MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Aided Design**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**PM 401**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	PM		**College**	TEMO	
Module Leader	Hasan abdulellah Abdulla		**e-mail**	hasan.alsarraf@ntu.edu.iq	
Module Leader's Acad. Title	Ass. Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**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	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. 3D Modeling: AutoCAD supports the creation of 3D models by extruding 2D shapes or using more advanced modeling techniques like surface modeling or solid modeling. Users can create complex 3D objects and perform operations such as blending, chamfering, or shelling. This course deals with the basic concept of the computer in mechanical drawing. 2. Annotation and Documentation: AutoCAD allows users to add text, dimensions, and annotations to their designs, enabling clear communication and documentation of design intent. 3. Collaboration: AutoCAD provides features for sharing and collaborating on designs. Multiple users can work on the same drawing simultaneously, and the software offers tools for managing revisions and tracking changes. To be able to communicate with other mechanical engineering professionals regardless their spoken language. 4. Customization: AutoCAD can be customized to suit individual workflows and preferences. Users can create and apply custom templates, create macros and scripts, and extend the functionality of the software through programming interfaces. 5. For ANSYS application Gain a solid understanding of the principles and fundamentals of finite element analysis, including the concept of discretization, meshing, and the finite element method. 6. earn Simulation Workflow: Develop the skills necessary to perform a complete simulation workflow, including pre-processing tasks like geometry creation, mesh generation, and defining boundary conditions, as well as post-processing tasks for interpreting and analyzing results. 7. Perform Structural Analysis: Gain competence in setting up and running structural analysis simulations in ANSYS. Learn how to define materials, apply loads and boundary conditions, and interpret results for stress, strain, deformation, and other structural behavior. 8. Conduct Thermal Analysis: Acquire knowledge and skills to perform thermal analysis using ANSYS. Understand how to define thermal loads, boundary conditions, and material properties for analyzing heat transfer, temperature distribution, and thermal behavior.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 2. 3D Modeling Skills: Students will acquire the ability to create 3D models using AutoCAD. They will learn different techniques for creating 3D objects, such as extrusion, lofting, and sweeping. 3. Design Visualization: Students will learn how to effectively visualize and present their designs using AutoCAD. They will explore techniques for creating realistic renderings and animations to showcase their 3D models.

	4. Problem Solving and Critical Thinking: Through working on design projects and exercises, students will enhance their problem-solving and critical thinking skills. 5. Professional Standards and Practices: Students will gain knowledge of industry standards and best practices for using AutoCAD. They will learn about drawing standards, file organization, and proper techniques for creating professional-quality drawings. 6. The module learning outcomes of studying ANSYS application can vary depending on the level and focus of the course, gain a comprehensive understanding of the simulation workflow, including pre-processing, solving, and post-processing stages. 7. Technical Skills: Develop proficiency in using ANSYS software, including its user interface, tools, and commands. Acquire practical skills in geometry creation, mesh generation, material assignment, and defining boundary conditions in conditions in ANSYS. 8. Analysis and Interpretation: Gain the ability to analyze and interpret simulation results obtained from ANSYS. Understand how to assess the structural behavior, deformation, stress, strain, temperature distribution, fluid flow parameters, and electromagnetic fields. 9. Develop problem-solving skills by identifying and troubleshooting issues that may arise during simulations. Learn optimization techniques to improve designs and achieve desired performance or efficiency. Apply ANSYS to solve practical engineering problems and make informed design decisions based on simulation results.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. AutoCAD application 1-Advanced Drawing Techniques: ● Working with advanced object construction methods (polylines, splines, etc.) ● Modifying complex objects (fillet, chamfer, etc.) ● Creating and editing hatches and gradients. ● Using grips and grip editing techniques. 2- 3D Modeling: ● Introduction to 3D modeling concepts ● Creating 3D objects (extrude, revolve, sweep, etc.) ● Modifying and manipulating 3D objects ● Applying materials and textures to 3D models ● Rendering and creating realistic 3D presentations 3- Project Work: ● Applying learned skills to complete design projects ● Integrating multiple concepts and techniques in practical applications ● Problem-solving and critical thinking in design scenarios

	ANSYS application 1 -Introduction to ANSYS: ● Overview of ANSYS software suite and its capabilities ● Understanding the ANSYS user interface and navigation ● Introduction to the ANSYS Workbench environment 2- Pre-processing: ● Geometry creation and manipulation using ANSYS Design Modeler or other CAD tools ● Mesh generation techniques, including element types, mesh controls, and quality assessment ● Material assignment and definition of material properties 3- Structural Analysis: ● Static structural analysis: applying loads and constraints, solving linear and nonlinear problems ● Modal analysis: natural frequencies, mode shapes, and vibration analysis ● Buckling analysis: evaluation of critical buckling loads and modes

