Module Description Form

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mechanical Engineering Design**			**Module Delivery**	
Module Type	**Support (S)**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**ATU13062**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	3		**Semester of Delivery**	6	
Administering Department			**College**		
Module Leader	Mohammed Abdulridha Abbas		**e-mail**	mohd.a.abbas@atu.edu.iq	
Module Leader's Acad. Title	Senior lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ATU13016, ATU13025, ATU13042, ATU13044	**Semester**	1, 2, 4, 4
Co-requisites module	ATU13066, ATU13071, ATU13072, ATU13076, ATU13081, ATU13084, ATU13086	**Semester**	6, 7, 7, 7, 8, 8, 8

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To present an overview of the type of stresses applied as simple principles. 2. To study the combined stresses principle and the failure theories. 3. To evaluate the design of the significant components in any machine. 4. To analyze any mechanical system as a design study scheme based on CAE by SOLIDWORK simulation. 5. To optimize the final designed part and comparison with the hand solution.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enabling the student to use the final decision of any mechanical design. 2. Enabling the student to employ the CAE technique to assess the design. 3. Encouraging the student to build the right path for the worksheet design as an effective mechanical report. 4. Enabling the student to invest the sustainable design depending on the optimal case as a flowed design scheme. 5. Presenting an impact design without any repeated and routine.
Indicative Contents المحتويات الإرشادية	**The indicative contents of this subject are:** **Part (A) Stresses and shaft loads:** Simple stresses, Parallel and Serious Shaft Loads. **(4 hrs)** **Part (B) Bending and torsional concept:** Bending stress, Torsional stress. **(4 hrs)** **Part (C) Curved beam concept and combined stresses:** Curved Beam, Principal stresses (Combined stresses). **(4 hrs)** **Part (D) Failure theories and stresses concentration:** Failure theories in mechanical members, Stress concentration. **(4 hrs)** **Part (E) Fatigue theories:** Fatigue theories in complicated and combined members. **(4 hrs)** **Part (F) Shaft design**: Torsional, Bending, combined torsional and bending, Fluctuating. **(4 hrs)** **Part (G) Welding design:** Types of welded joint, Strength of transverse fillet welded joints, Strength of parallel fillet welded joints, Special cases of fillet welded joints, Strength of butt joints, Stresses for welded joints. **(4 hrs)** **Part (H) Bearing concept:** Classification of bearing, bearing limitations, Properties of lubricants, Terms used in hydrodynamic journal bearing, bearing characteristic number and bearing modulus for journal bearings, Coefficient of friction for journal bearings, Pressure and heat generation. **(4 hrs)** **Part (I) Clutches concept design and Springs design:** Types of clutches, Materials for friction surface, Considerations in Designing a Friction Clutch, Types of Friction Clutches, Design of a Disc or Plate Clutch, Multiple Disc Clutch, Design of a Cone Clutch, Design of a Centrifugal Clutch, Types of spring, Terms used in Compression Springs, End Connections for Compression Helical Springs, End Connections for Tension Helical Springs, Eccentric and buckling, Surge in spring, Potential energy in spring. **(4 hrs)**

	Part (J) Transporter system design: Face Width of Helical Gears, Formative or Equivalent Number of Teeth for Helical Gears, Strength of Helical Gears, Types of V-belts and Pulleys, Belt standards, Ratio of Driving Tensions for V-belt, V-flat Drives, Sheave for Fiber Ropes, Ratio drive, Designation and properties of wire ropes, Stresses in Wire Ropes, Procedure for Designing a Wire Rope. **(4 hrs)** **Part (K) Insertion objects design concept:** Types of Screw Threads used for Power Screws, Torque Required to Raise Load by Square Threaded Screws, Torque Required to Lower Load by Square Threaded Screws, Efficiency of Square Threaded Screws, Maximum Efficiency of a Square Threaded Screw, Coefficient of Friction, Acme or Trapezoidal Threads, Stresses in Power Screws, Design of screw jack, Types of Keys, Strength of a Sunk Key, Effect of Keyways, Keys in shaft, Keys in flange. **(8 hrs)** **Part (L) Brake design concept:** Energy Absorbed by a Brake, Heat to be Dissipated during Braking, Single Block or Shoe Brake, Pivoted Block or Shoe Brake, Double Block or Shoe Brake, Simple Band Brake, Internal Expanding Brake. **(4 hrs)** **Part (M) Internal engine design concept:** Design of a Cylinder, Piston configuration, Piston Head or Crown, Piston Rings, Piston Barrel, Piston Skirt, Piston Pin, Connecting Rod, Design of Centre Crankshaft. **(4 hrs)**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The design procedures are considered a peak of scientific and professional for aeronautical engineers. It collected internal and external effects applied to mechanical systems besides the influential material selection. Hence, the major strategy employed is to enable and encourage the students to pick the right way toward any systematic mechanical design depending on the principles studied. Therefore, this strategy blends among the design principles and CAE techniques using SOLIDWORKS simulation to create an un-boring education environment.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	108	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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)	6 and 14	
	Assignments	2	10% (10)	0	
	Projects / Lab.	15	10% (10)	Continues	
	Report	1	10% (10)	0	
Summative assessment	Midterm Exam	3hr	10% (10)	7	
	Final Exam	3hr	50% (50)	15	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Stresses and shaft loads.
Week 2	Bending and torsional concept.
Week 3	Curved beam concept and combined stresses.
Week 4	Failure theories and stresses concentration.
Week 5	Fatigue theories.
Week 6	Shaft design.
Week 7	Mid Exam, Welding design.
Week 8	Bearing concept.
Week 9	Clutches concept design and Springs design.
Week 10	Transporter system design.
Week 11	Insertion objects design concept.
Week 12	Insertion objects design concept.
Week 13	Brake design concept
Week 14	Internal engine design concept
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Solidwork Applications: Normal stress, Shear stress.
Week 2	Solidwork Applications: Bearing stress, Bending stress.
Week 3	Solidwork Applications: Torsional stress, Bending stress in curved beam, Beam stresses (SFD,BMD).
Week 4	Solidwork Applications: Combined stresses, Failure theories.
Week 5	Solidwork Applications: Stresses concentration, Fatigue cases.
Week 6	Solidwork Applications: Shaft design, Shaft design-Design study optimization.
Week 7	Mid test, Solidwork Applications: Welding strength.
Week 8	Solidwork Applications: Ball bearing Design study optimization.
Week 9	Solidwork Applications: Clutch Design study optimization, Spring Design study optimization.
Week 10	Solidwork Applications: Gear case study, Belt case study.
Week 11	Solidwork Applications: PS case study.
Week 12	Solidwork Applications: Keys case study.
Week 13	Solidwork Applications: Brake Design study optimization.
Week 14	Solidwork Applications: Piston case study.
Week 15	Final test.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	A Textbook Machine Design (R. S.Khurmi & G. K. Gupta).	Yes
Recommended Texts	Mechanical Engineering Design (Shigley).	Yes
Websites		

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.