URUK University
جامعة اوروك

Third Cycle – Bachelor's Degree (B.Sc.) – Department of Aeronautical Technical Engineering (ATE)

بكالوريوس - قسم هندسة تقنيات الطيران



Academic Program Description Form

University name: URUK University
College/Institute: Engineering Technical College
Department: Aeronautical technical Engineering
Academic or Professional Program Name: Bachelor's Degree
Final Degree Name: Bachelor's Degree in Aeronautical technical Engineering
Study System: Bologna (First level + Second level + Third level)
Date of Preparation of Description: 18-4-2026
Date of completion: 18-5-2026

Signature:

Head of Department name: Prof. Dr. Yasin K. Salman

Date: 27/6/2026

Signature:

Scientific Associate Name: Asst. Prof. Dr. Falih Hamzah Edan

Date: 27/6/2026

File Reviewed by
Department of Quality Assurance and University Performance
Director of the Quality Assurance and University Performance Department
Lect. Dr. Saadiyah Hasan Halos

Date: 27/6/2026

Signature:

Authentication by the Dean:

Prof. Dr. Waleed Ameen Al-Jawher

COLLEGE OF TECHNICAL ENGIEERING
URUK UNIVERSITY

Table of Contents | جدول المحتويات

1. Mission & Vision Statement

Vision Statement

The vision of the Department of **Aeronautical technical Engineering** (ATE) is to prepare students to become applied engineers familiar with contemporary aircraft equipment engineering technology. Moreover, it offers the latest study programs to keep pace with the scientific departments corresponding to the Department of aircraft equipment technology engineering in respected Arab and international universities, as well as the academic environment and community services that keep pace with the rapid development in the field of aircraft devices.

Mission Statement

Through cutting-edge educational programs and curricula that highlight the importance of this discipline, the Department of technical engineering of aircraft devices aims to provide students with an educational, technical and research environment. Providing practical and scientific methods and advanced applied research to imitate the requirements of the labor market, acceptance of airplane facilities, and help improve the airplane status at the global and regional level.

2. Program Specification

Program code:	BSc- ATE	**ECTS**	240
Duration:	4 levels, 8 Semesters	**Method of Attendance:**	Full Time

Specifications of the aircraft Instrumentations Techniques Engineering program pour into the field of knowledge and skills necessary for the profession of installation, calibration, and maintenance of aircraft instruments. This program focuses on the development of technical expertise in the aircraft device sector, new aircraft technologies, aircraft transport management, and aircraft Device Maintenance. The program consists of classroom lectures, practical training, and on-site work. In addition to developing technical skills such as electrical circuit design, computer-aided design, microprocessor programming and aircraft project management. The program also aims to provide graduates with the necessary skills to work as aircraft device engineers, aircraft engineering team leaders, aircraft device inspectors, cost estimators, and other technical positions in the field of aircraft technical engineering

3. Program Goals

1. Giving program graduates the scientific and practical abilities required to identify aircraft device failures.
2. Educate students to comprehend aircraft device components and handle them effectively while staying up to date with industry technical advancements.
3. Giving students a thorough understanding of contemporary technologies utilized in aircraft device engineering.
4. Improving the graduates' capacity to update and develop aircraft gadgets in accordance with the requirements of flying facilities.
5. The department aims to meet academic quality criteria that are appropriate for the resources at hand

4. Student Learning Outcomes

Students who successfully complete the **Aeronautical technical Engineering** program will have a strong foundation in aircraft devices and be ready for a range of careers. Graduates have expertise in the creation, design, testing, and upkeep of aircraft devices and equipment. Additionally, they can determine the critical impact that aircraft technology advancements have played in the development of the modern aircraft system. They can obtain accurate and pertinent content for presentations, reports, etc. which use information, internet, and communication technologies to fulfill academic needs. They can converse in a second language. Additionally, they can write and speak to a wide range of audiences. Furthermore, the capacity for transparent and engaging communication with non-experts.

Outcome 1
Understanding of allied knowledge
Graduates will be able to demonstrate a deep understanding of the knowledge, capabilities and competence that the market needs. They are also familiar with developments in technology and business.

Outcome 2
Oral and Written Communication
Graduates will be able to use their oral and written communication abilities to professionally convey the results of aircraft device troubleshooting.

Outcome 3
Technical and cognitive skills
Graduates can create applications to examine or control the results and construct circuits for aircraft equipment based on predetermined parameters.

Outcome 4
Critical thinking and analytical skills
Graduates will be able to recognize new issues and attempt to address them utilizing modeling, designing, and forecasting techniques based on logical and critical thinking.

Outcome 5
Appropriate research tools and techniques

Graduates will be able to use basic research techniques to carry out a variety of scientific applications. To achieve the intended outcomes, the graduate might adjust and pick up new abilities.

Outcome 6
Communications and IT skills
In order to identify the best solution, graduates can exchange information with the technical team. They can also make use of communication, information, and internet technology. Graduates can read and understand instructions and user manuals for a variety of medical devices. They use a variety of medical phrases in English to interact with non-experts while demonstrating understanding of varied informational levels and viewpoints.

Outcome 7
Group/team leadership
Graduates will be self-driven, collaborate well with professionals from various fields, backgrounds, and interests to solve issues, work clearly under pressure in perplexing situations, and exhibit knowledge of and dedication to adhering to safety protocols for both themselves and others

Outcome 8
Own professional development
Graduates can plan, solve problems, make decisions, and maintain current professional knowledge.

5. Academic Staff

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Amenah Jowad Kadhim Abd-Alhasan / Ass. Lech. / M. SC. Chemical Engineering.

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6. Credits, Grading and GPA

Credits

URUK University is following the Bologna Process with the European Credit Transfer System (ECTS) credit system. The total degree program number of ECTS is 240, 30 ECTS per semester. 1 ECTS is equivalent to 30 hrs. student workload, including structured and unstructured workload.

Grading

Before the evaluation, the results are divided into two subgroups: pass and fail. Therefore, the results are independent of the students who failed a course. The grading system is defined as follows:

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:				

Number 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.

Calculation of the Cumulative Grade Point Average (CGPA)

1. The CGPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

   CGPA of a 4-year B.Sc. degree:

   CGPA = [(1st module score x ECTS) + (2nd module score x ECTS) + ……] / 240

7. Curriculum/Modules: (first year)

Semester 1 | 30 ECTS | 1 ECTS = 25 hr. (first year)

No.	Code	Module	SSWL	USSWL	ECTS	Type	Pre- request
1	ATUU113	English Language (1)	18	32	2	S	
2	ATU1111	Computer Applications (1)	48	27	3	S	
3	ATU13013	single variable calculus	78	72	6	B	
4	ATU13014	Workshop	63	62	5	B	
5	ATU13015	Thermodynamics fundamental	78	72	6	B	
6	ATU13016	CAD Drawing	93	57	6	B	
7	ATUU112	Arabic (1)	18	32	2	S	

Semester 2 | 30 ECTS | 1 ECTS = 25 hr.

No.	Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
1	ATU13021	Integration & differentiations for multi-variables	78	72	6	B	single variable calculus
2	ATU13022	Engineering Materials	33	67	4	B	
3	ATU13023	Physics	78	72	6	B	Thermodynamics fundamental
4	ATU13024	Engineering Mechanics-Static	93	57	6	B	
5	ATU13025	Fundamental of Electricity	78	72	5	B	
6	ATUU111	Human Right and democracy	33	17	2	S	

(second year)

Semester 3 | 30 ECTS | 1 ECTS = 30 hr.

No.	Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
1	ATU13031	Fundamental of Fluid Mechanics	63	62	5	B	
2	ATU13032	Fundamental of Electronics	63	62	5	B	Fundamental of Electricity
3	ATU13033	Theory of Flight	78	72	6	C	
4	ATU13034	Thermodynamics-Steam	63	37	4	B	Thermodynamics fundamental
5	ATU13035	Manufacturing Processes	48	52	4	B	Engineering Materials
6	ATU13036	Fundamental of engineering Mechanics-Dynamics	48	52	4	B	Engineering Mechanics-Static
7	ATUU211	Baath Party Crimes	33	17	2	S	

Semester 4 | 30 ECTS | 1 ECTS = 30 hr.

No.	Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
1	ATU13041	Fluid Mechanics-Dynamics	63	62	5	B	Fundamental of Fluid Mechanics
2	ATU222	Computer Programing (2)	48	27	3	B	Computer Applications (1)
3	ATU13043	Engineering Mechanics-Applied of Dynamics	78	48	5	B	Fundamental of engineering Mechanics-Dynamics
4	ATU13044	Strength of materials	78	48	5	B	Engineering Mechanics-Static
5	ATU13045	Algebraic Equation and Programing MATLAB	63	37	4	B	
6	ATU220	Arabic (Intermediate Level)	18	32	2	S	Arabic (1)
7	ATU221	English (Intermediate Level)	18	32	2	S	English Language (1)
8	ATU13046	Thermodynamics -Ideal Gas	63	37	4	B	Thermodynamics fundamental

(third year) Semester 5 | 30 ECTS | 1 ECTS = 30 hr.

No.	Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
1	ATU13051	Aerodynamics Fundamental	63	37	4	C	Fluid Mechanics-Dynamics
2	ATU13052	Aircraft Electricity	63	37	4	C	Fundamental of Electronics
3	ATU13053	Engineering Analysis	48	27	3	B	integration differentiations for multi-variables
4	ATU13054	Gas Dynamics Fundamental	48	52	4	C	
5	ATU13055	Aircraft engine	48	52	4	C	
6	ATU13056	Mechanical Design Fundamental	63	37	4	B	Strength of materials
7	ATU13057	Theory of Mechanics	48	52	4	B	
8	ATU13058	Mechanics of Material	48	27	3	C	Engineering Materials

Semester 6 | 30 ECTS | 1 ECTS = 30 hr.

No.	Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
1	ATU13061	Aerodynamic Application	63	37	4	C	Aerodynamics Fundamental
2	ATU13062	Mechanical Design Application	78	72	6	B	Mechanical Design Fundamental
3	ATU13063	Heat transfer	63	37	4	B	
4	ATU13064	Gas Turbine Engine	63	37	4	C	Aircraft engine
5	ATU13065	Gas Dynamics application	48	52	4	C	Gas Dynamics Fundamental
6	ATU13066	Digital Techniques & Electronic Instrument	63	37	4	C	Aircraft Electricity
7	ATU13067	Numerical Analysis	33	67	4	B	

(fourth year) Semester 7| 30 ECTS | 1 ECTS = 30 hr.

No.	Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
1	ATU13071	Aircraft Structure-fundamentals	48	52	4	C	Mechanical Design Application
2	ATU13072	Aircraft Vibration-free vibration	63	37	4	C	
3	ATU13073	A320 family, Airbus Aircraft syst. & Main. I	78	22	4	C	
4	ATU13074	Aircraft Heat Exchanger	48	27	3	C	Heat transfer
5	ATU13075	Aircraft Design Fundamentals	78	47	5	C	Mechanical Design Application
6	ATU13076	CAM (computer Aided manufacturing)	63	37	4	C	
7	ATU13077	Industrial Engineering	33	42	3	B	
8	ATU13078	AI in Aero. legislation & Aero. Eng. Ethics	48	27	3	C	

(fourth year) Semester 8 | 30 ECTS | 1 ECTS = 30 hr.

No.	Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
1	ATU13081	Aircraft Design applied	48	27	3	C	Mechanical Design Fundamental
2	ATU13082	Propolsion Systems	63	37	4	C	
3	ATU13083	Green & Sustainable Aero. Tech. Eng.	33	17	2	C	
4	ATU13084	Aircraft Structure- Applied	48	27	3	C	Aircraft Structure-fundamentals
5	ATU13085	Aircraft Vibration-forced vibration	48	52	4	C	Aircraft Vibration-free vibration
6	ATU13086	Automatic Control	63	37	4	C	
7	ATU13087	A320 family, Airbus Aircraft system & Maintenance II	78	22	4	C	

8	ATU13088	Aircraft Stability	63	12	3	C	
9	ATU13089	4inal year project	63	12	3	C	

8. Information contact:

Program manager:

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Program organizer:

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First year / first semester

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="8">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">English for Academic U.</td><td colspan="4">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">S</td><td colspan="4" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☒ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATUU113</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">2</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">50</td></tr>
<tr><td colspan="2">Module Level</td><td>1</td><td colspan="3">Semester of Delivery</td><td colspan="2">1</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU13</td><td>College</td><td colspan="4">Technical Engineering (TEC)</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name: Areeg</td><td>e-mail</td><td colspan="4">E-mail</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Ass. Lech.</td><td colspan="3">Module Leader’s Qualification</td><td colspan="2">MSc.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="4">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="4">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>01/06/2026</td><td colspan="2">Version Number</td><td colspan="3">1.0</td></tr>
<tr><td colspan="8">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td colspan="2">Prerequisite module</td><td colspan="4">None</td><td>Semester</td><td></td></tr>
<tr><td colspan="2">Co-requisites module</td><td colspan="4">None</td><td>Semester</td><td></td></tr>
<tr><td colspan="8">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
</table>

Module Objectives أهداف المادة الدراسية	1- The aim of this course is to provide English learners with integrated language skills such as reading, listening and writing resulting in a level of basic language knowledge. 2- This course will focus on grammar rules, basic word knowledge and usage, reading comprehension, reading out of the lesson, and Paragraph writing. 3- A student may be able to listen to native speakers and speak English Language. 4- A student may be able to write and have creativity in his writing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Uses expressions of Quantity in elementary level of English. - Constructs sentences in Present Perfect Tense, Simple Future Tense and Going to Future Tense both in an oral and written task. - Defines basic Modals and employ them in elementary level of communication and writing skills. 4- Translates sentences in elementary level from English to another language. 5- Interprets the texts written in elementary level of English.
Indicative Contents المحتويات الإرشادية	**Language** is a rule-governed behavior. It is defined as the comprehension and/or use of a spoken (i.e., listening and speaking), written (i.e., reading and writing), and/or **other communication symbol system** (e.g., American Sign Language). **Spoken and written language** are composed of receptive (i.e., listening and reading) and expressive (i.e., speaking and writing) components. Spoken language, written language, and their associated components (i.e., receptive and expressive) are each a synergistic system comprised of individual language domains (i.e., phonology, morphology, syntax, semantics, pragmatics) that form a dynamic integrative whole **Phonology** study of the speech sound (i.e., phoneme) system of a language, including the rules for combining and using phonemes. **Morphology** study of the rules that govern how morphemes, the minimal meaningful units of language, are used in a language. **Syntax** the rules that pertain to the ways in which words can be combined to form sentences in a language. **Semantics** the meaning of words and combinations of words in a language.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Uses the available material to increase his efficiency. - Constructs sentences in Present Perfect Tense, Simple Future Tense and Going to Future Tense both in an oral and written task.

	-Defines basic Modals and employ them in elementary level of communication and writing skills. -Develop and enhance students' language skills to communicate in English properly. 5- Interprets the texts written in elementary level of English.

Student Workload (SWL) الحمل الدرا يس للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدرا يس المنتظم للطالب خلال الفصل	18	**Structured SWL (h/w)** الحمل الدرا يس المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدرا يس غ رت المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدرا يس غ رت المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدرا يس الك يل للطالب خلال الفصل	**50**		

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 الاسبو يع النظري	
	Material Covered
Week 1	Able to identify linking Ideas: Present and Past Irregular Plurals, Consonants, There was/were
Week 2	Identify countable and Uncountable Nouns, Imperatives Healthy Living and
Week 3	Able to identify can for ability Could and Couldn't Skills at work
Week 4	Able to identify can for requests Adjectives and Adverbs
Week 5	Able to identify describing People, Present Continuous and Adjectives
Week 6	Demonstrates knowledge about question for, 'information, prepositions: (at, in, on, to)
Week 7	Mid-term Exam

Week 8	Able to identify (Have to don't have to Housework, home, school & work obligations)
Week 9	Demonstrates knowledge about Offering and Inviting Why..? Would you like to...? Let's...? Free time activities
Week 10	Able to identify (Be going to + infinitive for plans)
Week 11	Able to identify (Be going to weak forms: Maybe/perhaps)
Week 12	Able to identify {Past Simple have to)
Week 13	Demonstrates knowledge about Transport, Prepositions of movement Address
Week 14	Demonstrates knowledge about (Writing Activities)
Week 15	Writing short essay
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبو يع للمخت.ت

	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	Headway book for learning English	Yes
Recommended Texts	Skills in writing and Learning English	Yes
Websites	https://www.bbc.co.uk/learningenglish/	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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معلومات المادة الدراسية</th></tr>
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<tr><td>Module Type</td><td colspan="2">S</td><td colspan="3" rowspan="4">☒ Theory
☒ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATU13012</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">4</td></tr>
<tr><td>SWL (hr./Sem)</td><td colspan="2">100</td></tr>
<tr><td colspan="2">Module Level</td><td>1</td><td colspan="2">Semester of Delivery</td><td>1</td></tr>
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<tr><td>Module Leader</td><td colspan="2">Name: Ahmed Haeder Ismaeel</td><td>e-mail</td><td colspan="2"></td></tr>
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Uses the available material to increase his efficiency. - Constructs sentence in Present Perfect Tense, Simple Future Tense and Going to Future Tense both in an oral and written task.

	-Defines basic Modals and employ them in elementary level of communication and writing skills. -Develop and enhance students' language skills to communicate in English properly. 5- Interprets the texts written in elementary level of English.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

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	**Introduction to programming using (MATLAB)** - Introduction to (MATLAB) Menu bar , tool bar, and program windows
Week 2	**Format & numbers** - Real, Integer, Inf, NaN, Complex numbers
Week 3	**Variables** - Variable Names
Week 4	- Examples on variable names
Week 5	- Show the results - Examples on (+, -, *, /) - Outputs

	Intermediate results during calculations
Week 6	**Built-in-functions** - Trigonometric Functions (sin, cos, tan, sec) Elementary Functions (abs, log10, log, exp, sqrt)
Week 7 Week 8	**Functions** - Poly-area (X, Y) - polygon - Standard Deviation - abs function - (max) - (min) (mean)
Week 9	**Logical commands** - Logical Operations > greater than >= greater than or equal < less than <= less than or equal = = equal = ~ not equal - Logical commands or (|), and (&)
Week 10	**Strings manipulation** - Creating Strings save
Week 11 Week 12	**Conditional commands** - if end If elseif else function - Examples Problems
Week 13 Week 14	**Loops** for while Program control - Example Problems
Week 15	**Matrices** - Matrices manipulation
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبو يع للمخت ت.

	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	Headway book for learning English	Yes
Recommended Texts	Skills in writing and Learning English	Yes
Websites	https://www.bbc.co.uk/learningenglish/	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**single variables calculus**	**Module Delivery**	
Module Type	**S**	☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13013**		
ECTS Credits	**5**		
SWL (hr/sem)	**125**		
Module Level	1	**Semester of Delivery**	1
Administering Department	ATU13	**College**	TEC
Module Leader	Name: **Taif Mahdi Oudah**	**e-mail**	Taifmahde96@gmail.com
Module Leader's Acad. Title	Assistant Lech.	**Module Leader's Qualification**	MSc
Module Tutor	None	**e-mail**	
Peer Reviewer Name	None	**e-mail**	
Scientific Committee Approval Date	01/06/2026	**Version Number**	1

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 introduce the student to the basic and advanced principles of calculus and integrations and its various applications 2. To develop his mental abilities when solving exercises. 3. Linking data with information to reach a solution to issues and benefit from them in other subjects.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define the determinants and be able to solution of linear equation 2. Recognize trigonometric functions and some applications. 3. Summarize what is meant by a scalar and vector product and projections. 4. Discuss the Limit and continuity. 5. Describe derivative theory. 6. Define Chain rule. 7. Identify the inverse function and its derivative. 8. Discuss Derivative of logarithmic and hyperbolic functions. 9. Discuss the definite and indefinite integral. 10. Explain the Retail integration. 11. Identify the Integration by completing the square. 12. Discuss the approximate area using the trapezoidal rule and Simpsons.
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
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	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

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.	0	0%		
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	20% (20)	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	Determinants and solution of linear equation by Gramer's rule
Week 2	Trigonometric functions and some applications
Week 3	Vectors, scalar and vector product and projections, mechanical applications to vectors
Week 4	Limit and continuity, and some applications
Week 5	Derivative theory, derivatives of algebraic and implicit functions
Week 6	Chain rule, mechanical applications on the derivative
Week 7	The inverse function and its derivative
Week 8	Derivative of logarithmic and hyperbolic functions
Week 9	Integration, definite and indefinite integral, integration of trigonometric and logarithmic functions
Week 10	Retail integration
Week 11	Integration by division of fractions
Week 12	Integration by trigonometric function method
ek 13	Integration by completing the square
Week 14	Simplified differential equations

Week 15	Approximate area using the trapezoidal rule and Simpsons
Week 16	**Preparatory week before the final Exam**

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	Calculus, R. Mohammed and A. Abdulaali, 2002	
Recommended Texts	Advanced calculus, Murray R. Splegel, 1962	
Websites		

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**Engineering Workshops**	**Module Delivery**
Module Type	Basic	**Theory** **Lab** **Tutorial**
Module Code	**ATU13014**	

ECTS Credits	4	
SWL (hr/sem)	100	

Module Level	1	**Semester of Delivery**	1
Administering Department	**ATU13**	**College**	TEC
Module Leader	Name:**Mohammed Ajmi Mahan**	**e-mail**	mohamedalshamary43@gmail.com
Module Leader's Acad. Title	Ass. Lech.	**Module Leader's Qualification**	M.Sc..
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Ahmad T Abdulsadda	**e-mail**	Coj.abdulsad@atu.edu.iq
Review Committee Approval	01/06/2026	**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 Aims أهداف المادة الدراسية	1. Develop practical skills in mechanical workshop operations, focusing on safety measures and proficiency in using measuring devices and tools. 2. Acquire knowledge and techniques related to welding, soldering, filling, surface finishing and handling mechanical components on drawing sheets. 3. Gain familiarity with various mechanical components, and their behaviors through hands-on manufacturing and experimentation. 4. Understand the principles of parallel and series circuits involving resistors and capacitors, and apply them in practical scenarios. 5. Enhance the ability to read and interpret electronic boards, and design and assemble electronic circuits on printed boards.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a thorough understanding of the fundamental concepts and principles of electronics, including measuring devices, soldering techniques, and electronic components. 2. Apply knowledge and skills in conducting welding and soldering operations with precision and adherence to safety guidelines in an electronics workshop. 3. Construct and analyze various electronic circuits, including resistive, capacitive, and semiconductor circuits, using appropriate tools and materials. 4. Evaluate and troubleshoot electronic circuits, identify faults, and apply effective problem-solving techniques to rectify issues. 5. Develop proficiency in reading and interpreting electronic boards,

	designing and assembling circuits, and effectively communicating ideas and findings related to electronics.
Indicative Contents المحتويات الإرشادية	1. Electronic Workshop: Acquire practical skills in electronics, including the use of measuring devices, soldering techniques, and working with electronic components. 2. Mechanical Workshop: Develop hands-on knowledge and skills in mechanical engineering, including working with different tools, understanding mechanical systems, and performing various mechanical operations.
Strategies	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 showing the students how the construction members exposed to external loads. This can be done by films or videos or by the ready structural software.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (hr/sem) (SSWL) الحمل الدراسي المنتظم للطالب خلال الفصل	27	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	27/15 =1.8
Unstructured SWL (hr/sem)(USSWL) الحمل الدراسي غير المنتظم للطالب خلال الفصل	48	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	62/15=3.2
Total SWL (hr/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

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
Summative assessment	**Midterm Exam**	1.5 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week	**Syllabus**

	•
	•
	•
	•
	•

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي المختبري

	Material Covered
Week	**Syllabus**
1-7	• Occupational Safety, Foundry Workshop, Files type Workshop, Carpentry Workshop, Turnery workshop, Welding types Workshop
8	• Learn how to use different measuring devices in the workshop, Learn how to use caustic, types of caustic, welding by using caustic
9	• Types of welding, Auxiliary materials for welding, wires welding between them and with other components. • Sucker solder and Solder removal, Training to remove some of the electronic components of the printed board
10	• Learn different types of printing board through printing method, drilling operation, Install the various components.
11	• Different types of electronics components through manufacturing for example the resistance and its power, measure the value of resistance in different methods, rheostat, Parallel resistance circuit - series resistance circuit - parallel and series resistance circuits - and check it.
12-13	• Types of capacitance • 14-15 Parallel capacitance circuit - series capacitance circuit - parallel and series capacitance, circuit - check it on the board, Switch types, Fuses types, Inductor types, Transformer types
14-15	• Learn how to read electronic board, Students learn to design electronic board on the printed board, install the component on the board, and welding the components on the board.

