

Vehicle Parts Design MODULE

Module Information				
معلومات المادة الدراسية				
Module Title	Vehicle Parts Design		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code				
ECTS Credits	8			
SWL (hr/sem)	200			
Module Level	1	Semester of Delivery		1
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Ahmed Almurshedi		e-mail	Ahmed.Al-murshedi@atu.edu.iq
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/06/2023		Version Number	1.0

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 Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of design theory through the application of techniques. 2. To understand Material types, Vehicle Parts. 3. This course deals with the important Vehicle Parts design method. 4. This is the essential subject for mechanical Design. 5. To understand the design of the vehicle parts as one component. 6. To perform Finite Element Analysis for the vehicle parts. 7. To do calculations in order to carried out to find out the dimensions of the machine elements
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize the various procedures, requirements, design methods. 2. List the engineering materials and describes the different kinds of irons, steels and alloys used in engineering design. 3. Summarize manufacturing considerations in design. 4. Discuss various procedures for design against static load and fluctuating load correspondingly. 5. describes a particular design element, that is, shafts, keys and couplings; springs; friction clutches; brakes; belt drives; chain drives; rolling contact bearings; sliding contact bearings; spur gears; helical gears; bevel gears; worm gears; flywheel; cylinders and pressure vessels respectively 6. Explains the design of IC engine components.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Vehicle Parts Design</u> Machine Design, Basic Procedure of Machine Design, Basic Requirements of Machine Elements, Design of Machine Elements, Traditional Design Methods, Design Synthesis, Use of Standards in Design, Selection of Preferred Sizes. [15 hrs] Stress–Strain Diagrams, Mechanical Properties of Engineering Materials, Cast Iron, BIS System of Designation of Steels, Plain-carbon Steels, Free-cutting Steels, Alloy Steels, Overseas Standards, Heat Treatment of Steels, Case Hardening of Steels, Cast Steel, Aluminium Alloys. [15 hrs] Design Considerations of Machined Parts, Hot and Cold Working of Metals, Selective Assembly, Tolerances For Bolt Spacing, Surface Roughness. [10 hrs] Transmission Shafts, Shaft Design on Strength Basis, Shaft Design on Torsional Rigidity Basis, ASME Code for Shaft Design, Design of Hollow Shaft on Strength Basis, Design of Hollow Shaft on Torsional Rigidity Basis, Flexible Shafts. [15 hrs] Revision problem classes [6 hrs]

	<u>Part B - Analogue Electronics</u> Springs, Types of Springs 393 10.3 Terminology of Helical Springs, Styles of End, Stress and Deflection Equations, Series and Parallel Connections, Spring Materials, Design of Helical Springs, Spring Design—Trial-and-Error Method, Design against Fluctuating Load, Concentric Springs, Optimum Design of Helical Spring, Surge in Spring, Helical Torsion Springs, Spiral Springs, Multi-Leaf Spring, Nipping of Leaf Springs, Belleville Spring, Shot Peening. [15 hrs] Clutches, Torque Transmitting Capacity, Multi-disk Clutches, Friction Materials, Cone Clutches, Centrifugal Clutches, Energy Equation, Thermal Considerations. [7 hrs] Brakes- Energy Equations, Block Brake with Short Shoe, Block Brake with Long Shoe, Pivoted Block Brake with Long Shoe, Internal Expanding Brake, Band Brakes, Disk Brakes, Thermal Considerations. [15 hrs] Rolling Contact Bearings, Bearings, Types of Rolling-contact Bearings, Principle of Self-aligning Bearing, Selection of Bearing-type, Static Load Carrying Capacity [7 hrs]. Sliding Contact Bearings- Basic Modes of Lubrication, Measurement of Viscosity, Bearing Materials, Bearing Design—Selection of Parameters, Bearing Failure—Causes and Remedies. [7 hrs] Gears- Classification of Gears, Standard Systems of Gear Tooth, Spur Gears design, Helical Gears, Helical Gears design, Bevel Gears, Effective Load on Gear Tooth and Bevel Gears design. [7 hrs] Design of IC Engine Components- Internal Combustion Engine Classifications, Cylinder and Cylinder Liner, Bore and Length of Cylinder, Thickness of Cylinder Wall, Stresses in Cylinder Wall, Cylinder Head, Design of Studs for Cylinder Head, Piston, Piston Materials, Thickness of Piston Head, Piston Rings, Piston Barrel, Piston Skirt, Piston Pin, Connecting Rod, Buckling of Connecting Rod, Cross-section for Connecting Rod, Big and Small End Bearings, Design of Valves. [15 hrs] (75)
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
الحمل الدراسي للطلاب محسوب ل ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	109	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	91	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	200		

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Machine Design, Basic Procedure of Machine Design
Week 2	Design Considerations of Machined Parts, Hot and Cold Working of Metals
Week 3	Shaft Design
Week 4	Shaft Design
Week 5	Springs Design
Week 6	Springs Design
Week 7	Clutches Design

Week 8	Clutches Design
Week 9	Brakes Design
Week 10	Brakes Design
Week 11	Bearings Design
Week 12	Bearings Design
Week 13	Gears Design
Week 14	IC Engine Components Design
Week 15	IC Engine Components Design
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Finite Element Modelling for the shafts.
Week 2	Lab 2: Finite Element Modelling for the Springs.
Week 3	Lab 3: Finite Element Modelling for the Brakes.
Week 4	Lab 4: Finite Element Modelling for the Clutches.
Week 5	Lab 5: Finite Element Modelling for the Gears.
Week 6	Lab 6: Finite Element Modelling for the Bearings.
Week 7	Lab 7: Finite Element Modelling for the IC engine parts.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	A Textbook of Machine Design by R.S.KHURMI	Yes
Recommended Texts	Shigleys Mechanical Engineering Design, by Richard Budynas, Keith Nisbett.	No
Websites	https://web.iitd.ac.in/~pmvs/course_mel713.php	

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	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	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.				