hr	10% (10)	7	LO # 1-7

Summative assessment	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري محتوي كل اسبوع يجب ان يغطي الوقت المحدد

	Material Covered
Week 1	Design consideration, Design principle, Material Strength and Stiffness
Week 2	Simple Stresses in Machine Parts
Week 3	Working Stress and Factor of Safety
Week 4	Stresses in Composite Bars and Thermal Stresses
Week 5	Torsional and Bending Stresses in Machine Parts
Week 6	Principal Stresses and Principal Planes
Week 7	Theories of Failure
Week 8	Variable Stresses in Machine Parts and Stress Concentration
Week 9	Design of Shafts
Week 10	Design of keys, Splines and Couplings
Week 11	Riveted Joints
Week 12	Welded joints
Week 13	Pressure Vessels
Week 14	Power Screws
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الأسبوعي للمختبر

	Material Covered
Week 1	No Lab.
Week 2	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	➤ A Textbook of Machine Design by R.S.KHURMI AND J.K.GUPTA	No
Recommended Texts	➤ Shigley's Mechanical Engineering Design (McGraw-Hill Series in Mechanical Engineering) 10th Edition	No
Websites	➤ https://www.coursera.org/learn/machine-design1	

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	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded

(0 – 49)	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks 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.



أستاذ المادة: علي حمودي الوزير



العميد: ا.م.د علي باسم محمد



رئيس القسم: ا.م.د محمد حسن عبود

التاريخ: 31-8-2026

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