Learning and Teaching Resources
مصادر التعلم و التدريس

	Text	Available in the Library?
Required Texts	1. Digital principles and applications, by Albert Paul Malvino, 2nd Edition. ¬ 2. Digital Logic Circuits by D.A.Godse A.P.Godse, Technical Publications 2008	Yes
Recommended Texts	1. Digital principles and applications, by Albert Paul Malvino, 2nd Edition. ¬	Yes
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">Fundamentals of Thermodynamics</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">S</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☒ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13015</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">6</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">:</td></tr>
<tr><td colspan="2">Module Level</td><td>1</td><td colspan="2">Semester of Delivery</td><td>1</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU13</td><td>College</td><td colspan="2">TEC</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name: Ali Yasir Hasan Shamhy</td><td>e-mail</td><td colspan="2">aliyasir1961@gmail.com</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Lech.</td><td colspan="2">Module Leader’s Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="2">1.0</td></tr>
</table>

<table>
<tr><td colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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<table>
<tr><td>Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
</table>

Module Objectives أهداف المادة الدراسية	1- Basic terms and definitions: energy, thermodynamics system, properties, state and thermodynamics equilibrium, units, zero law of thermodynamics. 2- Microscopic forms of energy, the basic axiom of thermodynamics, works and heat, moving boundary work, the first law of thermodynamics for closed systems 3- Specific heat, entropy, ideal gas equation of state, characteristic thermodynamics process. 4- The first law of thermodynamics for open systems (control volume). The concept of entropy, causes of entropy change, reversible and irreversible processes, entropy as a function of the state. 5- The second law of thermodynamics. Examples of thermodynamics cycles; gas power cycles, refrigeration and heat pump cycles. 6- Phases of pure substance, saturated liquid, saturated liquid-vapor mixture, critical parameters, triple point property diagrams for phase-change processes, properties of gas and two-phase mixtures. 7- Unconventional sources of energy.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Uses expressions of Quantity in elementary level of English. - Constructs sentence in Present Perfect Tense, Simple Future Tense and Going to Future Tense both in an oral and written task. - Defines basic Modals and employ them in elementary level of communication and writing skills. 4- Translates sentences in elementary level from English to another language. 5- Interprets the texts written in elementary level of English.
Indicative Contents المحتويات الإرشادية	**Language** is a rule-governed behavior. It is defined as the comprehension and/or use of a spoken (i.e., listening and speaking), written (i.e., reading and writing), and/or **other communication symbol system** (e.g., American Sign Language). **Spoken and written language** are composed of receptive (i.e., listening and reading) and expressive (i.e., speaking and writing) components. Spoken language, written language, and their associated components (i.e., receptive and expressive) are each a synergistic system comprised of individual language domains (i.e., phonology, morphology, syntax, semantics, pragmatics) that form a dynamic integrative whole **Phonology** study of the speech sound (i.e., phoneme) system of a language, including the rules for combining and using phonemes. **Morphology** study of the rules that govern how morphemes, the minimal meaningful units of language, are used in a language. **Syntax** the rules that pertain to the ways in which words can be combined to form sentences in a language. **Semantics** the meaning of words and combinations of words in a language.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Uses the available material to increase his efficiency. - Constructs sentences in Present Perfect Tense, Simple Future Tense and Going to Future Tense both in an oral and written task.
	- Defines basic Modals and employ them in elementary level of communication and writing skills. - Develop and enhance students' language skills to communicate in English properly. 5- Interprets the texts written in elementary level of English.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
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**	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	**Introduction** - Introduction to Thermodynamics - Thermodynamics System - Dimensions, Units & symbols, units' system
Week 2	**Properties of System**

	- Thermodynamic Process - Intensive & extensive Variables - Specific Value, Mole Independent & dependent properties
Week 3	**Thermal Equilibrium, Temperature** - Thermal & thermodynamic equilibrium - Zero Law - Thermometers Temperature Scale
Week 4	**Energy** - Types and source of energy - Kinetic & potential energy the conservation of energy, use
Week 5	**Kinetic Theory of Gases** - Molecular Motion of Gases - Internal Energy, joule's law Molecular Energy
Week 6	**Heat** - Specific Heat - Relation between (q,Q,Q) - Sensible & Latent Heat Joule’s Equivalent
Week 7	**Work** - Displacement Work - Work & (p-v) Diagram - State & Path Function - Electrical Work Relation Between (Q, W)
Week 8	**Ideal (Perfect) Gas** - Actual & Ideal Gas Boyle's & Charles Law - Equation of Ideal Gas Absolute Scale
Week 9	**Enthalpy** - Enthalpy Joule’s Experiment
Week 10	**The First Law of Thermodynamic** - Joule's Law of Internal Energy - The First Law Statements Energy Equation
Week 1	**Application of the First Law on the Closed Systems** - Constant Volume Process

	- Constant Pressure Process Constant Temperature Process - Adiabatic Process Polytrophic Process
Week 12	**Open systems** - Motion of Fluid - Steady & none Steady Flow
	Appl Boiler & Condenser ressor & Turbine zles & throttling Exchanger
	Second Law of Thermodynamics
Week 14	- Friction Reversible & Irreversible Process
Week 15	- Heat Engine - Reversed Heat Engine - Engine Thermal Efficiency Coefficient of Performance
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Headway book for learning English	Yes
Recommended Texts	Skills in Writing and Learning English	Yes
Websites	https://www.bbc.co.uk/learningenglish/	

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبو يع للمخت ت.	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**CAD Drawing**		**Module Delivery**	
Module Type	Support or related learning activity		☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**ATU13016**			
ECTS Credits	8			
SWL (hr/sem)	200			
Module Level	1		**Semester of Delivery**	1
Administering Department	ATU13		**College**	TEC
Module Leader	Name: Meas hameed Auda		**e-mail**	

Module Leader's Acad. Title	Assistant teacher	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	
Peer Reviewer Name	None	**e-mail**	
Scientific Committee Approval Date	01/06/2026	**Version Number**	1

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. This course introduces the fundamentals of engineering drawing and the use of AutoCAD software. It covers menus, toolbars, commands, and dimensioning techniques. Students learn how to create accurate drawings in accordance with engineering drawing standards and apply them using AutoCAD. The course also includes the study of orthographic projection in both traditional engineering drawing and through the use of AutoCAD.This course deals with identifying engineering drawing tools and materials, methods of using them, performing manual exercises, drawing lines, curves, and two- and three-dimensional shapes. Thus, developing the student's potential to study and apply the basics of engineering drawing. Which includes reading, disassembling and assembling geometric shapes through drawing, projection, and sections methods. In addition to how to draw engineering mechanical plans necessary to clarify design ideas. 2. Also, To learn the student the basic principles and theories of engineering drawing and how to implement different sketches by using computer programs such as (AUTOCAD).
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowing the tools used in engineering drawing and how to use them properly. 2. The student's ability to understand and apply the basics of engineering. 3. Reading, disassembling, and assembling geometric shapes through drawing. 4. Developing the student's skill in using tools in drawing geometric shapes. 5. Developing the student's engineering imagination through deducing the projections and sections of each geometric solid and realizing its dimensions. 6. Developing student skills using AutoCAD drawing software. 7. Conducting auxiliary exercises to apply it correctly to increase its absorption capacity of the material. 8. Communicate with the most important ideas presented by the article through the Internet. 9. Developing student skills using AutoCAD drawing software.

	10. Going to implement an engineering design with all its recognized requirements in the field of work, which reflect skills through designing engineering plans that meet the details and dimensions that can be implemented. 11. Applications to various engineering processes. 12. Auxiliary exercises that the student presents by applying and delivering them as a participatory work to increase his ability to absorb the material
Indicative Contents المحتويات الإرشادية	1- Introduction to the subject: basics of engineering drawing and the difference between it and free drawing: Engineering drawing, its elements, tools and drawing methods. 2- Introducing students to paper scales and drawing boards, and Free hand drawing (lines, circles, ...etc) 3- Distribute the canvas (frame, table, etc.), Types of lines in engineering drawing, Rules for writing dimensions and measurements and recognizing symbols and their significance, Drawing scales (zoom in and zoom out) 4- Construction and engineering operations: Create and divide angles, Divide circles and draw regular shapes in them.Create connecting lines between arcs and circles. 5- Drawing engineering perspectives, Types of engineering perspectives and its construction from projections. Perspective constructions (drawing 3D solids (isometric perspective) 6- Projection in orthogonal planes, vertical projection methods, Drop geometric shapes. 7- Distribution of projections on the drawing board, Conclusion of the third projection from two projections. 8-Inferring the isometric perspective from projections with dimensions 9- Single simple and complex geometric objects 10- Sectors in engineering drawing, their importance, Cutting, sector, and hatching levels, Types of sectors and their classification

معلومات المادة الدراسية

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Planning a unit or lesson involves a number of instructional decisions. The teacher must identify the following: the content and processes to be addressed, the strengths, needs, and interests of students, the Common Essential Learnings that could be incorporated, and the most effective instructional approaches. Such decisions are critical and must be made consciously and purposefully. It begins with the student's interest in engineering tools and the drawing board. To reach the highest level of understanding in the application of all theoretical and laboratory lesson processes.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	115	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	85	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	0	0%		
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	20% (20)	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	Explanation of the vision and mission of the college, and the objectives and outcomes of learning the subject.
Week 2	Introduction to the subject: basics of engineering drawing and the difference between it and free drawing: Engineering drawing, its elements, tools and drawing methods. Introducing students to paper scales and drawing boards. Free hand drawing (lines, circles, ...etc)
Week 3	Distribute the canvas (frame, table, etc.) Types of lines in engineering drawing Rules for writing dimensions and measurements and recognizing symbols and their significance. Drawing scales (zoom in and zoom out)
Week 4	Construction and engineering operations: Create and divide angles, Divide circles and draw regular shapes in them. Create connecting lines between arcs and circles
Week 5	Drawing engineering perspectives, Types of engineering perspectives and its construction from projections.
Week 6	Perspective constructions (drawing 3D solids (isometric perspective).
Week 7	Projection in orthogonal planes, vertical projection methods, Drop geometric shapes
Week 8	Distribution of projections on the drawing board, Conclusion of the third projection from two projections
Week 9	Inferring the isometric perspective from projections with dimensions.

<table>
<tr><td>Week 10</td><td>Single simple geometric objects.</td></tr>
<tr><td>Week 11</td><td>Review on the above: Mid exam</td></tr>
<tr><td>Week 12</td><td>Single complex geometric objects.</td></tr>
<tr><td>Week 13</td><td>Sectors in engineering drawing, their importance, Cutting, sector, and hatching levels
Types of sectors and their classification</td></tr>
<tr><td>Week 14</td><td>Learn about drawings in all their parts and how to draw them</td></tr>
<tr><td>Week 15</td><td>Review on the above:</td></tr>
<tr><td>Week 16</td><td>Preparatory week before the final Exam</td></tr>
<tr><td colspan="2">Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر</td></tr>
<tr><td></td><td>Material Covered</td></tr>
<tr><td>Week 1&2
Week 2&3</td><td>The first chapter dealt with the topic of running the program and general concepts to get acquainted with the AutoCAD drawing area, the implementation of commands, the types of enlargements and reduction, units of measurement, and the formation of transparencies and dealing with them.</td></tr>
<tr><td>Week 4&5</td><td>Chapter 2 is to get acquainted with the drawing commands contained within the "Main" tab.Chapter 3 deals with precision drawing and drawing aids such as Grid, Command Line, Orthogonal, and Jump to Elements.</td></tr>
<tr><td>Week 6&7</td><td>Chapter 4 deals with drawing modification such as the delete, move, mirror, matrix, rinse, and stretch commands.
Chapter 5 deals with adding dimensions in terms of dimension components and their signs.</td></tr>
<tr><td>Week 8&9</td><td>The sixth chapter deals with writing and publicizing, while the seventh chapter deals with blocks, descriptions, controlling their specifications, and how they are formed, included, and modified.</td></tr>
<tr><td>Week 10&11&12</td><td>Chapter 8 deals with 3D drawing. It shows how to create the new "mesh objects", use the coordinate system, divide the screen into different scenes, and use commands such as "RevSurf" "TabSurf" "rulesurfe".</td></tr>
<tr><td>Week 13&14</td><td>The ninth chapter deals with “inanimate objects,” how they are created, and the operations of addition and subtraction that are performed on them.</td></tr>
</table>

<table>
<tr><td colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</td></tr>
<tr><td></td><td>Text</td><td>Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>[1] الرسم الهندسي، عبد الرسول عبد الحسين الخفاف، دار الكتب والوثائق العراقية، 1990.</td><td></td></tr>
</table>

Recommended Texts	[2] Beginning Auto CAD, by Bob McFarlane, Elsevier, 2007	
Websites	https://www.youtube.com/watch?v=yhRDjplrl1U, https://www.youtube.com/watch?v=fQNwVo2hWU4 https://www.youtube.com/watch?v=K8fQsse68Sc	

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

<table>
<tr><th colspan="6">Module Information
معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td colspan="2">اللغة العربية</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">S</td><td colspan="3" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☒ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATUU112</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">2</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">50</td></tr>
<tr><td colspan="2">Module Level</td><td>1</td><td colspan="2">Semester of Delivery</td><td>1</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU13</td><td>College</td><td colspan="2">PMTE</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name: Yasmeen</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Ass. Lech.</td><td colspan="2">Module Leader’s Qualification</td><td>MSc.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="2">1.0</td></tr>
</table>

<table>
<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

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.تمكين الطلبة من التكلم باللغة العربية الفصيحة. 2.تمكين الطلبة من القراءة بصورة صحيحة من خلال تشكيل المفردات. 3.تمكين الطلبة من الحصول على المعرفة اللازمة للتراث العربي من النثر والشعر والمدونات الأخرى. 4.تمكين الطلبة من القابلية على النطق السليم. 5.تمكين الطلبة من إستعمال مصطلحات اللغة العربية وفق اختصاصاتهم. 6.تمكين الطلبة من الكتابة بلغة سليمة خالية من الأخطاء الإملائية.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	أ- الأهداف المعرفية: أ1.معرفة وفهم القواعد اللغوية والنحوية ومخارج نطق الكلمات في اللغة العربية. أ2. معرفة وفهم أساليب التعبير اللغوي والأدبي الشائعة في اللغة العربية وتحليل نصوصها. أ3. معرفة أشهر الأدباء والمفكرين وعلماء اللغة القدماء والمعاصرين في تراث اللغة العربية وفهم أهم نتاجهم الأدبي والفكري. أ4. معرفة وفهم أهم اساليب وطرق التدريس الحديثة بالإضافة الى اهم وسائل التقييم والتقويم والاختبارات اللغوية المستخدمة في تقييم وتدريس اللغة العربية ب- الأهداف المهارية الخاصة بالبرنامج ب 1- يتدرب الطلاب على المهارات اللغوية الأساسية . ب2- تدريب الطلاب على تطوير مهاراتهم في التحدث والاستماع ليكونوا قادرين على أن يتعاملوا مع المواقف ب 3 - تقديم مهارات واستراتيجيات القراءة للطلاب تمرينهم عليها كميكانيكية القراءة، وتقنيات القراءة ومهارات استخدام المفردات . ب4 - تنمية قدرات الطلاب على مهارات الكتابة في كتابة البحوث والتقارير مثل الاستلال من الحقائق .
Indicative Contents المحتويات الإرشادية	تدرس اللغة العربية على عدة مستويات : 1- المستوى النحوي: وهو المستوى الذي من خلاله يمكن معرفة المعنى التركيبي للنص. 2- المستوى الصرفي وهو المستوى الذي يمكن من خلالة معرفة المعنى المتفرع على المعنى المعجمي، 3- المستوى الدلالي: وهو المستوى الذي من خلاله يمكن معرفة دلالة الألفاظ (الجذر). 4- المستوى الصوتي: وهو المستوى الذي يدرس الحروف والحركات والمقاطع الصوتية سواء كانت لفظا أو جزءا من لفظ.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1- 1- التعليم من خلال تجزئة مفردات اللغة العربية وتصنيفها بلحاظ موضوعاتها؛ لتمكين الطالب من التمييز بينها 2- التعليم من خلال النمط سواء كان النمط المرئي) اللفظي (او النمط الحسي) الحركي، لبيان لبيان الدلالات اللفظية والدلالات السياقية. 3- التعليم باستخدام الدروس المصغرة حيث يتم تقسيم المنهج العلمي الى افكار رئيسية ومن ثم تعليمها الى الطالب بشكل محاضرات متتالية وكل محاضرة تتناول فكرة واحدة فقط. 4- التعلم التعاوني/ حيث يتم اعطاء واجبات تقسم على الطلبة الى مجموعات صغيرة ويتم طرح مسألة معينة لهم واتاحة الفرصة للطلبة من اجل حل هذه المسألة بالتعاون مع بعضهم البعض.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem)	18	Structured SWL (h/w)	

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

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	علامات الإعراب
Week 2	الجملة الاسمية (المبتدأ والخبر)
Week 3	الجملة الاسمية (المبتدأ والخبر)
Week 4	الجملة الفعلية
Week 5	الهمزة وقواعد كتابتها
Week 6	الضاد والظاء
Week 7	امتحان نصف الفصل
Week 8	علامات الترقيم
Week 9	العدد والنعت العددي (الدرس الأول)
Week 10	العدد والنعت العددي (الدرس الثاني)
Week 11	نص من القرآن الكريم
Week 12	نص من الشعر القديم
Week 13	نص من الشعر الحديث
Week 14	نص نثري (من خطب نهج البلاغة)
Week 15	طريقة الكشف في المعجمات العربية
Week 16	امتحان نهاية الفصل

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 و التدريس		
	(اللغة العربية العامة لأقسام غير الإختصاص), تأليف عبد القادر حسن أمين وآخرين. (العربية الجامعية لغير المتخصصي), تأليف عبده الراجحي. (النحو الواضح في قواعد اللغة العربية), تأليف علي الجارم ومصطفى أمين. وكتب أخرى تعنى بتيسير اللغة العربية لغير المختصين ...	**Available in the Library?**
Required Texts		Yes
Recommended Texts	Skills in writing and Learning English	Yes
Websites	https://www.bbc.co.uk/learningenglish/	

First year / second semester

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Multi-variables calculus**	**Module Delivery**	
Module Type	**S**	☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**ATU32022**		
ECTS Credits	**5**		
SWL (hr/sem)	**125**		
Module Level	1	**Semester of Delivery**	2
Administering Department	ATU13	**College**	TEC
Module Leader	Name **Amenah Jowad Kadhim**:	**e-mail**	aminajawad700@gmail.com
Module Leader's Acad. Title	Ass. Lech.	**Module Leader's Qualification**	MSc.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	01/06/2026	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	2
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 differential equation . 2. To understand infinite series and its applications. 3. To understand vectors and vector valued functions. 4. To understand functions of several variable. 5. To understand double integral , line integral and vector analysis.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Solving ordinary differential equations. 2. Converting functions to power series forms such us Taylor's series. 3. Using polar coordinates to solve problems. 4. Solving problems related to vector algebra. 5. Solving problem related to double integrals. 6. Solving problems of multi-variable functions.
Indicative Contents المحتويات الإرشادية	