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching both AutoCAD and ANSYS by providing knowledge the various menus, toolbars, and commands available. This will help student to navigate the software more efficiently and locate the necessary tools for multiple tasks. Take advantage of online tutorials and documentation provided by Autodesk and ANSYS. These resources often include step-by-step guides, video tutorials, and examples that can help the student to understand the software's features and functionalities. Work through these resources to gain hands-on experience and reinforce learning. Dedicate regular time to practice using AutoCAD and ANSYS. Create simple drawings or models, and gradually progress to more complex projects. The more the student practice, the more comfortable and adept the student to become at right way to using the software effectively.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	10% (10)	3, 8 and 12	LO #1, #2, #4, #7 and #8
	Assignments	6	10% (10)	4, 6, 7, 9, 11 and 13	LO #3, #5, #6 and #9
	Projects / Lab.	10	20% (20)	Continuous	All
	Report				
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	Introduction to AutoCAD -3D, workspace, visual style, 3d views, view ports, right hand rule, world coordinate and user coordinate systems and types of coordinate systems.
Week 2	examples on box, wedge and cylinder 3D solids (box, wedge and cylinder). examples on cone and tours 3D solids (cone and tours). examples on sphere and pyramid 3D solids (sphere and pyramid).
Week 3	Basic solid editing (union, subtract and intersect) with examples.
Week 4	Fillet and chamfer with applied examples. 3D operations (3d move and 3d rotate) with examples.
Week 5	3D operations (3d align and 3d mirror) with examples.

	3D operations (3d array and slice) with examples.
Week 6	User coordinate system (origin, face and objects) with examples.
Week 7	Advanced 3d commands (extrude and loft)
Week 8	Advanced 3d commands (revolve, sweep) with examples.
Week 9	Advanced 3d commands (press pull and section plane) with examples. Advanced solid editing/face (extrude, move, rotate and offest).
Week 10	Advanced solid editing/face (taper, delete, copy, color, material, undo and exit). Advanced solid editing/edge (copy and color).
Week 11	Advanced solid editing/body (imprint, separate, shell, clean and check). Surface (box, cone, dome , mesh, pyramid and sphere)
Week 12	Introduction to ANSYS :Overview of ANSYS software and its applications, Familiarization with the ANSYS user interface , Creating a simple 2D model and performing basic analysis.
Week 13	Geometry Creation: Creating complex geometries using ANSYS Design Modeler Importing CAD models and cleaning up geometry Applying mesh controls and generating mesh for analysis
Week 14	Static Structural Analysis: Introduction to static structural analysis, Applying boundary conditions (constraints and loads).Running a structural analysis and interpreting results
Week 15	Modal Analysis : Understanding modal analysis and its significance Setting up modal analysis in ANSYS , Extracting natural frequencies and mode shapes
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	examples on coordinate systems, examples on box, wedge and cylinder
Week 2	examples on cone and tours, examples on sphere and pyramid
Week 3	examples on fillet and chamfer examples on 3d move and 3d rotate examples on 3d align and 3d mirror
Week 4	examples on 3d array and slice applied examples on ucs examples on extrude and loft
Week 5	examples on 3d surface Surface (box, cone, dome and mesh. Press pull and section plane examples on revolve and sweep
Week 6	Creating a simple 2D ANSYS model and performing basic analysis.
Week 7	Creating complex geometries using ANSYS Design Modeler

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	k. l. Narayana p. kannaiah k. venketa reddy mechanical engineering.	Yes
Recommended Texts	Up.and.Running.with.AutoCAD.2012.2D.and.3D.Drawing.and.Modeling	yes
Websites	https://learnengineering.in/mechanical-drawing-books/	

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.

Code	Course/Module Title	ECTS	Semester
PM 401	Computer Aided Design	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	3	63	87

Description

Studying AutoCAD and ANSYS applications provides students with essential skills for computer-aided design (CAD) and engineering analysis. AutoCAD, a leading CAD software, enables students to create precise 2D and 3D models, facilitating the design process for various industries such as architecture, engineering, and manufacturing. Through AutoCAD, students learn to transform conceptual ideas into detailed and accurate digital representations, enhancing their spatial visualization and technical drawing abilities. On the other hand, ANSYS, a powerful simulation software suite, equips students with the tools to analyze and optimize engineering designs. By studying ANSYS, students can perform structural, thermal, fluid dynamics, and electromagnetics analyses, enabling them to evaluate design performance, predict behavior, and make informed engineering decisions. Together, mastering AutoCAD and ANSYS empowers students to effectively design and analyze complex systems, enhancing their problem-solving skills and preparing them for careers in engineering and related fields.