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 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 للطالب محسوب لـ ١٥ اسبوعا			
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	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	15% (15)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	15% (15)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	----	--	--	--
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction – classification of Ordinary Differential Equations, Variable separable O.D.E, Homogenous O.D.E
Week 2	Exact O.D.E, Linear First order O.D.E, Bernoulli's O.D.E
Week 3	Solution of Homogenous Higher order D.E
Week 4	Solution of non-Homogenous Higher order D.E.
Week 5	Definition of Sequence and series, Convergence Tests for Infinite Series
Week 6	Maclaurin's Series, Taylor's Series.
Week 7	Polar coordinates and Parametric Equations
Week 8	Vectors in Space, Dot Product, Cross Product
Week 9	Vector Valued Functions
Week 10	Functions of Several Variable, Chain Rule, Constant Level Curves
Week 11	Gradient Vector, Extreme points, Lagrange Multipliers
Week 12	Double Integral in Cartesian and Polar Coordinates
Week 13	Application of Double Integral
Week 14	Line Integral, Integration of vector Field
Week 15	Relation between Line Integral and Double integral**, Green's Theorem**
Week 16	**Preparatory week before the final Exam**

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	CALCULUS, Thomas, twelfth edition	Yes
Recommended Texts		No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">Engineering Materials</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">S</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13023</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">3</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td>Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td colspan="2">2</td></tr>
<tr><td>Administering Department</td><td>ATU13</td><td>College</td><td colspan="3">TEC</td></tr>
<tr><td>Module Leader</td><td>Name: Dina Ali Abdulrazzaq</td><td>e-mail</td><td colspan="3">dinaaliabdalrazaq@gmail.com</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Ass. Lech.</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">MSc</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/06/2026</td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
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<table>
<tr><td colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td></td><td>Semester</td><td>2</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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<table>
<tr><td colspan="2">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td>This module presents the key underlying science and mathematical tools to predict material performance in-service to enable engineers to have an objective set of tools to make rational decisions on material selection. The module covers materials ranging from light alloys (i.e. aluminum alloys and titanium alloys) to steels (carbon, stainless, and advanced high strength steels). The course centers on the physical metallurgy of such engineering alloys to demonstrate the effect of alloying and its implications for the processing microstructure and performance of structural pipeline steels, large scale forgings and aerospace components in both airframe and aero-engine applications. Some parallels will also be drawn with the automotive industry, when discussing both steels and light alloys.</td></tr>
</table>

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Solving ordinary differential equations. 2. Converting functions to power series forms such us Taylor's series. 3. Using polar coordinates to solve problems. 4. Solving problems related to vector algebra. 5. Solving problem related to double integrals. 6. Solving problems of multi-variable functions.
Indicative Contents المحتويات الإرشادية	

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 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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	15% (15)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	15% (15)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	----	--	--	--
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction** -Introduction to ores, elements and materials -Iron ores -Periodic table of elements -Engineering materials.
Week 2	**Classification of engineering materials** - Metallic and non metallic - Ferrous and non-ferrous Natural and synthetic materials **Crystal structure** Atomic arrangement, BCC, FCC and HCP structures - Atomic packing factor.
Week 3	**Imperfections in crystals** - Point defects - Dislocations and grain boundaries Solidification of metals and alloys **Structure of ingots chilled** - Columnar and central equi-axed grains - Dendritic segregation.
Week 4	**Thermal equilibrium diagrams** - Solubility in the solid state - Phases

	Solid solutions, compounds and mechanical mixtures. **Lever rule** - Eutectic, Eutectoid and Peritectic reactions. **Applications on binary phase diagrams** -Components completely soluble, completely insoluble or partially soluble in the solid state.
Week 5	**Mechanical properties of metals** - Specifications and standards - Normal stress and shear stress - Strain Tensile and compression tests - Stress-strain diagram.
Week 6	- Hardness tests: Brinell, Rockwell and Vickers Impact tests: Izod and Charpy

Week 7	**Application on mechanical testing and properties** - Determination of Young's modulus - Yield stress - Proof stress - Ultimate tensile strength - Fracture stress, ductility Hardness and impact toughness
Week 8	**Iron and Steel** - Fe-Fe_3C phase diagram - Allotropy Microstructure of carbon steels - Effect of carbon content on microstructure & mechanical properties of carbon steel.
Week 9	**Carbon steel** - Types, Properties and uses of carbon steel Low, medium, and high carbon steel - Tool carbon steel.
Week 10	**Cast Iron** - Types, properties and uses of cast iron - White, grey, nodular and malleable cast iron
Week 11	**Non- destructive inspection** - Liquid penetrant - Magnetic particle - X-rays Ultrasonic. **Heat treatment of steel** - Non-equilibrium cooling - TTT diagrams
Week 12	- Annealing, normalizing, hardening and tempering of steel. **Alloy steel** - Role of alloying elements Types, properties and uses, stainless steel and high speed tool steel.
Week 13	**Aluminum and its alloys** - Classification Properties - Uses - - Aging and precipitation hardening Al-Si, Al-Mg and Al-Cu alloys.

Week 14	**Composite Materials** - Classification: metal matrix, ceramic matrix and polymer matrix composites Reinforcing phase: fibers, flakes, and particles.
Week 15	- Composites structure and volume fraction Properties and uses of composites.
Week 16	**Preparatory week before the final Exam**

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	CALCULUS, Thomas, twelfth edition	Yes
Recommended Texts		No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Physics**		**Module Delivery**		
Module Type	**Basic learning activities**		☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**		
Module Code	**ATU13023**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	ATU133		**College**	TEC	
Module Leader	Name: **Amenah Jowad Kadhim**		**e-mail**	aminajawad700@gmail.com	
Module Leader's Acad. Title	Ass. Lech.		**Module Leader's Qualification**	MSc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/6/2026		**Version Number**	1.0	
Relation with other Modules العلاقة مع المواد الدراسية الأخرى					
Prerequisite module	None		**Semester**		
Co-requisites module	None		**Semester**		
odule Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية					

Module Objectives أهداف المادة الدراسية	1. To develop basic understanding for the main engineering materials, principles. 2. To understand nature of matter, states, change between phases. 3. To build basic understanding of engineering mechanics (static, dynamics). 4. To build basic understanding of thermo and fluid mechanics (thermodynamics, fluid). 5. To build basic understanding of engineering optics. 6. To build basic understanding of waves.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Recognize construction of the materials, chemical and physical properties of material. 2. Ability to analyses the mechanical systems and determine resultant of force system. 3. Describe scientifically the thermal behave of different systems. 4. Discuss the fluid properties systems, pressure and forces. 5. Describe dynamic system, gyroscopic and friction. 6. Define ideal gas law. 7. Identify the basic optics principle and laws. 8. Discuss the optic and light systems. 9. Discuss the various properties of light and laser and fiber optics. 10. Explain waves laws used in physics. 11. Identify the speed of sound and transfer through media, Mach number .
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **1 Matter** Nature of matter: the chemical elements, structure of atoms, molecules; Chemical compounds. States: solid, liquid and gaseous; Changes between states. **2 Mechanics** 1 Statics Forces, moments and couples, representation as vectors; Centre of gravity; Elements of theory of stress, strain and elasticity: tension, compression, shear and torsion; Nature and properties of solid, fluid and gas; Pressure and buoyancy in liquids (barometers). 2 Kinetics Linear movement: uniform motion in a straight line, motion under constant acceleration (motion under gravity); Rotational movement: uniform circular motion (centrifugal/centripetal forces); Periodic motion: pendular movement; Simple theory of vibration, harmonics and resonance; Velocity ratio, mechanical advantage and efficiency. 2.3 Dynamics (a) Mass Force, inertia, work, power, energy (potential, kinetic and total energy), heat, efficiency; (b) Momentum, conservation of momentum;

	Impulse; Gyroscopic principles; Friction: nature and effects, coefficient of friction (rolling resistance) 2.2.4 Fluid dynamics (a) Specific gravity and density; (b) Viscosity, fluid resistance, effects of streamlining; Effects of compressibility on fluids; Static, dynamic and total pressure: Bernoulli's Theorem, venturi. **2.3 Thermodynamics** (a) Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; Heat definition. (b) Heat capacity, specific heat; Heat transfer: convection, radiation and conduction; Volumetric expansion; First and second law of thermodynamics; Gases: ideal gases laws; specific heat at constant volume and constant pressure, work done by expanding gas; Isothermal, adiabatic expansion and compression, engine cycles, constant volume & constant pressure, refrigerators & heat pumps; Latent heats of fusion and evaporation, thermal energy, heat of combustion. **2.4 Optics (Light)** Nature of light; speed of light; Laws of reflection and refraction: reflection at plane surfaces, reflection by spherical mirrors, refraction, lenses; Fibre optics. **2.5 Wave Motion and Sound** Wave motion: mechanical waves, sinusoidal wave motion, interference phenomena, standing waves; Sound: speed of sound, production of sound, intensity, pitch and quality, Doppler effect.

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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5

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	2	10% (10)	3,5,8,11,13 and 15	LO #2, #4, #7, #8 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #1, #5 and #9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6, #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 الاسبو يع النظري

	Material Covered
Week 1	Nature of matter: the chemical elements, structure of atoms, molecules; Chemical compounds. States: solid, liquid and gaseous; Changes between states.
Week 2	Statics Forces, moments and couples, representation as vectors; Centre of gravity.
Week 3	Elements of theory of stress, strain and elasticity: tension, compression, shear and torsion; Nature and properties of solid.
Week 4	fluid and gas; Pressure and buoyancy in liquids (barometers). Fluid dynamics (a) Specific gravity and density; (b) Viscosity, fluid resistance, effects of streamlining.
Week 5	Effects of compressibility on fluids; Static, dynamic and total pressure: Bernoulli's Theorem, venturi.
Week 6	Kinetics Linear movement: uniform motion in a straight line, motion under constant acceleration (motion under gravity); Rotational movement: uniform circular motion (centrifugal/centripetal forces); Periodic motion: pendular movement; Simple theory of vibration, harmonics and resonance; Velocity ratio, mechanical advantage and efficiency.
Week 7	Dynamics (a) Mass Force, inertia, work, power, energy (potential, kinetic and total energy), heat, efficiency; (b) Momentum, conservation of momentum; Impulse
Week 8	Gyroscopic principles; Friction: nature and effects, coefficient of friction (rolling resistance)
Week 9	Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; Heat definition. (b) Heat capacity, specific heat; Heat transfer: convection, radiation and conduction; Volumetric expansion; First and second law of thermodynamics;
Week 10	Gases: ideal gases laws; specific heat at constant volume and constant pressure, work done by expanding gas

Week 11	Isothermal, adiabatic expansion and compression, engine cycles, constant volume & constant pressure, refrigerators & heat pumps; Latent heats of fusion and evaporation, thermal energy, heat of combustion.
Week 12	Nature of light; speed of light; Laws of reflection and refraction: reflection at plane surfaces
Week 13	reflection by spherical mirrors, refraction, lenses; Fibre optics.
Week 14	Wave motion: mechanical waves, sinusoidal wave motion, interference phenomena, standing waves
Week 15	Sound: speed of sound, production of sound, intensity, pitch and quality, Doppler effect.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبو يع للمخت ب

	Material Covered
Week 1	Lab 1: Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: Thévenin's / Norton's Theorem and Kirchhoff's Laws
Week 3	Lab 3: First-Order Transient Responses
Week 4	Lab 4: Second-Order Transient Responses
Week 5	Lab 5: Frequency Response of RC Circuits
Week 6	Lab 6: Frequency Response of RLC Circuits
Week 7	Lab 7: Filters

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">Engineering Mechanics-Static</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">B</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☐ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13025</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">6</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">150</td></tr>
<tr><td>Module Level</td><td>1</td><td colspan="2">Semester of Delivery</td><td colspan="2">2</td></tr>
<tr><td>Administering Department</td><td>ATU13</td><td>College</td><td colspan="3">TEC</td></tr>
<tr><td>Module Leader</td><td>Name: Salwan Hasan Thabit</td><td>e-mail</td><td colspan="3">Salwan.h.thabit@Uruk.ed.iq</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Lech</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>-----</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td></td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/06/2023</td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="2">Mathematics</td><td colspan="2">Semester</td><td>1st</td></tr>
<tr><td>Co-requisites module</td><td colspan="2">-----</td><td colspan="2">Semester</td><td>-----</td></tr>
<tr><td colspan="6">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td colspan="5">The student can use the knowledge of Engineering Mechanics (Statics) for analyzing force systems (structures, machines, frames…etc.) , in order to became able to design components and finally the systems as a whole in the next years.
Mechanics is the steady of forces that set on bodies and the resultant motion that</td></tr>
</table>

	those bodies experience. With roots in physics and mathematics. Engineering Mechanics (including mechanics of solids and mechanics of fluid) is the basis of all mechanical sciences including but not limited to civil engineering, materials sciences and Metallurgical Engineering, Mechanical Engineering, Aeronautical and Aerospace Engineering, Petroleum Engineering, Geological Engineering, Mining Engineering, Chemical Engineering and Environmental Engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowing how to calculate rectangular components, moment, couple and resultant. 2. The student can apply equilibrium equations to find forces - and or - reaction that maintains the state of equilibrium to the structures. 3. Learning the ability to analyze truss structures, using method of joints and method of sections. 4. The student can calculate the forces in frames and machines.
Indicative Contents المحتويات الإرشادية	Indicative content includes the followings: 1. An introduction to the subject of static as a basic course that can be related to many other subjects in the next years [3hrs] 2. The different systems of units and the conversion to each other [6hrs] 3. Force and force systems, moment and couple, finally the resultant and the equivalent force-couple system [21hrs] 4. Drawing the free body diagram F.B.D. for single and multiple members [9hrs] 5. Equilibrium equations to 2- and 3- dimension systems [15hrs] 6. The method of joints and method of sections [18hrs] 7. The internal forces and reactions in the frames and the machines [18hrs]

Learning and Teaching Strategies استراتيجيات التعلم و التعليم	
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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
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	20% (20)	5 and 12	LO #1, #2 and #3, #4
	Assignments	2	10% (10)	4 and 11	LO #1, #2 and #3
	Projects / Lab.	-	-	-	-
	Report	1	10% (10)	14	LO #1, #2 and #3
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 and #2
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Basic Concepts, Scalars and Vectors, Units Conversion.
Week 2	Two-Dimensional Force Systems-Rectangular Components
Week 3	Two-Dimensional Force Systems-Moment and Couple
Week 4	Two-Dimensional Force Systems-Resultant
Week 5	Three-Dimensional Force systems-Rectangular Components
Week 6	Three-Dimensional Force Systems-Moment and Couple
Week 7	Mid-term Exam.
Week 8	Three-Dimensional Force Systems-Resultant
Week 9	Two-Dimensional Equilibrium, F.B.D. , Equilibrium Conditions …etc.
Week 10	Three-Dimensional Equilibrium, F.B.D. , Equilibrium Conditions …etc.
Week 11	Structures, Plane Trusses, Method Of Joints
Week 12	Structures, Plane Trusses, Method Of Sections
Week 13	Structures, Space Trusses
Week 14	Structures, Frames and Machines
Week 15	Review

Week 16	Preparatory week before the final Exam
Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: -
Week 2	Lab 2: -
Week 3	Lab 3: -
Week 4	Lab 4: -
Week 5	Lab 5: -
Week 6	Lab 6: -
Week 7	Lab 7: -

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	ENGINEERING MECHANICS – STATICS, MERIAM and KRAIGE, Sixth Edition	Yes
Recommended Texts	VECTOR MECHANICS FOR ENGINEER – STATICS, BEER and JOHNSON, Ninth Edition	Yes
Websites	https://www.youtube.com/@alaaaljassani6779/videos	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**Fundamentals of Electricity**		**Module Delivery**	
Module Type	**S**		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**ATU13026**			
ECTS Credits	**6**			
SWL (hr/sem)	**150**			
Module Level	1		**Semester of Delivery**	2
Administering Department	ATU13		**College**	TEC
Module Leader	Name: Ali Ahmed Hussen		**e-mail**	
Module Leader's Acad. Title	ASS. Prolecturer		**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 circuit theory through the application of techniques. 2. To understand voltage, current and power from a given circuit. 3. This course deals with the basic concept of electrical circuits. 4. This is the basic subject for all electrical and electronic circuits. 5. To understand Kirchhoff's current and voltage Laws problems. 6. To perform mesh and Nodal analysis.
Module Learning Outcomes مخرجات التعلم للمادة اسي	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Recognize how electricity works in electrical circuits. 2. List the various terms associated with electrical circuits. 3. Summarize what is meant by a basic electric circuit. 4. Discuss the reaction and involvement of atoms in electric circuits. 5. Describe electrical power, charge, and current. 6. Define Ohm's law. 7. Identify the basic circuit elements and their applications. 8. Discuss the operations of sinusoid and phasors in an electric circuit. 9. Discuss the various properties of resistors, capacitors, and inductors. 10. Explain the two Kirchoff's laws used in circuit analysis. 11. Identify the capacitor and inductor phasor relationship with respect to voltage and current.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A - Circuit Theory</u> DC circuits – Current and voltage definitions, Passive sign convention and circuit elements, Combining resistive elements in series and parallel. Kirchhoff's laws and Ohm's law. Anatomy of a circuit, Network reduction, Introduction to mesh and nodal analysis. [15 hrs] AC circuits I – Time dependent signals, average and RMS values. Capacitance and inductance, energy storage elements, simple AC steady-state sinusoidal analysis. [15 hrs] AC Circuits II - Phasor diagrams, definition of complex impedance, AC circuit analysis with complex numbers. [10 hrs] RL, RC and RLC circuits - Frequency response of RLC circuits, simple filter and band-pass circuits, resonance and Q-factor, use of Bode plots, use of differential equations and their solutions. Time response (natural and step responses). Introduction to second order circuits. [15 hrs]

<table>
<tr><td></td><td>Revision problem classes [6 hrs]

<u>Part B - Analogue Electronics</u>

Fundamentals
Resistive networks, voltage and current sources, Thevenin and Norton equivalent circuits, current and voltage division, input resistance, output resistance, coupling and decoupling capacitors, maximum power transfer, RMS and power dissipation, current limiting and over voltage protection. [15 hrs]

Components and active devices – Components vs elements and circuit modeling, real and ideal elements. Introduction to sensors and actuators, self-generating vs modulating type sensors, simple circuit interfacing. [7 hrs]

Diodes and Diode circuits – Diode characteristics and equations, ideal vs real. Signal conditioning, clamping and clipping, rectification and peak detection, photodiodes, LEDs, Zener diodes, voltage stabilization, voltage reference, power supplies. [15 hrs]</td></tr>
<tr><td colspan="2">Learning and Teaching Strategies
اس رتاتيجيات التعلم والتعليم</td></tr>
<tr><td>Strategies</td><td>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.</td></tr>
</table>

<table>
<tr><td colspan="4">Student Workload (SWL)
الحمل الدرا يس للطالب محسوب لـ ١٥ اسبوعا</td></tr>
<tr><td>Structured SWL (h/sem)
الحمل الدرا يس المنتظم للطالب خلال الفصل</td><td>78</td><td>Structured SWL (h/w)
الحمل الدرا يس المنتظم للطالب أسبوعيا</td><td>5</td></tr>
<tr><td>Unstructured SWL (h/sem)
الحمل الدرا يس غ رت المنتظم للطالب خلال الفصل</td><td>72</td><td>Unstructured SWL (h/w)
الحمل الدرا يس غ رت المنتظم للطالب أسبوعيا</td><td></td></tr>
<tr><td>Total SWL (h/sem)
الحمل الدرا يس الك يل للطالب خلال الفصل</td><td colspan="3">150</td></tr>
<tr><td colspan="4">Module Evaluation
تقييم المادة الدراسية</td></tr>
</table>

		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 الاسبو يع النظري

	Material Covered
Week 1	Introduction - Difference between Circuit Theory and Field Theory
Week 2	Basics of Network Elements
Week 3	Resistance and Resistivity, Ohm's Law and Inductance, Capacitance
Week 4	Review of Kirchhoff's Laws, Circuit Analysis - Nodal and Mesh
Week 5	Linearity and Superposition, Source Transformations, Thévenin and Norton Equivalents
Week 6	Review of Inductor and Capacitor as Circuit Elements, Source-free RL and RC Circuits, Transient Response
Week 7	Mid-term Exam + Unit-Step Forcing, Forced Response, the RLC Circuit
Week 8	Sinusoidal Forcing, Complex Forcing, Phasors, and Complex Impedance, Sinusoidal Steady State Response
Week 9	Nodal and Mesh Revisited, Average Power, RMS, Introduction to Polyphase Circuits
Week 10	Mutual Inductance, Linear and Ideal Transformers, Circuits with Mutual Inductance
Week 11	Frequency Response of Series/Parallel Resonances, High-Q Circuits
Week 12	Complex Frequency, s-Plane, Poles and Zeros, Response Function, Bode Plots
Week 13	Two Port Networks, Admittance, Impedance, Hybrid, and Transmittance Parameters
Week 14	Two Port Networks, Admittance, Impedance, Hybrid, and Transmittance Parameters
Week 15	Two Port Networks, Admittance, Impedance, Hybrid, and Transmittance Parameters
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبو يع للمخت ب

	Material Covered
Week 1	Lab 1: Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: Thévenin's / Norton's Theorem and Kirchhoff's Laws
Week 3	Lab 3: First-Order Transient Responses
Week 4	Lab 4: Second-Order Transient Responses
Week 5	Lab 5: Frequency Response of RC Circuits
Week 6	Lab 6: Frequency Response of RLC Circuits
Week 7	Lab 7: Filters

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Human Right and Democracy**	**Module Delivery**	
Module Type	S	☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**ATUU111**		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	1	**Semester of Delivery**	2
Administering Department	ATU13	**College**	TEC
Module Leader	Name: Widad	**e-mail**	
Module Leader's Acad. Title	Asist LECH.	**Module Leader's Qualification**	MSc.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	01/06/2026	**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	**Description:** The course in biophysics relates to the use of principles and fundamental physics concepts in the study of biological systems. 1. This course fosters the cultivation of fundamental thinking and methodologies that are essential to the development of an efficient interdisciplinary workforce. 2. The main emphasis of biophysics is on the quantitative analysis of the physical and chemical aspects of the functions of biological molecules, organisms, and

	entities. 3. The course bridges the physical and biological sciences. and highlights the various applications of the physical sciences to biology. 4. Make the students capable of designing industrial projects to solve problems of biological complexity and resolve various health and environmental issues.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. The student acquires knowledge and understanding of how to build biological models to understand complex biological phenomena. 2. Use simulations to understand and visualize particle trajectories. 3. Use their background in physics and biophysics to evaluate novel biophysical scenarios and create or improve experimental approaches for use in these settings. 4. Ability to effectively communicate content related to biophysics through the use of written reports as well as oral presentations. 5. Examine biophysical scenarios by having both a conceptual understanding of the fundamental concepts of biology, chemistry, and physics as well as by performing calculations applying the appropriate methods of mathematical, theoretical, and computational physics. 6. Applies knowledge in MATLAB training for symmetric random walks and vectorized operations. 7. Understand the basic principles and concepts of microscopy and optics when seeing molecules. 8. Perform and understand the interpretation of basic DNA structure and self-avoiding polymers, the role of applied confinement, and DNA sequencing methodologies 9. Understand the basic principles and concepts of the cytoskeleton and its dynamics. 10. Describe and understand a force in the biological world: the Brownian Ratchet 11. Learn how to measure small forces in the biological world with tweezers and atomic force microscopy
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the seminars, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive seminars involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	18	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	1.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

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**	1hr	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	**تعريف الحق** وعناصره مفهوم الشخصية القانونية
Weeks 2	مميزات الشخصية الانسانية نشأت مصطلح حقوق الانسان
Weeks 3	الحق بالحياة ، الحق بالكرامة وسلامة الشخصية الحقوق الشخصية
Week 4	الحق بالاقامة والتنقل ، الحق بالخصوصية الحق بالتكامل الجسدي ، الحق بالجنسية
Week 5	حماية من التجارب الطبية الحقوق الفكرية
Week 6	حرية الرأي ، حرية المعتقد حرية التعليم ، حرية الصحافة
Weeks 7	حرية الاجتماع والتظاهر ، حرية تكوين الاحزاب والجماعات السياسية الحقوق السياسية
Week 8	حق الانتخاب والترشيح ، حق التوظيف الحق بالمساواة ومظاهره

Week 9	الحقوق الاقتصادية الحقوق الاجتماعية
Week 10	الضمانات الدستورية لحماية حقوق الانسان الحق بالرعاية الصحية
Week 11	الضمانات الدستورية لحماية حقوق الانسان مبدأ الدستور المدون
Week 12	مبدأ الفصل بين السلطات مبدأ سيادة القانون
Week 13	الضمانات القانونية لحماية حقوق الانسان مبدأ لا جريمة ولا عقوبة الا بنص ، شخصية العقوبة
Week 14	مفهوم الديمقراطية صور الديمقراطية
Week 15	حقوق الطلاب ووجباتهم في تعليمات انضباط الطلبة العقوبات الانضباطية في تعليمات انضباط الطلبة
Week 16	Final exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		Yes
Recommended Texts	الدستور العراقي	No
Websites		

Second Year / third semester

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Fluid Mechanics -static</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">S</td><td colspan="3" rowspan="4">☒ Theory
☒ Lecture
☒ Lab
☒Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATU13031</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">5</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">125</td></tr>
<tr><td colspan="2">Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td>3</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU13</td><td>College</td><td colspan="2">TEC</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name: Mohammed Ajmi Mahan</td><td>e-mail</td><td colspan="2">mohamedalshamary43@gmail.com</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>ASS. Lech.</td><td colspan="2">Module Leader’s Qualification</td><td>MSc.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>1/6/2026</td><td>Version Number</td><td colspan="2">1.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="2"></td><td colspan="2">Semester</td><td>4</td></tr>
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Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The learning aims for the subject are the following: 1. Know, understand and apply the basic concepts of Fluid Mechanics to carry out professional engineering activities in the field of fluids. 2. Apply scientific method strategies to fluid mechanics: analyze qualitatively and quantitatively the problem situation, propose hypotheses and solutions. 3. Use specific vocabulary and terminology and the appropriate means to effectively communicate knowledge, procedures, results, skills and aspects inherent to fluid mechanics. 4. Work efficiently in a group, integrating skills and knowledge to make decisions in the performance of fluid mechanics tasks, adopting a responsible and organized attitude to work and a willingness to learn. 5. Plan and carry out designs and processes in the field of fluid mechanics in accordance with the relevant specific technology, applying the quality principles and methods and analyzing and assessing the social and environmental impact of the technical solutions adopted.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	13. Define what is a fluid 14. Describe the fundamental fluid properties 15. Understand pressure 16. Find the forces on submerged planar objects of arbitrary shapes 17. Find the forces on submerged objects of curved shapes 18. Solve buoyancy problems
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Fluid properties Introduction - General definitions, Fluid types, definition of Fluid Power System, Types of Fluid Power System, [3 hrs] Fluid properties (part A)

	General definitions, Measures of Fluid Mass and Weight: Density, Specific Weight, Specific Gravity. Ideal Gas Law, Viscosity, Kinematic viscosity, Bulk Modulus of elasticity, Surface tension, Surface Tension and capillary effect. [14 hrs] Fluid properties (part B) Compressibility of Fluids, Vapor Pressure [3hrs] Part B - Fluid Statics - Definitions, Pressure at a point, Variation of Pressure in a static fluid, Basic quations for the Pressure Field. [3 hrs] Part C - Hydrostatic Forces and stability Hydrostatic Condition, Standard Atmosphere, Manometry and Pressure Measurements. Hydrostatic Force on a Plane Surface, Hydrostatic Force on a Curved Surface, Buoyant force, Example Problems, Stability of floating and submerged bodies, Relative equilibrium, Fluid in rigid-body motion, (Linear acceleration) - Relative equilibrium (uniform rotation) [37 hrs]
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 للطالب محسوب لـ ١٥ اسبوعا			
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)	62	**Unstructured SWL (h/w)**	3

الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15%	2 to 12	LO #1, #2 and #10, #11
	Assignments	1	5%	5 and 14	LO #3, #4 and #6, #7
	Projects / Lab.	4	10%	Continuous	All
	Report	1	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	Introduction - General definitions, Fluid types, definition of Fluid Power System, Types of Fluid Power System,
Week 2	Fluid properties (part A) - General definitions • Measures of Fluid Mass and Weight: Density • -Specific Weight • -Specific Gravity

Week 3	Ideal Gas Law, Viscosity
Week 4	Kinematic viscosity, Bulk Modulus of elasticity, Surface tension
Week 5	Surface Tension and capillary effect
Week 6	Fluid properties (part B) - -Compressibility of Fluids - -Vapor Pressure
Week 7	Fluid Statics - Definitions - Pressure at a point - Variation of Pressure in a static fluid - - Basic Equations for the Pressure Field
Week 8	Hydrostatic Condition, Standard Atmosphere, Manometry and Pressure Measurements
Week 9	Hydrostatic Force on a Plane Surface . Example Problems
Week 10	Hydrostatic Force on a Curved Surface . Example Problems
Week 11	Buoyant force . Example Problems
Week 12	Stability of floating and submerged bodies - Relative equilibrium
Week 13	Fluid in rigid-body motion . Example Problems

Week 14	Special case 1: fluid at rest Special case 2: free fall of a fluid body
Week 15	(Linear acceleration) - Relative equilibrium (uniform rotation)

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Fluid density using the pycnometer
Week 2	Lab 2: Liquid viscosity measurement using capillary type viscometer
Week 3	Lab 3: Pressure gauge, Bourdon gauge, manometer.
Week 4	Lab 4: Center of Pressure on Submerged Plane Surface
Week 5	Lab 5: Hydrostatics Force on Flat Surfaces/Curved Surfaces
Week 6	Lab 6: Stability of Floating Body

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	F L U I D M E C H A N I C S F U N D A M E N Ta L S A N D A P P L I C At I O N S, Yunus A. Çengel And John M.Cimbala, Published By Mcgraw-Hill, 2006	Yes
Recommended Texts	Fundamentals of Fluid Mechanics, 7th Edition, Bruce R. Munson. Theodore H. Okiishi. Alric P. Rothmayer John Wiley & Sons, Inc.l, 2013	No
Websites	https://www.coursera.org/lecture/fe-exam/fluid-statics-introduction-and-pressure-variation-a8cwc	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Fundamentals of Electronics**		**Module Delivery**		
Module Type	Support or related learning activity		☐ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☒ Practical ☐ Seminar		
Module Code	**ATU13032**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	2		**Semester of Delivery**	3	
Administering Department	ATU13		**College**	TEC	
Module Leader	**Name: Ali Ahmad Hussen**		**e-mail**		
Module Leader's Acad. Title	**Ass. Prof**		**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	**01/06/2026**		**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	This course has two main aims or Objectives: 1. To master the use of modern electronic equipment like DMMs, Oscilloscopes, function generators and programmable power supplies. 2. Gain confidence in describing the basic components of electronic circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The students will be familiar with using the benchtop power supply Rigol DP832, and Fluke 87V digital multimeter. Then they will construct simple electrical circuits and develop a good understanding of how to read resistance values using different methods. 2. The students will learn how to test diodes and transistors using your Fluke 87V DMM. In addition, you will construct a simple transistor switch circuit to power ON an LED. 3. The students will learn how to test capacitors, some of their usage in electronics, and how to use an oscilloscope to measure various quantities related to capacitor circuits. 4. The students will be taught the soldering techniques to be able to construct any circuit by soldering the electronic components on a board. 5. They will learn about how to use diodes as rectifiers and the role of capacitors as filters. Then students will be taught the theoretical background of filter circuits and consolidate that with hands-on experiments. 6. The students will learn how to design a simple low power constant voltage supply using diodes, capacitors, and Zener's
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Fundamentals • DC circuits – Current and voltage definitions, Passive sign convention and circuit elements, Combining resistive elements in series and parallel. Kirchhoff's laws and Ohm's law. Basic analog and digital circuits and theory of operation are covered. The labs allow the students to master the use of electronic instruments. The labs also reinforce the concepts discussed in class with a hands-on approach and allow the students to gain significant experience with electrical instruments such as function generators, digital multimeters, oscilloscopes, logic analyzers and power supplies [30 hrs] • Soldering techniques, Time dependent signals, average and RMS values. Capacitance and inductance, energy storage elements, their transient response as well as the steady state response. [20 hrs] RC circuits – Display the Frequency response of RC circuits on Oscilloscope, explaining and practicing Low pass filter and High pass filter as an example of RC circuit in the lab.

	Part B - Analogue Electronics While the band-pass circuits will be asked as assignment by students , use of Bode plots, Introduction to second order circuits. [25 hrs] Non-linear Devices like Transistors, Diodes and Diode circuits – Diode characteristics and equations, ideal vs real. Signal conditioning, clamping and clipping, rectification and peak detection, photodiodes, LEDs, Zener diodes, voltage stabilization, voltage reference, power supplies. [15 hrs]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the practical part involvement, to solidify what have been taught through. while at the same time refining and expanding their critical thinking skills. This will be achieved through lectures, labs and interactive questionings and by considering types of relevant experiments which motivates the predicable sense. Also, there will be other different learning strategy like think pair share will be exploited as well.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
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	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		
Module Evaluation تقييم المادة الدراسية			

As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10%	Continuous	All
	Assignments	1	5%		
	Projects / Lab.	4	15%	13	LO #8 and #13
	Report	2	10%	12	LO # 14
Summative assessment	Midterm Exam	2hr	10% (10)	16	LO #8 and #13
	Final Exam	3hr	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Demonstrating the necessity and importance of the precaution procedures of the Safety in the Lab.
Week 2	Introduction to the electrical basic concepts, System units, common Acronyms, EE symbols and RMS voltage.
Week 3	Introduction to Lab Instruments and Electronic components (resistors, capacitors, inductors, LEDs, diodes, bipolar junction transistors, MOSFETs, optical isolators, op amps)
Week 4	Evaluating of the Resistance and Resistivity by the Resistor color code method and comparing their values with the measured ones by DMM.
Week 5	Use of multimeters (DMM) and oscilloscopes Construction and debugging of simple electronic circuits on bread broad
Week 6	Demonstrating Soldering techniques and showing differences of Solder types , the proper way of cleaning the tips , how to choose and set the appropriate temperatures .
Week 7	Review of Inductor and Capacitor as Circuit Elements, Source-free RL and RC Circuits, Transient Response as well as Steady state response then an Introduction to second order circuits
Week 8	1st mini project for example building a simple power supply

Week 9	Introduction to the Non-linear Devices (Diodes and BJTs).
Week 10	Illustrating the Diode Circuits measures and taking half and full bridge rectifier as an application
Week 11	Showing other types of diodes like LED, Zener as a regulated power supply design
Week 12	RC circuits – showing the effect of Frequency response of RC circuits and how to determine the cut off frequency also how to utilize the Oscilloscope to display, Designing Low pass filter and High pass filter, and how to apply Sweep signal by Function generator. utilizing of Bode plots for frequency response.
Week 13	2 nd mini project passive filter design (Band pass filter)
Week 14	Mid-term exam.
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: The precaution procedures of the Safety and an Introduction to Electronics instruments Lab.
Week 2	Lab 2: DMM and Function Generators and Oscilloscopes I
Week 3	Lab 3: Function Generators and Oscilloscopes II
Week 4	Lab 4: Resistors and construction of a simple circuit on Proto bread
Week 5	Lab 5: Types of soldering irons, Soldering stations
Week 6	Lab 6: Building up a simple circuit by soldering.
Week 7	Lab 7: Capacitor circuits and Inductor circuits
Week 8	Lab 8: 1 st Mini Project
Week 9	Lab 9: Diodes and BJTs
Week 10	Lab 10: Half and Full bridge rectifier
Week 11	Lab 11: Zener Voltage Regulator

Week 12	Lab 12: Frequency response of Passive filters with oscilloscope and Bode plots
Week 13	Lab 13: The second mini project passive filter design
Week 14	Lab 14: Mid-term exam
Week 15	Lab 15: Preparatory week before the final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Electronic Devices (conventional current version) , Thomas .L Floyd 2008	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents	Yes
Websites	Hands-On Introduction to Electrical Engineering Lab Skills | Electrical Engineering and Computer Science | MIT Open Courseware	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">Theory of flight</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Core learning activity</td><td colspan="2" rowspan="5">☒ Theory
☒ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13033</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">6</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">150</td></tr>
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<tr><td>Administering Department</td><td>ATU13</td><td>College</td><td>TEC</td></tr>
<tr><td>Module Leader</td><td>Name: Ali Yasir Hasan</td><td>e-mail</td><td>aliyasir1961@gmail.com</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>lecture</td><td>Module Leader's Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td>1.0</td></tr>
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العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td colspan="4">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
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Module Objectives أهداف المادة الدراسية	Theory of Flight is about how aircraft fly and the related theoretical background which is the inevitable consequence of flight:
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	-To give the basic concepts of aeronautical engineering -To solve the problems of the basic aerodynamic forces and moments -To give basic information about aerodynamic, aircraft engines and aircraft performance
Indicative Contents المحتويات الإرشادية	**COURSE POLOCIES:** 1. Attendance is expected at all classes. 2. Make-up examinations or quizzes will be given only for documented medical reasons, emergency circumstances, or University sponsored activities. Advance notice must be given well in advance for absence due to University sponsored activities. 3. Homework is assigned periodically in class and is due **at the beginning of class** on the day specified. Homework assignments will also appear on the web (Angel). 4. Late homework will not be accepted. 5. Homework will be done on an individual basis. You may check your results with others in the course, but the work done to solve the problems must be your own. 6. Short quizzes may be given periodically. Normally these quizzes will be announced. 7. Exams and quizzes will be closed book and closed notes. A one-page formula sheet (no worked problems) and use of a calculator is allowed. 8. You are advised to bring your calculator to class every day and you are responsible to make sure that it functions properly. Bring an extra set of batteries, or an extra calculator if necessary. 9. Engineers must adhere to a rigorous code of professional ethics. Unethical conduct in this class will result in the maximum disciplinary action permitted by the university. Unethical conduct in the class includes, but is not limited to, cheating on exams (this includes storing formulae and problem solutions within the memory of your calculator), and supplying information to others (students bear responsibility for ensuring the security of their examination papers). 10. Re-grading requests for exams must be submitted in writing within one week of the return of the exam outlining the specific concerns/questions. The entire exam may be re-graded, resulting in an increase or decrease in the final grade.
Learning and Teaching Strategies	

استراتيجيات التعلم والتعليم	
Strategies	In a theory of flight course, there are various learning and teaching strategies that can be employed to enhance student understanding and engagement. Here are some effective strategies commonly used : 1- Lectures: Lectures are a traditional teaching method were instructors present information to students. It allows for the delivery of foundational knowledge and theoretical concepts. To make lectures more interactive, instructors can incorporate multimedia presentations, demonstrations, and real-world examples. 2- Hands-on Projects and Experiments: Hands-on projects and experiments provide students with practical experience and promote active learning. These can include designing and building prototypes, conducting experiments in laboratories, or working on real-world case studies. Such activities help students develop problem-solving skills, enhance their understanding of theoretical concepts, and foster creativity. 3- Computer Simulator and Modeling: Computer simulations and modeling allow students to explore complex engineering systems and phenomena in a virtual environment. By using software tools, students can analyze and predict the behavior of aircraft during fly. 4- Group Discussions and Debates: Group discussions and debates provide an opportunity for students to share their perspectives, ask questions, and engage in critical analysis. This strategy encourages active participation, improves communication skills, and fosters a deeper understanding of concepts through peer interaction. 5- Industry Visits and Guest Speakers: Inviting industry professionals as guest speakers or arranging visits to manufacturing plants, research facilities, or engineering companies provides students with real-world exposure. They can learn about industry trends, gain insights into practical applications, and understand the relevance of their studies to the professional world.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem)	72	**Unstructured SWL (h/w)**	6

الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
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**	4	20% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	1	5% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	5% (10)	Continuous	All
	Report	2	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	**Standard atmosphere (ISA)** - What is the atmosphere - What is the atmosphere layers - Physical properties of gases in atmosphere
Week 2	Definition of airplane -types of airplanes -components of airplane

Week 3	Aerodynamic forces and moments on aircraft - The airplane as a rigid body - Airplane axis system - Forces and moments
Week 4	NACA -Interpretation of the NACA code -4-digit -5-digit -Lift coefficient vs angle of attack diagram
Week 5	**Lift force** - Introduction - Change of lift coefficient with the angle of attack - Lift calculation
Week 6	**Drag force Estimation** - Drag - Drag estimation at low speeds - Drag estimation at high speeds
Week 7	Types of drag - Parasite drag - Induced drag - Wave drag
Week 8	Thrust force and Weight -engines classification -thrust calculation

Week 9	**Stalling** - Wing stall - Control of wing stall - High lift equipment in airplane
Week 10	Take off performance
Week 11	Climb performance
Week 12	Stead level flight performance
Week 13	Descent performance
Week 14	Landing performance
Week 15	**Rotary aircraft**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Introduction to flight 7th edition	No(online only)
Recommended Texts	Principles of helicopter aerodynamics by J Gordon Leishman (z-lib.org)	No(online only)
Websites	-https://www.nasa.gov/ Www. NACAtools.com	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Thermodynamic - Steam			Module Delivery	
Module Type	S			☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	ATU13034				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	2		Semester of Delivery	3	
Administering Department	ATU13		College	TEC	
Module Leader	Name: **Yasin Khdear Salman**		e-mail	yksalman06@yahoo.com	
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.	
Module Tutor			e-mail		
Peer Reviewer Name	Name		e-mail	E-mail	
Scientific Committee Approval Date	01/06/2026		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	1. The course provides the student with knowledge about:

أهداف المادة الدراسية	2. Conservation laws for mass and energy (including the 1st law of Thermodynamics). 3. Forms of energy such as work (power) and heat, internal energy and enthalpy. 4. Entropy and the 2nd law of thermodynamics. 5. Reasons for thermodynamic losses in the form of irreversibilities. 6. The quality of different forms of energy measured as the ability to produce work. 7. Destruction of energy quality in processes. 8. Steam cycles 9. Operation of steam and gasbased power stations, internal combustion engines, heat pumps. – 10. The main components of heat & power processes, such as steam and gas turbines, compressors, pumps, fans, heat exchangers and valves. 11. The ability of fluids to change phase (solid, liquid and gas). 12. **Skills**: The course should enable the student to: 13. Estimate thermodynamic properties for systems by the use of tables and graphical diagrams. 14. Calculate efficiencies for power producing and power consuming processes. 15. Describe thermodynamic processes in graphical diagrams such as pv, Tv og Ts. 16. **General competence**: The course should give the student: 17. Basic competence that constitutes central elements in other courses focusing on energy systems and industrial processes. 18. Understanding of systems and the capability to evaluate the efficiency of processes w. r. t. energy and exergy (energy quality). 19. Overview of processes for power production, heating (heat pumps)
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. On completion of the course, students will have basic knowledge on energy, thermodynamic system and thermodynamic parameters, thermodynamic equilibrium, work and heat as methods of energy transport between systems 2. A student will have skills concerning basic laws of physics relating to thermodynamics and the laws of thermodynamics for closed and open systems. 3. A student will have a fundamental knowledge of the ideal gas equation, polytropic processes and characteristic processes. 4. A student will have the skills to utilize the procedures for energy balancing and methods of energy transport between systems. 5. A student will be able to utilize mathematical tools to solve problems related to the principles of thermodynamics. A student can interpret the obtained results. 6. A student will have the skills to computations in the field of typical issues of heating of a system by work transfer or by heat transfer 7. A student will have learning skills to utilize the ideal gas equation

	8. A student will be able to present graphs of thermodynamic processes 9. A student will be aware of the method of generating energy and the operation of energy devices (heat engines, etc.) on the natural environment. 10. A student will be able to work in a team during measurements and to analyses the results; a student will be aware of the importance of knowledge concerning the principles of teamwork
Indicative Contents المحتويات الإرشادية	1. Basic terms and definitions: energy, thermodynamic system, properties, state and thermodynamic equilibrium. Units. The zeroth law of thermodynamics. 2. Microscopic forms of energy. The basic axiom of thermodynamics. Work and heat, moving boundary work. The first law of thermodynamics for closed systems. 3. Specific heat, enthalpy, ideal gas equation of state, characteristic thermodynamic processes. 4. The first law of thermodynamics for open systems (control volume). The concept of entropy, causes of entropy change, reversible and irreversible processes, entropy as a function of the state. 5. The second law of thermodynamics. Examples of thermodynamic cycles: gas power cycles, refrigeration and heat pump cycles. 6. Phases of a pure substance, saturated liquid, saturated liquid-vapor mixture, critical parameters, triple point, property diagrams for phase-change processes, properties of gas and two-phase mixtures.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 للطالب محسوب لـ ١٥ اسبوعا			
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)	37	**Unstructured SWL (h/w)**	2

الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	15% (15)	5 and 10	LO #1, #2 and #10, #11
	Assignments	1	5% (5)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	2	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	- **pure substance**, Definitions, Phases of a Pure Substance, Phase-Change Processes of Pure Substances, Compressed Liquid and Saturated Liquid, Saturated Vapor and Superheated Vapor, Saturation Temperature and Saturation Pressure, Some Consequences of T_{sat} and P_{sat} Dependence. -Property Diagrams for Phase-Change Processes, The *T-v* Diagram, The *P-v* Diagram, Extending the Diagrams to Include the Solid Phase, The *P-T* Diagram, The *P-v-T* Surface
Week 2	-**Property Tables**, Enthalpy—A Combination Property, Saturated Liquid and Saturated Vapor States, Saturated Liquid–vapor Mixture, -Illustrative example.
Week 3	- **Property Tables** Superheated Vapor, Compressed Liquid, Reference State and Reference Values, - Illustrative example.
Week 4	**Steam reversible non-flow processes** -Constant volume process. -Constant pressure process. -Isothermal process.

	-Illustrative example.
Week 5	-Isentropic process. -Polytropic processes. -Illustrative example.
Week 6	**- ENERGY ANALYSIS OF CLOSED SYSTEMS** - Energy Balance for Closed Systems - Specific Heats, Internal Energy, Enthalpy, and Specific Heats of Solids and Liquids, Internal Energy Changes, Enthalpy Changes
Week 7	**Unsteady steam flow energy equation** -Derivation, applications. -Illustrative example
Week 8	**Application of steady state energy equation for steam** - Boiler - Condenser - Compressor - Turbine - Diffuser and nozzle. - Illustrative example
Week 9	**Entropy**, A Special Case: Internally Reversible Isothermal Heat Transfer Processes, The Increase of Entropy Principle, Some Remarks about Entropy,
Week 10	Entropy Change of Pure Substances Isentropic Processes, Property Diagrams Involving Entropy, Entropy and Entropy Generation in Daily Life, The *T ds* Relations, Entropy Change of Liquids and Solids
Week 11	**Steam cycles** -Carnot cycle. -Ideal Rankine cycle. -Illustrative example. -The effect of steam conditions on thermal efficiency and steam specific consumption. -Overall efficiency.
Week 12	- How Can We Increase the Efficiency of the Rankine Cycle? - Lowering the Condenser Pressure (*Lowers* $T_{\text{low,avg}}$) - Superheating the Steam to High Temperatures (*Increases* $T_{\text{high,avg}}$) - Increasing the Boiler Pressure (*Increases* $T_{\text{high,avg}}$) -Rankine cycle with superheat. -Illustrative example -Rankine cycle with reheat. -Illustrative example.
Week 13	- Regenerative Rankine cycle with open-feed water heaters. - Illustrative example. - Regenerative Rankine cycle with closed-feed water heaters. - Illustrative example - Binary Vapor Cycle
Week 14	**Gas-vapor mixtures.** -Specific and relative humidity of air. - Dalton's Law and Gibbs-Dalton Law - Volumetric Analysis of a Gas Mixture -Dew point temperature.

	-Illustrative example. -Adiabatic saturation and wet-bulb temperature. -Illustrative example. -Psychometric chart. -Illustrative example.
Week 15	**Psychrometric Processes** - Mixing of air streams - Sensible heating - Sensible cooling. - Cooling and dehumidification - Cooling and humidification - Heating and dehumidification - Heating and humidification
Week 16	**Preparatory week before the Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Steam process plotting
Week 2	Determination of Dryness Fraction of Steam: 1) Tank or bucket calorimeter
Week 3	2) Throttling calorimeter
Week 4	3) Separating and throttling calorimeter
Week 5	Measurement of Specific Heat
Week 6	
Week 7	Exp. 4

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

Module Description Form

نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**Manufacturing Process**	**Module Delivery**
Module Type	**Support (S)**	☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☐ Seminar
Module Code	**ATU13035**	
ECTS Credits	4	
SWL (hr/sem)	**100**	

Module Level	2	**Semester of Delivery**	3
Administering Department	ATU13	**College**	ETC
Module Leader	Name: **Abbas Ahmed Ayoob**	**e-mail**	dr.abbas.alasady@gmail.com
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	01/06/2026	**Version Number**	1.0

Relation with other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	To identify, discuss, and analyze the following manufacturing processes: 1. Sheet Metal operations. 2. Metal melting operations.

	3. Traditional Machining operations. 4. Non-Traditional operations. 5. Welding operations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of the course, the students will be able to: 1. Examine the design drawing of a component and describe a feasible sequence of manufacturing processes for production of the component. 2. Distinguish between different types of casting and differentiate between their output product characteristics. 3. Describe, in engineering sketch form, the bulk deformation processes of forging, rolling, extrusion, and drawing. 4. Characterize the major machining operations of turning, milling, and drilling via description of cutting tools used and basic components of the machine tools. 5. Relate the common mechanisms of cutting tool wear to desirable cutting tool material properties. 6. State the advantages and physical description of the nontraditional material removal processes of waterjet machining, electric discharge machining, and chemical machining.
Indicative Contents المحتويات الإرشادية	**The indicative contents of this subject are:** **Part (A) Manufacturing Concept:** Overview of Manufacturing Processes and Economic Reasonability. **(2 hrs)** **Part (B) Sheet Metal Operations:** Bending and drawing dies and processes. **(2 hrs)** **Part (C) Sheet Metal Operations:** Deep drawing dies and process, Rolling process. **(2 hrs)** **Part (D) Sheet Metal Operations:** Blanking and Piercing dies and process, Extrusion dies and process. **(2 hrs)** **Part (E) Sheet Metal Operations:** Forging dies and operation, Metal forming morphology. **(2 hrs)** **Part (F) Melting material operation concept**: Casting: Sand Casting; Die casting; Other casting methods. **(4 hrs)** **Part (G) Material removal processes:** Metal cutting theories, Coolant fluids, milling process, turning process, drilling process, grinding process. **(4 hrs)** **Part (H) Joining processes:** Welding operations: Curved bead welding, T-Welding, Spot welding, Acetylene Welding, Laser welding, FSW Welding. **(6 hrs)** **Part (J) Non-Traditional Machines:**

	CNC Machine, EDM Machine, ECM Machine, Plasma Machine, Thermal coating machines. **(6 hrs)**

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The strategy of the manufacturing processes subject is to prepare students to understand different manufacturing processes like Casting, Welding, Forging, Sheet metal working, and removal operations. It also helps them to understand the advancement of Technology in manufacturing. Educating in the area of manufacturing students will enable them to seek employment in engineering upon graduation while, at the same time, providing a firm foundation for the pursuit of graduate studies in engineering.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	15% (10)	0	
	Assignments	2	5% (10)	0	
	Projects / Lab.	2	10% (10)	4 to 8	
	Report	2	10% (10)	10	
Summative assessment	**Midterm Exam**	2hr	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	Manufacturing Concept.
Week 2	Sheet Metal Operations: Bending and Drawing Operation.
Week 3	Sheet Metal Operations: Deep drawing, Rolling.
Week 4	Sheet Metal Operations: Extrusion, Blanking and Piercing.
Week 5	Sheet Metal Operations: Forging, Forming morphology.
Week 6	Melting material operation concept: Sand casting operation.
Week 7	Mid Exam.
Week 8	Melting material operation concept: Die casting operation, other casting processes.
Week 9	Material removal processes: Theories of material cutting, milling.
Week 10	Material removal processes: Grinding, turning, cooling fluids..
Week 11	Joining processes: Spot welding, Acetylene Welding.
Week 12	Joining processes: Laser welding, FSW Welding.
Week 13	Non-Traditional Machines: CNC Machines, EDM Machine.
Week 14	Non-Traditional Machines: ECM Machine, Plasma Machine, Thermal coating Machine.
Week 15	Final Exam.

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Modern Manufacturing_ Materials, Processes, and Systems (Mikell P. Groover)	Yes
Recommended Texts	Tool Engineering and Design (G.R.Nagpal)	Yes
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Fundamentals of Engineering Mechanics-Dynamics</td><td colspan="3">Modlivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Support learning activity</td><td colspan="3" rowspan="4">☒ Theory
☒ Lecture
☒ Tutorial
☐ Lab
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATU13036</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">100</td></tr>
<tr><td colspan="2">Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td>3</td></tr>
<tr><td colspan="2">Administering Department</td><td>Type Dept. Code</td><td>College</td><td colspan="2">TEC</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name: Salwan Hasan Thabit</td><td>e-mail</td><td colspan="2">Salwan.h.thabit@Uruk.ed.iq</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Lech.</td><td colspan="2">Module Leader’s Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Assaad Alsahlani, Ph. D</td><td>e-mail</td><td colspan="2">alsahlan@msu.edu</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="2">1.0</td></tr>
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<tr><td colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td></td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course in vector dynamics is designed to teach solution techniques for rigid body kinematics. Conservation of momentum and energy are employed to analyze two- and three-dimensional problems. The use of vectors and free body diagrams for the analysis of dynamic mechanical systems is stressed. Analytical Thinking: This course will train you to analyze and solve problems systematically. This will be a major effort for many of you, so prepare to spend a lot of time on developing the skills every engineer is expected to have.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the course, the student should be able to do the following: 1- Create mathematical models of dynamic systems (point mass and rigid bodies) 2- Analyze the kinematics of point mass and rigid body systems. 3- Determine the motion of point mass and rigid body systems in space and time. 4- Resolve the motion of single particles in multiple coordinate systems, 5- Demonstrate the motion of multiple particles in constrained motion, 6- Use the equations of motion to compute the position, velocity, and acceleration of 7- multiple points on rigid bodies in constrained motion, 8- Apply the basic concepts of force, mass and acceleration; of work and energy; and of impulse and momentum for particles and rigid bodies. 9- Apply the knowledge and tools of dynamics to solve engineering problems, and 10- Explain your knowledge to peers through hand-written problem sets, verbalization, and writing.
Indicative Contents المحتويات الإرشادية	All course materials presented in class will also be posted on our Department website. The majority of the material will be organized by topic in the Modules and the links to lectures from a previous semester and the current semester (if available) are available on the Home page.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Conceptual Visualization: Use visual aids, diagrams, animations, and real-life examples to help students understand and visualize dynamic concepts such as motion, forces, and moments. This can assist in bridging the gap between theory and practical applications.

	2- Problem-solving Approach: Focus on problem-solving exercises and provide students with a variety of practice problems. Encourage them to actively engage in solving dynamics problems, applying concepts, and analyzing the solutions. This approach helps develop critical thinking and problem-solving skills. 3- Interactive Demonstrations: Conduct interactive demonstrations or experiments to illustrate key principles and phenomena in dynamics. These demonstrations can be conducted in the classroom or through virtual simulations to provide students with a hands-on understanding of dynamic concepts. 4- Use of Technology: Leverage technology tools and software packages to aid in dynamic analysis and visualization. Utilize simulation software, computational tools, and computer-aided design (CAD) software to demonstrate dynamic behaviors, analyze systems, and solve complex engineering problems.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20% (10)	Bi-weekly	Every other lecture
	Assignments	2	5% (10)	Every week	Concludes the taken

	Projects / Lab.	2	5% (10)	7-10	
	Report	2	10% (10)	13	LO #10, #11 and #12
Summative assessment	**Midterm Exam**	2hr	10% (20)	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 1-3	**Curvilinear motion** x-y coordinates Normal – tangential coordinates Polar – coordinates
Week 4	**Relative motion** Motion relative to a frame in translation
Week 5-7	**Kinetics of particles** Newton's 2nd law Rectilinear motion Curvilinear motion
Week 8-9	**Work and energy of particles** **(Midterm Exam)** Work of a force
Week 10-11	**Work and energy** Kinetic energy of a particle Potential energy
Week 13-15	**Introduction to Impulse and momentum of particles** Impulsive motion

	Angular momentum of a particle
Week 16	**(Final Exam review session) & Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	ENGINEERING MECHANICS, DYNAMICS by R. C. HIBBELER	Yes
Recommended Texts	ENGINEERING MECHANICS, DYNAMICS by J. L. MERIAM	No
Websites		

جرائم حزب البعث البائد المحضور

المحتويات

ا

Second Year /fourth semester

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**Fluid Mechanics -Dynamic**	**Module Delivery**
Module Type	S	☒ Theory ☒ Lecture ☒ Lab ☒Tutorial ☐ Practical ☐ Seminar
Module Code	**ATU13041**	
ECTS Credits	5	
SWL (hr/sem)	**125**	

Module Level	2	**Semester of Delivery**	4
Administering Department		**College**	**Type College Code**
Module Leader	**Name: Mohammed Ajmi Mahan**	**e-mail**	mohamedalshamary43@gmail.com
Module Leader's Acad. Title		**Module Leader's Qualification**	Ph.D.
Module Tutor	**Name (if available)**	**e-mail**	**E-mail**
Peer Reviewer Name		**e-mail**	**E-mail**
Scientific Committee Approval Date	1/6/2026	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Objectives أهداف المادة الدراسية	The learning aims for the subject are the following: 1. Know, understand and apply the basic concepts of Fluid Mechanics to carry out professional engineering activities in the field of fluids. 2. Apply scientific method strategies to fluid mechanics: analyze qualitatively and quantitatively the problem situation, propose hypotheses and solutions. 3. Use specific vocabulary and terminology and the appropriate means to effectively communicate knowledge, procedures, results, skills and aspects inherent to fluid mechanics. 4. Work efficiently in a group, integrating skills and knowledge to make decisions in the performance of fluid mechanics tasks, adopting a responsible and organized attitude to work and a willingness to learn. 5. Plan and carry out designs and processes in the field of fluid mechanics in accordance with the relevant specific technology, applying the quality principles and methods and analyzing and assessing the social and environmental impact of the technical solutions adopted.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Ability to understand Fluid flow concepts and use basic equations such as conservation of mass principle to calculate flow rates through control volumes 2. Ability to calculate accelerations and associated pressure variations in moving fluids using Euler’s and Bernoulli’s equations. 3. Ability to analyze momentum fluxes through a control volume and calculate forces in moving fluids. 4. Ability to apply conservation laws for mass, momentum and mechanical energy in combination to control volumes in ideal fluids and hence calculate hydraulic and energy grade lines. 5. Ability to calculate local and overall skin friction drag in laminar and turbulent flat plate boundary layers using approximate empirical formula. 6. Ability to solve hydraulic pipe flow problems using Moody's diagram for skin friction to calculate flow rate/ pressure loss / pipe diameter. 7. Ability to use dimensional analysis and similarity considerations in the design and interpretation of scale model experiments.		
Indicative Contents	Indicative content includes the following.		

المحتويات الإرشادية	<u>Part A - Fluid flow concepts and Basic Equations</u> Definitions, Continuity equation, Conservation of energy, Euler's equation of motion along streamline, Bernoulli equation, Steady-state energy equation, Liner momentum equation and its Application: Open system (fixed and moving blades) [9 hrs] <u>Flow Measurement</u> Pitot tube, orifice meter, Venturi meter, nozzle [3 hrs] <u>Part – B:</u> Resistance to flow in open and closed conduits [3 hrs] <u>Part – C: Flow and losses in pipes</u> laminar and turbulent flow, losses in pipes, Liner momentum equation and its Application, Closed system (bend pipes). [15hrs] <u>Part – D: pumps and Turbines</u> Introduction to pumps and Turbines[3hrs] <u>Part – E: Dimensional analysis and Dynamic similitude</u> Dimensional analysis (the π-theorem) Dimensional analysis (the π-theorem), Dimensionless parameters (Reynolds no., Froude no.), Dimensionless parameters, (Euler no., Weber no., Mach no.), Similitude (model studies) [12 hrs]
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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	**10**	15% (15)	2 to 12	LO #1, #2 and #10, #11
	Assignments	**2**	5 % (10)	5 and 14	LO #3, #4 and #6, #7
	Projects / Lab.	**3**	10% (10)	Continuous	All
	Report	**2**	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	Fluid flow concepts and Basic Equations

	- Definitions - Continuity equation,
Week 2	Conservation of energy - Euler's equation of motion along streamline - Bernoulli equation - Steady-state energy equation
Week 3	Flow Measurement -Pitot tube - orifice meter - Venturi meter - nozzle
Week 4	Resistance to flow in open and closed conduits
Week 5	Flow in pipes (laminar flow)
Week 6	Flow in pipes (Turbulent flow)
Week 7	Losses in pipes (major losses)
Week 8	Losses in pipes (minor losses) (Moody chart)
Week 9	Linear momentum equation and its Application: - Open system (fixed and moving blades)
Week 10	Linear momentum equation and its Application

	- Closed system (bend pipes)
Week 11	Introduction to pumps and Turbines Application - Types of pumps and Turbines and application.
Week 12	Dimensional analysis and Dynamic similitude - Dimensional analysis (the π-theorem)
Week 13	Dimensional analysis and Dynamic similitude - Dimensionless parameters (Reynolds no., Froude no.)
Week 14	Dimensional analysis and Dynamic similitude - Dimensionless parameters (Euler no., Weber no., Mach no.)
Week 15	Dimensional analysis and Dynamic similitude - Similitude (model studies)

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	fluid volume flow rate.
Week 2	Measuring the velocity of the fluid, the pitot tube, the measurement of the venturi and the nozzle.
Week 3	Jet water effect.
Week 4	Critical Reynolds number in pipe flow.
Week 5	External laminar flow over submerged objects.

Week 6	Visualization of laminar and turbulent flow, smoke tunnel.
Week 7	Air foil analysis, push and lift, ventilation duct.
Week 8	Calculation of boundary layers, pressure distribution, ventilation duct.
Week 9	Head losses in the pipes.
Week 10	Pump performance measurement.
Week 11	Pneumatic system elements, pressure control valves, directional control valves.
Week 12	Single- and double-cylinder direct drive
Week 13	Hydraulic system components, hydraulic pumps, hydraulic motors.
Week 14	Operation of hydraulic motors and speed control.
Week 15	Double cylinder operation using directional control valve.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Requed Texts	F L U I D M E C H A N I C S F U N D A M E N T A L S A N D A P P L I C At I O N S, Yunus A. Çengel And John M. Cimbala, Published By Mcgraw-Hill, 2006	Yes
Recommended Texts	Fundamentals of Fluid Mechanics, 7th Edition, Bruce R. Munson. Theodore H. Okiishi. Alric P. Rothmayer John Wiley & Sons, Inc.l, 2013	No
Websites	https://ocw.mit.edu/courses/2-06-fluid-dynamics-spring-2013/pages/syllabus/	

Module Description Form

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**Computer Programming (2)**		**Module Delivery**	
Module Type	Support (S)		☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**ATU222**			
ECTS Credits	3			
SWL (hr/sem)	**75**			
Module Level	2		**Semester of Delivery**	4
Administering Department			**College**	
Module Leader	Name: **Ahmed Haeder Ismaeel**		**e-mail**	
Module Leader's Acad. Title	Ass. Lech		**Module Leader's Qualification**	MSC.
Module Tutor			**e-mail**	
Peer Reviewer Name			**e-mail**	
Scientific Committee Approval Date	01/06/2026		**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To present a brief and influential concept for the Computer-Aided Engineering (CAE) technique and Finite Element method as a vital tool in this technique. 2. To study the significant fields of analysis and the controlling of employing tools available in SOLIDWORKS simulation. 3. Enabling the students to discover the meshing technique and discretization quality. 4. Grants the student a simple and suitable way to predict the optimal interpretation of outcomes. 5. Enable the student to validate the outputs of hand solutions and results of an experimental field if available. 6. Enabling a flexible use of CFD analysis by different and uncomplicated tools compared to other programs.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Increase the skill of users in the analysis of solid and fluid mediums. 2. Employ the valid route to mesh technique in SOLIDWORKS simulation. 3. Highlight the various issues of applying the parameters and specifying the accurate values of responses simulated. 4. Create a crucial path of prediction and comparison between experimental and numerical outcomes. 5. Understand the vital role of FE-Simulation to enable the student to comprehend the solution in the domain as governing equations. 6. Showing how to apply the boundary conditions according to FEM even approach the valid case.
Indicative Contents المحتويات الإرشادية	**The indicative contents of this subject are:** **Part (A) CAE Introduction:** CAE Fundamentals, Application of FEM, Simulation process phases, Basic steps of SOLIDWORK Simulation, Limitations of SOLIDWORK, and Interfacing. **(2 hrs)** **Part (B) A Brief description of FE-Theories:** Engineering problems, Physical properties, Parameters input, Solution methods. **(2 hrs)** **Part (C) SOLIDWORK Simulation-Truss and Beam Cases:** Structural details, Modeling strategies, Truss element behavior, Beam element behavior, Problem cases of truss and beam, and Implementation and outlines. **(2 hrs)** **Part (D) SOLIDWORK Simulation-Torsional Loaded Case:** Technical requirements, Modeling strategies, Shaft element behavior, Problem cases of shaft, and Implementation and outlines. **(2 hrs)** **Part (E) SOLIDWORK Simulation- A Brief Meshing Guide:**

	Discretization technique based on FEM, Mesh control with plane elements, Mesh control with three-dimensional elements, Discretization with H-Type and P-Type, Summary. **(2 hrs)** **Part (F) SOLIDWORK Simulation- Thermal Analysis**: The Brief fundamentals of heat transfer, Types of thermal loads, Setup of thermal solutions, and Simulation and interpretations. **(2 hrs)** **Part (G) SOLIDWORK Flow Simulation-Principles:** The Naiver-Stokes Equations for Laminar and Turbulent Fluid Flows, Constitutive Laws and Thermophysical Properties, Conjugate Heat Transfer, a brief view of radiation heat transfer between two bodies, and Other Calculation Options **(12 hrs)** **Part (H) SOLIDWORK Simulation- Analyses of Axisymmetric Bodies:** Characteristics of shell and axisymmetric plane elements, Modeling strategies, Axisymmetric limitations and advantages, and Stages of Axisymmetric case. **(2 hrs)** **Part (I) SOLIDWORK Simulation-Analysis of Components with Solid Elements:** Overview of components that deserve to be analyzed with solid elements, Structural details, Model simplification strategies, and Characteristics of solid elements. **(4 hrs)**

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The analysis of airplane components is considered one of the significant motivations for aeronautical engineers. Besides, the multiple simulation programs contribute to achieving these objectives. Hence, the SOLIDWORKS program is a multifunction program representing the Computer Integrated for the Design/Analysis/Control/Manufacturing. Furthermore, this program has simple tools for the users. Accordingly, the prominent strategy followed here is to complete the learning cycle for the aeronautical engineers to create an integrated loop of CAD/CAE by using this program among course semester terms for CAD Drawing and CAE Principles. Finally, this strategy avoids the dispersion from using other programs and gives more skills to the students.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 11	
	Assignments	1	5% (5)	6 and 12	
	Projects / Lab.	4	15% (15)	Continues	
	Report	1	10% (10)	6	
Summative assessment	Midterm Exam	2hr	10% (10)	7	
	Final Exam	3hr	50% (25)	15	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	

Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	
Week 16	Final Exam.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	

Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Practical Finite Element Simulations with SOLIDWORKS 2022, "2022 Packt Publishing".	Yes
	Akin, J. E.. Finite Element Analysis Concepts: Via SolidWorks. Hong Kong: World Scientific, 2010.	No
Recommended Texts	Moaveni, Saeed. Finite Element Analysis: Theory and Application with ANSYS, Global Edition. United Kingdom: Pearson Education, 2015.	Yes
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="5">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Engineering Mechanics-Applied of Dynamics</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Support learning activity</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☒ Tutorial
☐ Lab
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATU13043</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">6</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">150</td></tr>
<tr><td>Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td>4</td></tr>
<tr><td>Administering Department</td><td>Type Dept. Code</td><td>College</td><td colspan="2">Type College Code</td></tr>
<tr><td>Module Leader</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Professor</td><td colspan="2">Module Leader’s Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Assaad Alsahlani, Ph. D</td><td>e-mail</td><td colspan="2">alsahlan@msu.edu</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/02/2024</td><td>Version Number</td><td colspan="2">1.0</td></tr>
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<table>
<tr><td colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td></td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td></td><td>Semester</td><td></td></tr>
<tr><td colspan="4">Module Aims, Learning Outcomes and Indicative Contents</td></tr>
</table>

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course in vector dynamics is designed to teach solution techniques for rigid body kinematics. Conservation of momentum and energy are employed to analyze two- and three-dimensional problems. The use of vectors and free body diagrams for the analysis of dynamic mechanical systems is stressed. Analytical Thinking: This course will train you to analyze and solve problems systematically. This will be a major effort for many of you, so prepare to spend a lot of time on developing the skills every engineer is expected to have.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the course, the student should be able to do the following: 11- Create mathematical models of dynamic systems (point mass and rigid bodies) 12- Analyze the kinematics of point mass and rigid body systems. 13- Determine the motion of point mass and rigid body systems in space and time. 14- Resolve the motion of single particles in multiple coordinate systems, 15- Demonstrate the motion of multiple particles in constrained motion, 16- Use the equations of motion to compute the position, velocity, and acceleration of 17- multiple points on rigid bodies in constrained motion, 18- Apply the basic concepts of force, mass and acceleration; of work and energy; and of impulse and momentum for particles and rigid bodies. 19- Apply the knowledge and tools of dynamics to solve engineering problems, and 20- Explain your knowledge to peers through hand-written problem sets, verbalization, and writing.
Indicative Contents المحتويات الإرشادية	All course materials presented in class will also be posted on our Department website. The majority of the material will be organized by topic in the Modules and the links to lectures from a previous semester and the current semester (if available) are available on the Home page.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	5- Conceptual Visualization: Use visual aids, diagrams, animations, and real-life examples to help students understand and visualize dynamic concepts such as motion, forces, and moments. This can assist in bridging the gap between theory and practical applications. 6- Problem-solving Approach: Focus on problem-solving exercises and provide students with a variety of practice problems. Encourage them to actively engage in solving dynamics problems, applying concepts, and analyzing the

	solutions. This approach helps develop critical thinking and problem-solving skills. 7- Interactive Demonstrations: Conduct interactive demonstrations or experiments to illustrate key principles and phenomena in dynamics. These demonstrations can be conducted in the classroom or through virtual simulations to provide students with a hands-on understanding of dynamic concepts. 8- Use of Technology: Leverage technology tools and software packages to aid in dynamic analysis and visualization. Utilize simulation software, computational tools, and computer-aided design (CAD) software to demonstrate dynamic behaviors, analyze systems, and solve complex engineering problems.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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**	4	20% (20)	Bi-weekly	Every other lecture
	Assignments	1	5% (5)	Every week	Concludes the taken
	Projects / Lab.	1	5% (5)		
	Report	1	10% (10)	13	LO #10, #11 and #12
	Midterm Exam	2hr	10% (20)	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

	Material Covered
Week 1-2	**Impulse and momentum of particles** Impulsive motion Angular momentum of a particle
Week 3-4	**Conservation of liner momentum** liner impact
Week 4-6	**Conservation of momentum** Conservation of angular momentum Impact Impulse and momentum of particles
Week 6-7	**Angular momentum** Rate of changed of angular momentum Conservation of angular momentum
Week 8	**Kinematics of rigid bodies** **(Midterm Exam)** Translation of rigid bodies Rotation of rigid bodies
Week 9	**Absolute motion**
Week 10	**Moment of inertia** Mass moment of inertia
Week 11	**Force/mass/acceleration** Force/mass/acceleration for rigid bodies
Week 12-13	**Work and energy**

	Work for rigid bodies Energy for rigid bodies
Week 14-15	**Impulse and momentum** Impulse for rigid bodies Momentum for rigid bodies
Week 16	**(Final Exam review session) & Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Strength of Materials**			**Module Delivery**	
Module Type	Support learning activities			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13044**				
ECTS Credits	5				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**		4
Administering Department	ATU13		**College**	Type College Code	
Module Leader	Name: **Abbas Ahmed Ayoob**		**e-mail**	dr.abbas.alasady@gmail.com	
Module Leader's Acad. Title	Lecturer		**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	01/6/2026		**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	In this course, the student will be able to understand the basic meaning of different types of engineering stresses and strains. The student will learn the equations and formulas necessary to analyze the stresses in engineering structures and also will be able to draw the shear force diagram and bending moment diagrams which can make the student more familiar with engineering problems. Moreover, the student will be able to draw the stress-strain diagram for both the ductile and brittle materials and define the various regions of the curve.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	19. Learn the different types of engineering stresses 20. Recognize the various types of engineering strains. 21. Deal with thermal stress problems. 22. Using the superposition method and saint venant equations to solve stress problems. 23. Define the mechanical properties of ductile and brittle materials. 24. Analyze the loads on engineering structures by drawing the shear force and bending moment diagrams 25. Discuss the symmetrical and unsymmetrical bending moment. 26. Draw the mohr circle for compound stresses.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Stresses and strains Engineering stresses and strains, Poisson ratio , Hook law, tensile test for materials. [20 hrs] Part B – thermal stresses, superposition method and saint venant method (20hrs) Part C- Mechanical Properties of materials (20hrs). Part C- Shear force diagram and bending moment diagram [20 hrs] Part D- symmetrical and unsymmetrical bending moments [20hrs] Part E-Pressure vessels [8 hrs]
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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #3, #4 and #9, #10
	Assignments	1	5% (5)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	3	15% (15)	Continuous	All
	Report	1	10% (10)	13	All
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 1-2	Stress and Strain -Study and analysis of simple stress and simple strain

Week 3	Material Behavior-Study the behavior of material under load (tensile test)
Week 4	Hooke's Law To know where the Hooke's law apply
Week 5	Thermal Strain and Stress Study the strain and stress induced due to temperature changes -Solve statically indeterminate problems due to temperature changes
Week 6	Pressure Vessels-Stresses in pressure vessels
Week7	Torsion of Circular Shaft Study the pure torsion for solid and hollow circular shafts-Study the stress induced due to torsion -Study the angular deformation induced due to torsion
Week 8	Mid-term Exam
Week 9-10	Beams: Shear force and Bending Moment-Introduction to beams and loading typesand the resulted shear and moment
Week 11-12	Mohr's Circle-Graphical representation of stress at a point using Mohr's circle -Systematic procedure of graphical representation of stresses at a point using Mohr's circle
Week 13-14	Symmetrical and unsymmetrical bending moments,
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1-2	Tension Test
Week 3-4	Compression Test
Week 5-6	Hardness Test
Week 6-7	Impact Test

Week 8-9	Bending Test
Week 10-11	Heat Treatment
Week 12-13	Torsion Test
Week 14-15	Fatigue Test

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Mechanics of Materials R.C Hibbler	Yes
Recommended Texts	Mechanics of Materials E J Hearn	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">Algebraic and math. equations and Programming MATLAB</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Basic learning activities</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13045</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td colspan="2">Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td>4</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU13</td><td>College</td><td colspan="2">TEC</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name: Dina Ali Abdulrazzaq</td><td>e-mail</td><td colspan="2">dinaaliabdalrazaq@gmail.com</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td></td><td colspan="2">Module Leader’s Qualification</td><td></td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>1/6/2026</td><td>Version Number</td><td colspan="2"></td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="3"></td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td colspan="3"></td><td>Semester</td><td></td></tr>
<tr><td colspan="6">Module Aims, Learning Outcomes and Indicative Contents</td></tr>
</table>

<table>
<tr><th colspan="2">أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td>Module Objectives

أهداف المادة الدراسية</td><td>1. The basic language of algebraic expression
2. recognize technical terms and appreciate some of the uses of algebra
3. collect like terms and simplify expressions term by term
4. multiply out brackets and simplify some formulas</td></tr>
<tr><td>Module Learning Outcomes

مخرجات التعلم للمادة الدراسية</td><td>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.

1. Simplify or manipulate expressions involving polynomial, radical, rational, exponential, or logarithmic terms using appropriate properties and rule

2. Solving of linear equations and inequalities

3. The basic language of graphing

4. The addition, subtraction, multiplication and division of vectors

5. The several methods of factoring

6. Solving rational equations

7. Systems of equations

8. Radical expressions and equations.

9. Solving quadratic equations.</td></tr>
<tr><td>Indicative Contents

المحتويات الإرشادية</td><td>Indicative content includes the following.

<u>Part A – Vectors:</u>

-Vector in Space, Parallel Vectors, Triple Product

- Volume of Box {Projection of Two Vectors, Applications}

- Equation of Line in Space, Equation of Plane in space, Applications

- Vector Valued Functions, Curvature, Motion of Particle [20 hrs],

<u>Part B - Matrices</u>

- Elementary Operations with matrices and Vectors, Determinants and Properties, Transpose and inverse of matrices

-Solution of non- linear equations, Application of non- linear equations, - Rank of a matrix, Linear transformation, Orthogonal transformation, Eigen values, Eigen vectors [25 hrs]

<u>Part C – I Complex Numbers</u></td></tr>
</table>

	- Introduction to complex numbers, **Mathematical Operations for Complex Numbers**, Argrand diagrams and product quotients [10hrs] Part D – **Solution of simultaneously linear equations:** **-**Definition of equations, Methods of solution, -**Direct methods**, Matrix inversion, Gauss Elimination, Gauss -Jordan Elimination, **Indirect methods**, Jacob's method, Gauss- Seidle method, **Applications** [20 hrs].

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 للطالب محسوب لـ ١٥ اسبوعا

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	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

تقييم المادة الدراسية

	Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome

Formative assessment	**Quizzes**	2	10% (15)	5,10 and 14	LO #1, #2 and #4, LO LO #5, #6 and #9
	Assignments	1	10% (5)	2 and 13	LO #3, #4 and #6, #7
	Projects / Lab.	4	10% (10)	0	0
	Report	1	10% (10)	0	0
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+العملي (مختبر حاسبات)

	Material Covered
Week 1	**Introduction to programming using (Matlab)** - Introduction to (Matlab) - Menu bar , tool bar, and program windows
Week 2	**Variables** - Variable Names - Examples on variable names - Show the results - Examples on (+ , - , * , /) - Outputs - Intermediate results during calculations
Week 3	**Built-in-functions** - Trigonometric Functions (sin , cos , tan , sec) - Elementary Functions (abs, log10 , log, exp, sqrt)
Week 4	**Functions** - polyarea (X,Y) - polygon - Standard Deviation - abs function - (max) - (min) - (mean)

Week 5	**Logical commands** - Logical Operations > greater than >= greater than or equal < less than <= less than or equal **= = equal** = ~ not equal - Logical commands or (|), and (&)
Week 6	**loops** - for - while - Program control - Example - Problems
Week 7	**loops** - for - while - Program control - Example - Problems
Week 8	**loops** - for - while - Program control - Example - Problems
Week 9	**- Matrix construction** - Extracting Bits of a matrix - Dot product of matrices - Tabulating Functions - Matrix-Vector product - Matrix-Matrix product
Week 10	**Matrix construction** - Extracting Bits of a matrix - Dot product of matrices - Tabulating Functions - Matrix-Vector product - Matrix-Matrix product
Week 11	**Matrix construction** - Extracting Bits of a matrix - Dot product of matrices - Tabulating Functions

	- Matrix-Vector product - Matrix-Matrix product
Week 12	**Plotting by Matlab** - plotting a matrix (Plot) - subplot(m,n,p) - Two dimensional plot - Three dimensional plot - Examples and Problems
Week 13	**Plotting by Matlab** - plotting a matrix (Plot) - subplot(m,n,p) - Two dimensional plot - Three dimensional plot - Examples and Problems
Week 14	**Plotting by Matlab** - plotting a matrix (Plot) - subplot(m,n,p) - Two dimensional plot - Three dimensional plot - Examples and Problems
Week 15	**Applications** - Examples - problems
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Thomas Calculus Early Transcendentals Single Variable 13th	Yes
Recommended Texts	Engineering Mathematics - 5th Edition [K A Stroud].	No
Websites	https://www.khanacademy.org/math/calculus-1. https://www.mathsisfun.com/	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	اللغة العربية (2)	**Module Delivery**	
Module Type	S	☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☒ Seminar	
Module Code	ATU220		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	2	**Semester of Delivery**	4
Administering Department	ATU12	**College**	PMTE
Module Leader	Name: Areeg	**e-mail**	I
Module Leader's Acad. Title	Ass. Lech.	**Module Leader's Qualification**	MSc.
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	

<table>
<tr><td>أهداف المادة الدراسية</td><td>.1تمكين الطلبة من التكلم باللغة العربية الفصيحة.
.2تمكين الطلبة من القراءة بصورة صحيحة من خلال تشكيل المفردات.
.3تمكين الطلبة من الحصول على المعرفة اللازمة للتراث العربي من النثر والشعر والمدونات الأخرى.
.4تمكين الطلبة من القابلية على النطق السليم.
.5تمكين الطلبة من إستعمال مصطلحات اللغة العربية وفق اختصاصاتهم.
.6تمكين الطلبة من الكتابة بلغة سليمة خالية من الأخطاء الإملائية.</td></tr>
<tr><td>Module Learning Outcomes

مخرجات التعلم للمادة الدراسية</td><td>ب- الأهداف المعرفية:
أ1.معرفة وفهم القواعد اللغوية والنحوية ومخارج نطق الكلمات في اللغة العربية.
أ2. معرفة وفهم أساليب التعبير اللغوي والأدبي الشائعة في اللغة العربية وتحليل نصوصها.
أ3. معرفة أشهر الأدباء والمفكرين وعلماء اللغة القدماء والمعاصرين في تراث اللغة العربية وفهم أهم نتاجهم الأدبي والفكري.
أ4. معرفة وفهم أهم اساليب وطرق التدريس الحديثة بالإضافة الى اهم وسائل التقييم والتقويم والاختبارات اللغوية المستخدمة في تقييم وتدريس اللغة العربية
ب- الأهداف المهارية الخاصة بالبرنامج
ب 1- يتدرب الطلاب على المهارات اللغوية الأساسية .
ب2- تدريب الطلاب على تطوير مهاراتهم في التحدث والاستماع ليكونوا قادرين على أن يتعاملوا مع المواقف
ب 3 - تقديم مهارات واستراتيجيات القراءة للطلاب تمرينهم عليها كميكانيكية القراءة، وتقنيات القراءة ومهارات استخدام المفردات .
ب4 - تنمية قدرات الطلاب على مهارات الكتابة في كتابة البحوث والتقارير مثل الاستلال من الحقائق .</td></tr>
<tr><td>Indicative Contents

المحتويات الإرشادية</td><td>تدرس اللغة العربية على عدة مستويات :
5- المستوى النحوي: وهو المستوى الذي من خلاله يمكن معرفة المعنى التركيبي للنص.
6- المستوى الصرفي وهو المستوى الذي يمكن من خلالة معرفة المعنى المتفرع على المعنى المعجمي،
7- المستوى الدلالي: وهو المستوى الذي من خلاله يمكن معرفة دلالة الألفاظ (الجذر).
8- المستوى الصوتى: وهو المستوى الذي يدرس الحروف والحركات والمقاطع الصوتية سواء كانت لفظا أو جزءا من لفظ.</td></tr>
<tr><td colspan="2">Learning and Teaching Strategies

استراتيجيات التعلم والتعليم</td></tr>
<tr><td>Strategies</td><td>2- 1- التعليم من خلال تجزئة مفردات اللغة العربية وتصنيفها بلحاظ موضوعاتها؛ لتمكين الطالب من التمييز بينها</td></tr>
</table>

	2- التعليم من خلال النمط سواء كان النمط المرئي) اللفظي (او النمط الحسي) الحركي، لبيان لبيان الدلالات اللفظية والدلالات السياقية. 3- التعليم باستخدام الدروس المصغرة حيث يتم تقسيم المنهج العلمي الى افكار رئيسية ومن ثم تعليمها الى الطالب بشكل محاضرات متتالية وكل محاضرة تتناول فكرة واحدة فقط. 4- التعلم التعاوني/ حيث يتم اعطاء واجبات تقسم على الطلبة الى مجموعات صغيرة ويتم طرح مسألة معينة لهم واتاحة الفرصة للطلبة من اجل حل هذه المسألة بالتعاون مع بعضهم البعض.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	18	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

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)		

0 Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	علامات الإعراب
Week 2	الجملة الاسمية (المبتدأ والخبر)
Week 3	الجملة الاسمية (المبتدأ والخبر)
Week 4	الجملة الفعلية
Week 5	الهمزة وقواعد كتابتها
Week 6	الضاد والظاء
Week 7	امتحان نصف الفصل
Week 8	علامات الترقيم
Week 9	العدد والنعت العددي (الدرس الأول)
Week 10	العدد والنعت العددي (الدرس الثاني)
Week 11	نص من القرآن الكريم
Week 12	نص من الشعر القديم
Week 13	نص من الشعر الحديث
Week 14	نص نثري (من خطب نهج البلاغة)
Week 15	طريقة الكشف في المعجمات العربية
Week 16	امتحان نهاية الفصل

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		
	(اللغة العربية العامة لأقسام غير الإختصاص) ,تأليف عبد القادر حسن أمين وآخرين. (العربية الجامعية لغير المتخصصي), تأليف عبده الراجحي. (النحو الواضح في قواعد اللغة العربية), تأليف علي الجارم ومصطفى أمين. وكتب أخرى تعنى بتيسير اللغة العربية لغير المختصين ...	**Available in the Library?**
Required Texts		Yes
Recommended Texts	Skills in writing and Learning English	Yes
Websites	https://www.bbc.co.uk/learningenglish/	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">English for Academic U. (2)</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">S</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☒ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU221</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">2</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">50</td></tr>
<tr><td colspan="2">Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td>4</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU13</td><td>College</td><td colspan="2">TEC</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name: Areeg</td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Ass. Lech.</td><td colspan="2">Module Leader’s Qualification</td><td>MSc</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="2">1.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="3">None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td colspan="3">None</td><td>Semester</td><td></td></tr>
<tr><td colspan="6">ing Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
</table>

Module Objectives أهداف المادة الدراسية	1-The aim of this course is to provide English learners with integrated language skills such as reading, listening and writing resulting in a level of basic language knowledge. 2-This course will focus on grammar rules, basic word knowledge and usage, reading comprehension, reading out of the lesson, and Paragraph writing. 3- A student may be able to listen to native speakers and speak English Language. 4- A student may be able to write and have creativity in his writing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Uses expressions of Quantity in elementary level of English. 2- Constructs sentences in Present Perfect Tense, Simple Future Tense and Going to Future Tense both in an oral and written task. 3- Defines basic Modals and employ them in elementary level of communication and writing skills. 4- Translates sentences in elementary level from English to another language. 5- Interprets the texts written in elementary level of English.
Indicative Contents المحتويات الإرشادية	**Language** is a rule-governed behavior. It is defined as the comprehension and/or use of a spoken (i.e., listening and speaking), written (i.e., reading and writing), and/or **other communication symbol system** (e.g., American Sign Language). **Spoken and written language** are composed of receptive (i.e., listening and reading) and expressive (i.e., speaking and writing) components. Spoken language, written language, and their associated components (i.e., receptive and expressive) are each a synergistic system comprised of individual language domains (i.e., phonology, morphology, syntax, semantics, pragmatics) that form a dynamic integrative whole **Phonology** study of the speech sound (i.e., phoneme) system of a language, including the rules for combining and using phonemes. **Morphology** study of the rules that govern how morphemes, the minimal meaningful units of language, are used in a language. **Syntax** the rules that pertain to the ways in which words can be combined to form sentences in a language. **Semantics** the meaning of words and combinations of words in a language.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Uses the available material to increase his efficiency. 2- Constructs sentences in Present Perfect Tense, Simple Future Tense and Going to Future Tense both in an oral and written task.

	3-Defines basic Modals and employ them in elementary level of communication and writing skills. 4- Develop and enhance students' language skills to communicate in English properly. 5- Interprets the texts written in elementary level of English.

Student Workload (SWL)

الحمل الدرا يس للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدرا يس المنتظم للطالب خلال الفصل	18	**Structured SWL (h/w)** الحمل الدرا يس المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدرا يس غ رت المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدرا يس غ رت المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدرا يس الك يل للطالب خلال الفصل	**50**		

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 الاسبو يع النظري

	Material Covered
Week 1	Able to identify linking Ideas: Present and Past Irregular Plurals, Consonants, There was/were
Week 2	Identify countable and Uncountable Nouns, Imperatives Healthy Living and
Week 3	Able to identify can for ability Could and Couldn't Skills at work
Week 4	Able to identify can for requests Adjectives and Adverbs
Week 5	Able to identify describing People, Present Continuous and Adjectives

Week 6	Demonstrates knowledge about question for, 'information, prepositions: (at, in, on, to)
Week 7	Mid-term Exam
Week 8	Able to identify (Have to don't have to Housework, home, school & work obligations)
Week 9	Demonstrates knowledge about Offering and Inviting Why..? Would you like to...? Let's...? Free time activities
Week 10	Able to identify (Be going to + infinitive for plans)
Week 11	Able to identify (Be going to weak forms: Maybe/perhaps)
Week 12	Able to identify {Past Simple have to)
Week 13	Demonstrates knowledge about Transport, Prepositions of movement Address
Week 14	Demonstrates knowledge about (Writing Activities)
Week 15	Writing short essay
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبرات

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

earning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Headway book for learning English	Yes
Recommended Texts	Skills in writing and Learning English	Yes
Websites	https://www.bbc.co.uk/learningenglish/	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Applied of Thermodynamics- Ideal gas</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">S</td><td colspan="3" rowspan="4">☒ Theory
☒ Lecture
☒ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATU13046</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">100</td></tr>
<tr><td colspan="2">Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td>4</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU13</td><td>College</td><td colspan="2"></td></tr>
<tr><td>Module Leader</td><td colspan="2">Name: Yasin Khdear Salman</td><td>e-mail</td><td colspan="2">yksalman06@yahoo.com</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Professor</td><td colspan="2">Module Leader’s Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Basemah</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="2">1.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td colspan="2">Prerequisite module</td><td colspan="2">None</td><td>Semester</td><td></td></tr>
<tr><td colspan="2">Co-requisites module</td><td colspan="2">None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The course provides the student with knowledge about: 20. Entropy and the 2nd law of thermodynamics. 21. Different **GAS POWER CYCLES** such as Carnot, Otto, Diesel and Brayton. The course gives the student insight about 22. The quality of different forms of energy measured as the ability to produce work. 23. Destruction of energy quality in processes. 24. Ideal gas model, its assumptions, applications and limitations. 25. 26. Operation of gas based power stations, internal combustion engines, heat pumps. 27. The main components of heat & power processes, such as gas turbines compressors, pumps, fans, heat exchangers and valves. 28. Operation of **Refrigeration cycles** 29. Operation of **Air Refrigeration System** 30. **Skills**: The course should enable the student to: a. Estimate thermodynamic properties for systems by the use of tables and graphical diagrams. b. Calculate efficiencies for power producing and power consuming processes. c. Describe thermodynamic processes in graphical diagrams such as pv, Tv og Ts.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	11. On completion of the course, students will have basic knowledge on energy, thermodynamic system and thermodynamic parameters, thermodynamic equilibrium, work and heat as methods of energy transport between systems 12. A student will have skills concerning basic laws of physics relating to thermodynamics and the laws of thermodynamics for closed and open systems. 13. A student will have a fundamental knowledge of the ideal gas equation, polytropic processes and characteristic processes. 14. A student will have the skills to utilize the procedures for energy balancing and methods of energy transport between systems. 15. A student will be able to utilize mathematical tools to solve problems related to the principles of thermodynamics. A student can interpret the obtained results. 16. A student will have the skills to computations in the field of typical issues of heating of a system by work transfer or by heat transfer 17. A student will have learning skills to utilize the ideal gas equation 18. A student will be able to present graphs of thermodynamic processes 19. A student will be aware of the method of generating energy and the operation of energy devices (heat engines, etc.) on the natural environment.

	20. A student will be able to work in a team during measurements and to analyse the results; a student will be aware of the importance of knowledge concerning the principles of teamwork
Indicative Contents المحتويات الإرشادية	1. Basic terms and definitions: energy, thermodynamic system, properties, state and thermodynamic equilibrium. Units. The zeroth law of thermodynamics. 2. Microscopic forms of energy. The basic axiom of thermodynamics. Work and heat, moving boundary work. The first law of thermodynamics for closed systems. 3. Specific heat, enthalpy, ideal gas equation of state, characteristic thermodynamic processes. 4. The first law of thermodynamics for open systems (control volume). The concept of entropy, causes of entropy change, reversible and irreversible processes, entropy as a function of the state. 5. The second law of thermodynamics. Examples of thermodynamic cycles: gas power cycles, refrigeration and heat pump cycles. 6. Phases of a pure substance, saturated liquid, saturated liquid-vapor mixture, critical parameters, triple point, property diagrams for phase-change processes, properties of gas and two-phase mixtures.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem)	**100**		

الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	5% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	3	10% (10)	Continuous	All
	Report	2	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

Week	Material Covered
Week 1	- GAS POWER CYCLES, - Definition of a Cycle, Basic Considerations in the Analysis of Power Cycles - The Carnot Cycle and its Value in Engineering - Air-Standard Assumptions - An Overview of Reciprocating Engines - Illustrative example.
Week 2	- Constant Volume or Otto Cycle: The Ideal Cycle for Spark-Ignition Engines - Constant Pressure or Diesel Cycle: The Ideal Cycle for Compression-Ignition Engines
Week 3	- Dual Combustion Cycle - Comparison of Otto, Diesel and Dual Combustion Cycles - Efficiency versus compression ratio - For the same compression ratio and the same heat input

	- For constant maximum pressure and heat supplied - Illustrative example.
Week 4	- Atkinson Cycle - Stirling and Ericsson Cycles -Illustrative example.
Week 5	- Brayton Cycle: The Ideal Cycle for Gas-Turbine Engines - The Brayton Cycle with Regeneration - The Brayton Cycle with Intercooling, Reheating, and Regeneration - Illustrative example.
Week 6	- Pressure ratio for maximum work, Work ratio, Open cycle gas turbine-actual brayton cycle, Methods for improvement of thermal efficiency of open cycle gas turbine plant, Effect of operating variables on thermal efficiency, Closed cycle gas turbine, Gas turbine fuels
Week 7	- Ideal Jet-Propulsion cycle modifications to Turbojet Engines - Second-Law Analysis of Gas Power Cycles
Week 8	Reciprocating Positive displacement air compressors -Introduction -Definitions -Components -Indicated work. -Steady flow analysis. -Illustrative example
Week 9	-The condition of minimum work -Isothermal efficiency. -Illustrative example. -Effect of clearance volume. -Volumetric efficiency. -Actual indicator diagram. -Illustrative example.
Week 10	-Multi-stage compression. -Inter-cooling effect on Multistage compression. -Illustrative example.
Week 11	-The ideal intermediate pressure.

	-Energy balance of a two-stage machine with intercooling. -Illustrative example. -Roots air blower. -Van air compressors. -Illustrative example.
Week 12	Rotary air compressors -Radial compressors. -Axial compressors. -Illustrative example.
Week 13	Refrigeration cycles, - Idea vapor-compression refrigeration cycle. - Introduction - Elements of refrigeration system - Refrigeration systems - Co-efficient of performance (C.O.P.) - Standard rating of a refrigeration machine
Week 14	- Simple vapor compression cycle - Functions of parts of a simple vapor compression system - Vapor compression cycle on temperature-entropy (T-s) diagram and Pressure-enthalpy (p-h) chart Simple vapor compression cycle on p-h chart - Illustrative example.
Week 15	- Air Refrigeration System, -Idea gas refrigeration cycle. - Introduction - Reversed Carnot cycle - Reversed Brayton cycle - Merits and demerits of air refrigeration system -Illustrative example.
Week 16	Preparatory week before the final Exam

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		
Recommended Texts		
Websites		

Third year / First semester

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">Aerodynamics: Fundamentals</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">C</td><td colspan="2" rowspan="4">☒ Theory
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☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13051</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
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<tr><td>Administering Department</td><td>ATU13</td><td>College</td><td colspan="3">TEC</td></tr>
<tr><td>Module Leader</td><td>Name: Ali Yasir Hasan</td><td>e-mail</td><td colspan="3">aliyasir1961@gma.com</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Lech.</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/06/2026</td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
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<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td colspan="4">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td colspan="3">3. Understand the difference between ideal and real fluid.
4. Know the main difference between stream and potential flow.
5. Understanding the flow patterns.
6. To build basic understanding of Navier-stoke.
7. To build basic understanding of boundary layer.
8. To build basic understanding of separation on wings.</td></tr>
<tr><td>Module Learning Outcomes
مخرجات التعلم للمادة الدراسية</td><td colspan="3">Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.
27. Recognize the main difference between fluids.
28. Ability to analyses the flow using continuity equation and vorticity equation.
29. Derive and use the stream function to describe the flow patterns.
30. Discuss the application of stream and potential flow.
31. Recognize the difference between basic and super impose flow patterns.
32. Derive and use Navier -stoke equation and it is application.
33. Recognize the flow properties between parallel plates.
34. Recognize the types of boundary layers.
35. Discuss the application of the boundary layer.
36. Calculate the drag and lift in laminar and turbulent boundary layer.
37. Discuss the separation and pressure drag.</td></tr>
<tr><td>Indicative Contents
المحتويات الإرشادية</td><td colspan="3">Indicative content includes the following.
Part A: potential flow
- Potential flow theory, continuity equation, vorticity flow.
- Basic concept in potential flow.
- Basic flow patterns.
- Superimpose of basic flow
Part B : Navier- stoke equation
- Laminar flow between parallel plates.</td></tr>
</table>

	- **Couette flow** **Part C : boundary layer theory** - Displacement, - Momentum equation for the boundary layer. - Transient of boundary layer - Separation and pressure drag

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	3,5,8,11,13 and 15	LO #2, #4, #7, #8 and #10, #11

	Assignments	2	10% (10)	2 and 12	LO #1, #5 and #9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6, #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	Potential flow theory, continuity equation, vorticity equation
Week 2	Stream function, potential function and circulation
Week 3	Uniform flow, source and sink, Doublet, Free Vortex
Week 4	Flow past a half body, flow past a Rankine oval
Week 5	Flow past a cylinder, flow past a cylinder with circulation
Week 6	Navier-Stokes equations, introduction, Derivation
Week 7	Laminar flow between parallel plates, Couette
Week 8	Hydrodynamic lubrication, sliding bearing
Week 9	Laminar flow between coaxial rotating cylinders
Week 10	Boundary layer theory, introduction, Displacement, momentum
Week 11	Energy thickness, momentum equation for the boundary layer

Week 12	Laminar boundary layer
Week 13	Turbulent boundary layer
Week 14	Transition from laminar to turbulent flow
Week 15	Separation and pressure drag
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 3	Lab 1: stream flow visualizing
Week 5	Lab 2: velocity distribution behind different bodies
Week 9	Lab 3: velocity distribution behind different bodies
Week 12	Lab 4: pressure distribution over wings

earning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Aerodynamics for Engineering Students by E. L. Houghton & P. W. Carpenter & Steven Collicott & Daniel Valentine	Yes
Recommended Texts	Understanding Aerodynamics: Arguing from the Real Physics by Doug McLean	yes
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	Aircraft electricity	**Module Delivery**	
Module Type	C	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	ATU13052		
ECTS Credits	4		
SWL (hr/sem)	75		
Module Level	3	**Semester of Delivery**	5
Administering Department	3	**College**	1
Module Leader	Name: Abd-Alrahman Kshash	**e-mail**	
Module Leader's Acad. Title	Ass. Lech.	**Module Leader's Qualification**	MSc.
Module Tutor		**e-mail**	
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	01/06/2026	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

<table>
<tr><th colspan="2">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td rowspan="3">Module Objectives
أهداف المادة الدراسية</td>
<td>

1. Core Electrical Theory & Principles

- **Objective:** Apply foundational laws (Ohm's Law, Kirchhoff's Laws) to analyze DC/AC circuits.
  - Understand alternating current (AC) principles, including frequency (400 Hz), phase relationships, and impedance
  - Analyze capacitance, inductance, and electromagnetism in aircraft systems

</td></tr>
<tr><td>

2. Aircraft Electrical Components & Systems

- **Objective:** Identify components and their functions in aviation power systems.
  - **Power Sources:**
    - Main generators (115/200 V AC, 400 Hz), batteries (Ni-Cd, Li-ion), and auxiliary power units (APUs)
    - Emergency power systems and their role during generator failure
  - **Distribution Systems:**
    - Interpret wiring diagrams, schematics, and symbols
    - Understand voltage regulation, circuit protection (fuses, breakers), and grounding

</td></tr>
<tr><td>

3. Safety & Emergency Procedures

- **Objective:** Mitigate electrical hazards and respond to failures.

</td></tr>
</table>

	◦ Diagnose causes of electrical fires (e.g., short circuits, insulation degradation) ◦ Manage battery-related risks (e.g., thermal runaway in Li-ion batteries, as in the 2013 Boeing 787 incident) ◦ Execute protocols for smoke/fire emergencies and generator failure
	4. Practical Skills & Troubleshooting • **Objective:** Master measurement tools and diagnostic techniques. ◦ Use multimeters, oscilloscopes, and continuity testers ◦ Measure voltage drop, resistance, and capacitance in live circuits ◦ Troubleshoot faults using wiring diagrams and FAA-approved methods
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**I. Core Theory & Electrical Fundamentals** 1. **Explain electron theory**, static electricity, conduction principles, and electromagnetic fields 2. **Differentiate semiconductor operations** (diodes, transistors, integrated circuits) and their applications in avionics
	⚙ **II. Component Operation & Systems Maintenance** 4. **Service power sources** (generators, batteries) and troubleshoot failures in DC/AC motors 5. **Select wiring** by type/size and perform terminations using schematics

	6. **Test capacitors, resistors, inductors**, and transformers using multimeters, LCR meters, and oscilloscopes
	III. Safety & Compliance 7. **Mitigate electrical hazards** (short circuits, thermal runaway in Li-ion/Ni-Cd batteries) 8. **Adhere to regulatory standards** (EASA Part 66, FAA 14 CFR Part 65) for system modifications and certifications
	IV. Practical Skills & Troubleshooting 9. **Diagnose faults** in servomechanisms, synchro systems, and logic circuits (e.g., flip-flops, Boolean gates) 10. **Interpret technical data** for communication/navigation systems and perform FMEA (Failure Modes Effects Analysis)
	V. Systems Integration & Emerging Technologies 11. **Integrate electricity** with aircraft systems (e.g., environmental controls, flight controls) 12. **Evaluate "More Electric Aircraft" (MEA)** advancements like 270V DC networks 38.
Indicative Contents المحتويات الإرشادية	**Indicative Table of Contents – Aircraft Electricity** **1. Introduction to Aircraft Electrical Systems** • Importance of electricity in aviation • Historical evolution of aircraft electrical systems • Types of aircraft electrical systems (AC vs DC)

	2. Basic Electrical Theory • Ohm's Law • Electrical units (voltage, current, resistance, power) • Series and parallel circuits • Electrical components: resistors, capacitors, inductors **3. Aircraft Electrical Power Sources** • Battery systems (NiCad, lead-acid, lithium-ion) • Generators and alternators • Auxiliary Power Units (APU) • Ground power units (GPU) • Ram Air Turbine (RAT) **4. Distribution Systems** • AC and DC bus systems • Single-phase and three-phase AC power • Wiring, bonding, and shielding • Circuit breakers and fuses • Electrical load management **5. Electrical Components and Devices** • Relays and contactors • Transformers and rectifiers • Inverters and converters • Switches and sensors **6. Aircraft Lighting Systems** • Interior lighting (cabin, cockpit, emergency) • Exterior lighting (navigation, anti-collision, landing/taxi) • LED vs incandescent vs fluorescent **7. Instrumentation and Avionics Power** • Electrical power for avionics systems • Redundancy and fail-safe systems • Power conditioning units **8. Wiring Practices and Maintenance**

	• Standard practices for aircraft wiring (e.g., SAE, ATA specs) • Wire types, connectors, and harnessing • Inspection and troubleshooting techniques • Safety procedures **9. Advanced Electrical Systems** • Fly-by-wire systems • Integrated Modular Avionics (IMA) • Electrical Load Management Systems (ELMS) • More Electric Aircraft (MEA) and All-Electric Aircraft concepts **10. Troubleshooting and Fault Diagnosis** • Use of multimeters and specialized testing tools • Common electrical failures and symptoms • Maintenance diagnostics procedures **11. Regulatory and Safety Considerations** • FAA and EASA electrical system regulations • Certification standards (e.g., FAR/CS Part 23, 25) • Lightning and electromagnetic interference (EMI) protection • Human factors in electrical system maintenance **12. Case Studies and Applications** • Electrical system layouts of popular aircraft (e.g., Boeing 737, Airbus A320) • Incident/accident analysis involving electrical failures

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

<table>
<tr><td></td><td>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.</td></tr>
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الحمل الدراسي المنتظم للطالب أسبوعيا</td><td>3</td></tr>
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الحمل الدراسي غير المنتظم للطالب أسبوعيا</td><td>3</td></tr>
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تقييم المادة الدراسية</th></tr>
<tr><td colspan="2"></td><td>Time/Number</td><td>Weight (Marks)</td><td>Week Due</td><td>Relevant Learning Outcome</td></tr>
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<tr><td>Report</td><td>1</td><td>10% (10)</td><td>13</td><td>LO #6, #10</td></tr>
<tr><td></td><td>Midterm Exam</td><td>2hr</td><td>10% (10)</td><td>7</td><td>LO #1 - #7</td></tr>
</table>

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Electrical power sources in aircraft** - General introduction - Main sources and drives - Auxiliary sources - Emergency sources
Week 2	**DC and AC generators** - Construction - Applications
Week 3	**DC and AC motors** - Construction - Applications
Week 4	**Brushless and stepper Motors** -Construction - Applications
Week 5	**Power conversion and energy storage** - Inverters/ Converters - Transformer Rectifier Units (TRU) - Auto-Transformers

	- Battery chargers - Batteries
Week 6	**Components of Electrical Systems**
Week 7	**Aircraft Electrical System**
Week 8	**Emergency power generation** - Ram air turbine - Backup power converters -Permanent Magnet Generators (PMG)
Week 9	**Power distribution and electrical loads** - Primary power distribution - Secondary power distribution - Electrical loads -Typical aircraft DC system
Week 10	**Turn and Bank indicators** -**Heading indicating instrument**
Week 11	Aircraft instruments - Introduction - Sensors and Transducers -Pitot-static instruments and systems -Altimeter -Air speed and vertical speed indicators
Week 12	Attitude Indicator (AI) - Heading Indicator (HI) - Turn Coordinator (TC)
Week 13	**Engine parameters measurements** -Primary indicating systems -Secondary Indicating Systems
Week 14	**INTRODUCTION TO AVIONICS**
Week 15	**Aircraft Communication Systems**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**1. FAA – Aviation Maintenance Technician Series** • **Title**: *Aviation Maintenance Technician: Airframe, Volume 1* • **Author**: FAA / ASA (Aviation Supplies & Academics) • **Chapters**: Includes detailed sections on aircraft electrical systems • **Free PDF**: Available on FAA website • **Link**: FAA.gov - Handbooks	Yes
Recommended Texts	**2. Jeppesen – Aircraft Electricity and Electronics** • **Authors**: Thomas K. Eismin • **Details**: Industry-standard textbook used in many aviation maintenance programs • **Covers**: DC and AC systems, solid-state devices, digital systems, troubleshooting	yes
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Engineering Analyses</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Basic learning activities</td><td colspan="3" rowspan="4">☒ Theory
☐ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATU13053</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">3</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">75</td></tr>
<tr><td>Module Level</td><td colspan="2">3</td><td colspan="2">Semester of Delivery</td><td>5</td></tr>
<tr><td>Administering Department</td><td colspan="2">ATU13</td><td>College</td><td colspan="2">TEC</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name: Falih Hamza Edan</td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td>Module Leader’s Acad. Title</td><td colspan="2">Ass. Prof.</td><td colspan="2">Module Leader’s Qualification</td><td>PhD</td></tr>
<tr><td>Module Tutor</td><td colspan="2"></td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td>Peer Reviewer Name</td><td colspan="2">Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td colspan="2">1/6/2026</td><td>Version Number</td><td colspan="2"></td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="3"></td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td colspan="3"></td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Engineering analysis involves the application of scientific/mathematical analytic principles and processes to reveal the properties and state of a system, device or mechanism under study. 2. Understanding Fundamental Concepts: Enhance understanding of basic mathematical concepts used in engineering analysis. 3. Applying Mathematical Techniques: Use mathematical methods to solve engineering problems and equations. 4. Developing Critical Thinking Skills: Foster critical and analytical thinking through problem-solving in engineering contexts. 5. Utilizing Modern Techniques: Familiarize students with modern tools and techniques in engineering analysis, such as programming and simulation. 6. Analyzing Complex Systems: Study how to analyze complex engineering systems and understand their dynamics. 7. Improving Communication Skills: Enhance the ability to communicate results and analyses clearly and effectively.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Use the Method of Laplace transforms to solve initial-value problems for linear differential equations with constant coefficients. 2. To understand and be able to apply the idea of a power series. 3. Demonstrate capacity to model physical phenomena using PDE's (in particular using the heat and wave equations). 4. Learn to use Fourier series to represent periodical physical phenomena in engineering analysis. 5. Basic Understanding of Matrices: Recognize the definition, types, and dimensions of matrices, as well as Ability to execute fundamental operations 6. Solving Linear Equations: Use matrices to solve systems of linear equations. 7. Developing Critical Thinking Skills: Enhance analytical thinking through solving complex problems related to matrices.
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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,9and 14	LO #1, #2 and #3, LO #5, #6, #7 and #8 LO #11, #12 and #13
	Assignments	5	10% (10)	2 and 13	LO #3, #4, #5, #6, and #12
	Projects / Lab.	1	10% (10)	continue	0
	Report	1	10% (10)	continue	0
	Midterm Exam	2hr	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	
	Material Covered
Week 1	Laplace Transformations (L.T) - Introduction - Definition of (L.T)
Week 2&3	Inverse Laplace Transformations (I.L.T.) - Introduction - Definition of (I.L. T)
Week 4	Solution of differential equations using L.T - Method of solution - Examples
Week 5	Solution of 2^{nd} order D.E. using power series method - Introduction - Solution near the ordinary point and singular point
Week 6	Applications - Using L.T. for solving practical Problems
Week 7	Mid Exam
Week 8&9	Fourier Series - Periodic Function - Even and Odd Functions

	- Half Range Expansion Function
Week 10	Solution of partial D.E - Definition - Methods of solution of P.D.E.
Week 11	Using of separation method - Definition of separation method - Examples. Applications of heat transfer - Solution of unsteady one-dimensional heat equation
Week 12	Introduction and processing of matrix
Week 13 & 14	- Solution of equation by Gauss elimination method - Solution of equation by Gauss Jordan method - inverse of matrix by Gauss Jordan method
Week 15	Preparatory week before the final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	10T H E D I T I O N ADVANCED ENGINEERING MATHEMATICS ERWIN KREYSZIG	No
Recommended Texts	Advanced Engineering Mathematics (6th Ed) Dennis G. Zill Advanced Engineering Mathematics, Stroud, Advanced Engineering Mathematics, Stroud	No
Websites	https://www.mathsisfun.com/	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Gas Dynamics-fundamentals</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Basic learning activities</td><td colspan="3" rowspan="4">☒ Theory
☐ Lecture
☐ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATU13054</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">100</td></tr>
<tr><td colspan="2">Module Level</td><td>. 3</td><td colspan="2">Semester of Delivery</td><td>5</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU!3</td><td>College</td><td colspan="2">TEC</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name:Mohammed Ajmi Mahan</td><td>e-mail</td><td colspan="2">mohamedalshamary43@gmail.com</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Pass. Lech</td><td colspan="2">Module Leader’s Qualification</td><td>MSc.</td></tr>
<tr><td>Module Tutor</td><td colspan="2"></td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="2">1.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="3">None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td colspan="3">None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Understand the difference between ideal and real fluid. 2. Know the main difference between stream and potential flow. 3. Understanding the flow patterns. 4. To build basic understanding of Navier-stoke. 5. To build basic understanding of boundary layer. 6. To build basic understanding of separation on wings.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 39. Recognize the main difference between fluids. 40. Ability to analyses the flow using continuity equation and vorticity equation. 41. Derive and use the stream function to describe the flow patterns. 42. Discuss the application of stream and potential flow. 43. Recognize the difference between basic and super impose flow patterns. 44. Derive and use Navier -stoke equation and it is application. 45. Recognize the flow properties between parallel plates. 46. Recognize the types of boundary layers. 47. Discuss the application of the boundary layer. 48. Calculate the drag and lift in laminar and turbulent boundary layer. 49. Discuss the separation and pressure drag.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A: potential flow** - **Potential flow theory, continuity equation, vorticity flow.** - **Basic concept in potential flow.** - **Basic flow patterns.** - **Superimpose of basic flow** **Part B : Navier- stoke equation** - **Laminar flow between parallel plates.** - **Couette flow**

	Part C : boundary layer theory - Displacement, - Momentum equation for the boundary layer. - Transient of boundary layer - Separation and pressure drag

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية				
	Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**

Formative assessment	**Quizzes**	2	10% (10)	3,5,8,11,13 and 15	LO #2, #4, #7, #8 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #1, #5 and #9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6, #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	**Fundamentals of Gas Dynamics** • Definition and scope of gas dynamics • Historical perspective and development • Overview of applications in aerospace, mechanical, and HVAC fields
Week 2	**Classification of Flows and Thermodynamics Review** • Key differences and criteria • Effects of compressibility on fluid flow • Review of thermodynamics basics relevant to gas dynamics: ideal gas law, thermodynamic properties
Week 3	**Conservation Equations in Compressible Flow – Mass and Momentum** • Continuity equation derivation and explanation • Euler's equations for inviscid flow

	• Physical interpretation and assumptions
Week 4	**Conservation Equations in Compressible Flow – Energy and Thermodynamics** • Energy conservation equation • Thermodynamic relations for ideal gases in flow • Stagnation properties: total pressure, temperature, and density
Week 5	**Understanding Isentropic Flow** • Definition and characteristics • Conditions for isentropic processes (adiabatic and reversible) • Real-world assumptions and limitations
Week 6	**Practical Isentropic Flow Relations** • Isentropic relations for pressure, temperature, and density • Use of γ (ratio of specific heats) in calculations • Introduction to isentropic flow tables and charts
Week 7	**The Speed of Sound in Gases** • Physical meaning and significance • Derivation from thermodynamic principles • Factors affecting speed of sound in gases
Week 8	**Mach Number and Flow Regimes** • Definition and calculation of Mach number • Classification: subsonic, sonic, supersonic, hypersonic • Practical examples and physical interpretation in engineering systems
Week 9	**Area–Mach Number Relationship Fundamentals** • Derivation of area–Mach number relation for steady 1D flow • Impact of cross-sectional area changes on flow velocity and Mach number
Week 10	**Stagnation and Static Property Ratios in Isentropic Flow** • Relationship between stagnation and static properties

	• Practical use of stagnation to static pressure, temperature, and density ratios • Interpreting isentropic flow charts
Week 11	**Flow Choking and Critical Flow Conditions** • Concept of choking in compressible flow • Critical Mach number and area ratio • Effect on mass flow rate and system design
Week 12	**: Behavior of Flow in Converging Nozzles** • Flow acceleration in converging sections • Subsonic and sonic conditions explained • Physical understanding of flow behavior in converging ducts
Week 13	**Supersonic Flow in Converging-Diverging Nozzles** • Flow regimes in diverging sections • Conditions for supersonic flow and shock formation • Calculating nozzle area ratios for desired Mach numbers
Week 14	**Applications of Nozzle Flow in Propulsion** • Rocket nozzles and jet engine flow analysis • Calculation of flow parameters in nozzles • Influence of ambient conditions on nozzle performance
Week 15	**Performance Metrics and Advanced Concepts in Nozzle Flow** • Maximum mass flow rate and choked flow implications • Thrust, specific impulse, and efficiency metrics • Introduction to shocks, expansion waves, and real-gas effects
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 3	
Week 5	
Week 9	
Week 12	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Gas Dynamics" by Robert Zucker and Oscar Biblarz	No
Recommended Texts	Gas Dynamics" by E. Rathakrishnan	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Aircraft Engines</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">C</td><td colspan="3" rowspan="4">☒ Theory
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☐ Lab
☐ Tutorial
☒ Practical
☐ Seminar</td></tr>
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<tr><td>ECTS Credits</td><td colspan="2">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">100</td></tr>
<tr><td>Module Level</td><td>3</td><td colspan="2">Semester of Delivery</td><td colspan="2">5</td></tr>
<tr><td>Administering Department</td><td>ATU13</td><td>College</td><td colspan="3">TEC</td></tr>
<tr><td>Module Leader</td><td>Name: Taif Mahdi Oudah</td><td>e-mail</td><td colspan="3">Taifmahde96@gmail.com</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Asst. Lech.</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">MSc.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="3">1.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="2">None</td><td>Semester</td><td colspan="2"></td></tr>
<tr><td>Co-requisites module</td><td colspan="2"></td><td>Semester</td><td colspan="2"></td></tr>
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<table>
<tr><th colspan="2">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td>7. Gain knowledge about the basic concepts of all aircraft engines types.
8. To understand and knowledge of the fundamentals and performance and construction of aircraft piston engines.
9. This course is introduction subject for piston engine fuel systems, starting and ignition systems, exhaust and cooling systems, lubrication systems.
10. To understand and knowledge of the fundamentals and performance and construction of aircraft propeller engines.
11. To develop deriving and problem solving skills of thrust force for the jet and propeller engines and knowledge the factors affecting on it.
12. To develop problem solving skills and understanding of aircraft engines performance parameters.
13. To develop the skill of troubleshoot for an aircraft engine mechanic.</td></tr>
<tr><td>Module Learning Outcomes
مخرجات التعلم للمادة الدراسية</td><td>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.
50. Recognize the classifications of aircrafts and propulsion systems.
51. List the types of propulsion systems.
52. Recognize the difference between air breathing and non-air breathing engines.
53. Recognize the difference between the shaft base engines (piston or propeller) and the reaction engines.
54. Identify the type of jet engine: turbine-based or ram-based (Athodyd).
55. Identify the basic parts in construction of each type of aircraft engines.
56. Understand how thrust force is generated in the different types of aircraft engines and how it is calculated.
57. Describe the advantages and applications the type of bypass engines.
58. Summarize the factors affecting on the thrust force.
59. Describe and calculation the engine performance parameters.
60. Identify the function and component of engine systems: (fuel system, starting and ignition systems, exhaust and cooling systems, lubrication system)</td></tr>
<tr><td>Indicative Contents
المحتويات الإرشادية</td><td>Indicative content includes the following:</td></tr>
</table>

	Part A - Classifications of Propulsion Systems
	
	- External Combustion
	- Internal Combustion engines (Shaft engines)
	    • Aero piston engines
	    • Wankel engines
	    • Turbo shaft (Helicopter Engines)
	    • Turbo propeller bypass engines
	    • Propfan bypass engines
	- Internal Combustion engines (Reaction engines)
	    • Turbine-based engines
	    • Athodyd or ram-based engines
	- Other Power Sources
	
	Part B – Fundamentals and applied of thrust force
	
	- Thrust Force
	- Factors Affecting Thrust
	
	Part C – Engine Performance Parameters
	
	- Engine Efficiencies
	- Takeoff Thrust
	- Specific Fuel Consumption
	- Aircraft Range
	- Range Factor

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	58	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

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 / lap.	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	Introduction to most aircraft types and Classifications of Propulsion Systems
Week 2	External Combustion engines
Week 3	Internal Combustion engines (Shaft engines): Aero piston engines, Wankel engines
Week 4	Internal Combustion engines (Shaft engines): Aerodynamics and Thermodynamics of Reciprocating ICE
Week 5	Internal Combustion engines (Shaft engines): Turbo propeller bypass engines, Propfan bypass engines, Turboshaft (Helicopter) engines
Week 6	Internal Combustion engines (Reaction engines) without gas generator: Athodyd or ram-based engines (ramjet, scramjet, pulsejet)
Week 7	Internal Combustion engines (Reaction engines) with gas generator: Turbine-based engines
Week 8	Other Power Sources
Week 9	Fundamentals and derive of the thrust force
Week 10	The applied of the thrust force (Turbojet, ramjet, scramjet, turboramjet) engine
Week 11	The applied of the thrust force (Turbofan, propfan, turboprop, turboshaft) engines
Week 12	Factors Affecting Thrust
Week 13	Engine Performance Parameters: Engine Efficiencies
Week 14	Engine Performance Parameters: Takeoff Thrust
Week 15	Engine Performance Parameters: (Aircraft Range, Range Factor)
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly workshop Syllabus) المنهاج الاسبوعي للورشة	
	Material Covered
Week 5	Workshop 1: Turboprop engine (Intake, Compressor, Combustion chamber, Turbine, Propeller)
Week 6	Workshop 2: Turboshaft (Helicopter engine) (Intake, Compressor, Combustion chamber, Turbine, Rotor)
Week 7	Workshop 3: Turbofan, Turbojet engine (Intake, Fan, Compressor, Combustion chamber, Turbine, Afterburner)
Week 8	Workshop 4: Fuel system
Week 9	Workshop 5: Lubrication system
Week 10	Workshop 6: Starting and ignition systems
Week 11	Workshop 7: Exhaust and cooling systems
Week 12	Workshop 8: Ground power unit APU

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Aircraft Propulsion and Gas Turbine Engines (Ahmed F. El-Sayed).	Yes
Recommended Texts	Fundamentals of Aircraft and Rocket Propulsion (Ahmed F. El-Sayed).	No
Websites	- http://part66.blogspot.com/2012/05/module-5-digital-techniques-electronic.html# - https://www.aviationonline.co.uk/part66Syllabus.htm	

Module Description Form

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Mechanical Engineering Design-Fundamentals**	**Module Delivery**	
Module Type	Support (S)	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**ATU13056**		
ECTS Credits	**4**		
SWL (hr/sem)	**100**		
Module Level	3	**Semester of Delivery**	5
Administering Department	ATU13	**College**	TEC
Module Leader	Name: **Abbas Ahmed Ayoob**	**e-mail**	dr.abbas.alasady@gmail.com
Module Leader's Acad. Title	Lech.	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	1/06/2026	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-Requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Presenting an overview of the type of stresses applied as simple principles. 2. Studying the combined stresses principle and the failure theories. 3. Showing the stress concentration and theories of fatigue. 4. Covering the significant joints methods. 5. Learning the fundamentals of designing and analyzing machine parts based on CAE principles.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enabling the student to have the fundamentals of machine design. 2. Enlarging the concepts of machine design depending on the skills of students in mechanics of materials and static principles. 3. Building a good bases to use the tools of analysis relying on CAE.
Indicative Contents المحتويات الإرشادية	**The indicative contents of this subject are:** **Part (A) Simple stresses:** Simple stresses. **(2 hrs)** **Part (B) Torsional and bending stresses, combined stresses:** Torsional Shear Stress, Shafts in Series and Parallel, Bending Stress in Straight Beams, Bending Stress in Curved Beams, Principal Stresses and Principal Planes, Determination of Principal Stresses for a Member Subjected to Biaxial Stress, Application of Principal Stresses in Designing Machine Members, Theories of Failure under Static Load, Maximum Principal or Normal Stress Theory (Rankine's Theory), Maximum Shear Stress Theory (Guest's or Tresca's Theory), Maximum Principal Strain Theory (Saint Venant's Theory), Maximum Strain Energy Theory (Haigh's Theory), Maximum Distortion Energy Theory (Hencky and Von Mises Theory), Eccentric Loading—Direct and Bending Stresses Combined, Shear Stresses in Beams. **(8 hrs)** **Part (C) Pressure vessels**: Classification of Pressure Vessels, Stresses in a Thin Cylindrical Shell due to an Internal Pressure, Circumferential or Hoop Stress, Longitudinal Stress, Change in Dimensions of a Thin Cylindrical Shell due to an Internal Pressure, Thin Spherical Shells Subjected to an Internal Pressure, Change in Dimensions of a Thin Spherical Shell due to an Internal Pressure, Thick Cylindrical Shell Subjected to an Internal Pressure, Compound Cylindrical Shells, Stresses in Compound Cylindrical Shells, Cylinder Heads and Cover Plates. **(6 hrs)**

	Part (D) Fatigue theories: Completely Reversed or Cyclic Stresses, Fatigue and Endurance Limit, Effect of Loading on Endurance Limit—Load Factor, Effect of Surface Finish on Endurance Limit—Surface Finish Factor, Effect of Size on Endurance Limit—Size Factor, Relation Between Endurance Limit and Ultimate Tensile Strength, Factor of Safety for Fatigue Loading, Stress Concentration, Theoretical or Form Stress Concentration Factor, Stress Concentration due to Holes and Notches, Factors to be Considered while Designing Machine Parts to Avoid Fatigue Failure, Stress Concentration Factor for Various Machine Members, Fatigue Stress Concentration Factor, Notch Sensitivity, Combined Steady and Variable Stresses, Gerber Method for Combination of Stresses, Goodman Method for Combination of Stresses, Soderberg Method for Combination of Stresses. **(8 hrs)** **Part (E) Pipes and Pipes joint design:** Stresses in Pipes, Design of Pipes, Pipe Joints, Standard Pipe Flanges for Steam, Hydraulic Pipe Joint for High Pressures, Design of Circular Flanged Pipe Joint, Design of Oval Flanged Pipe Joint, Design of Square Flanged Pipe Joint. **(8 hrs)** **Part (F) Riveted joint design:** Methods of Riveting, Material of Rivets, Essential Qualities of a Rivet, Manufacture of Rivets, Types of Rivet Heads, Types of Riveted Joints, Lap Joint, Butt Joint, Important Terms Used in Riveted Joints, Caulking and Fullering, Failures of a Riveted Joint, Strength of a Riveted Joint, Efficiency of a Riveted Joint, Design of Boiler Joints, Assumptions in Designing Boiler Joints, Design of Longitudinal Butt Joint for a Boiler, Design of Circumferential Lap Joint for a Boiler, Recommended Joints for Pressure Vessels, Riveted Joint for Structural, Use–Joints of Uniform Strength (Lozenge Joint), Eccentric Loaded Riveted Joint.. **(8 hrs)** **Part (G) Welded joint 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) Screwed joint design:** Important Terms used in Screw Threads, Forms of Screw Threads, Location of Screwed Joints, Common Types of Screw Fastenings, Locking Devices, Designation of Screw Threads, Standard Dimensions of Screw Threads, Stresses in Screwed Fastening due to Static Loading, Initial Stresses due to Screwing Up

<table>
<tr><td></td><td>Forces, Stresses due to External Forces, Stress due to Combined Forces, Design of Cylinder Covers, Boiler Stays, Bolts of Uniform Strength, Design of a Nut, Bolted Joints under Eccentric Loading, Eccentric Load Acting Parallel to the Axis of Bolts, Eccentric Load Acting Perpendicular to the Axis of Bolts, Eccentric Load on a Bracket with Circular Base, Eccentric Load Acting in the Plane Containing the Bolts. (8 hrs)

Part (I) Keys and coupling:

Types of Keys, Sunk Keys, Saddle Keys, Tangent Keys, Round Keys, Splines, Forces acting on a Sunk Key, Strength of a Sunk Key, Effect of Keyways, Shaft Couplings, Requirements of a Good Shaft Coupling, Types of Shaft Couplings, Sleeve or Muff Coupling, Clamp or Compression Coupling, Flange Coupling, Design of Flange Coupling, Flexible Coupling, Bushed Pin Flexible Coupling, Oldham Coupling, Universal Coupling. (8 hrs)</td></tr>
<tr><td colspan="2">Learning and Teaching Strategies
استراتيجيات التعلم والتعليم</td></tr>
<tr><td>Strategies</td><td>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.</td></tr>
</table>

<table>
<tr><td colspan="4">Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</td></tr>
<tr><td>Structured SWL (h/sem)
الحمل الدراسي المنتظم للطالب خلال الفصل</td><td>63</td><td>Structured SWL (h/w)
الحمل الدراسي المنتظم للطالب أسبوعيا</td><td>7</td></tr>
<tr><td>Unstructured SWL (h/sem)
الحمل الدراسي غير المنتظم للطالب خلال الفصل</td><td>37</td><td>Unstructured SWL (h/w)
الحمل الدراسي غير المنتظم للطالب أسبوعيا</td><td>6</td></tr>
<tr><td>Total SWL (h/sem)
الحمل الدراسي الكلي للطالب خلال الفصل</td><td colspan="3">100</td></tr>
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Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	20% (20)	6 and 14	
	Assignments/HW	2	10% (10)	Continues	
	Projects / Lab.	5	10% (10)	Continues	
	Report	1	5% (5)	Continues	
Summative assessment	Midterm Exam	3hr	10% (10)	7	
	Final Exam	3hr	50% (50)	16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Simple stresses, bending and torsional concept.
Week 2	Combined stresses (Principal Stresses), failure theories.
Week 3	Curved beam concept.
Week 4	Eccentric loading.
Week 5	Shear stresses in beams.
Week 6	Pressure vessels.
Week 7	Mid Exam, Stresses concentration.

Week 8	Fatigue theories.
Week 9	Pipes design.
Week 10	Pipes joint design.
Week 11	Riveted joint design.
Week 12	Welded joint design.
Week 13	Screwed joint design.
Week 14	Keys and coupling.
Week 15	Final Exam
Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Solidwork tool design: fundamentals drawing.
Week 2	Solidwork tool design and Excel program: verification of simple stresses.
Week 3	Solidwork tool design and Excel program: verification of combined stresses.
Week 4	Solidwork tool design and Excel program: verification of Rankin, Tresca, and Von-Mises.
Week 5	Solidwork tool design and Excel program: verification of curved beam.
Week 6	Solidwork tool design and Excel program: BMD and SFD.
Week 7	Solidwork tool design and Excel program: pressure Vessels Drawing and test.
Week 8	Solidwork tool design and Excel program: stresses concentration.
Week 9	Solidwork tool design and Excel program: fatigue verification.
Week 10	Solidwork tool design and Excel program: pipes verification.
Week 11	Solidwork tool design and Excel program: pipes joint drawing.

Week 12	Solidwork tool design and Excel program: riveted and bolts joint drawing.
Week 13	Solidwork tool design and Excel program: welding verification.
Week 14	Solidwork tool design and Excel program: key and coupling drawing.
Week 15	Final practical exam

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		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><th colspan="6">Module Information
معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td colspan="3">Theory of Machines</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">S</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13057</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td>Module Level</td><td>3</td><td colspan="2">Semester of Delivery</td><td colspan="2">5</td></tr>
<tr><td>Administering Department</td><td>ATU13</td><td>College</td><td colspan="3">TEC</td></tr>
<tr><td>Module Leader</td><td>Name: Salwan Hasan Thabit</td><td>e-mail</td><td colspan="3">Salwan.h.thabit@Uruk.ed.iq</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Professor</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Peer Reviewer Name</td><td></td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="3">1.0</td></tr>
<tr><th colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td colspan="2">None</td><td>Semester</td><td colspan="2"></td></tr>
<tr><td>Co-requisites module</td><td colspan="2">None</td><td>Semester</td><td colspan="2"></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**A. Course Objectives** Mechanical devices are characterized by the fact that they have mobility and must move to perform their function. This differentiates mechanical engineering from other fields of engineering such as aeronautical technical engineering, in which structures are generally immobile The study of kinematics and dynamics of machines is an applied field of mechanical engineering that is concerned with understanding the relationship between the geometry and the motions of the parts of a machine and the forces that produce this motion. The overall objective of this course is to learn how to analyze the motions of mechanisms, design mechanisms to have given motions, and analyze forces in machines. This includes relative motion analysis and design of gears, gear trains, cams, and linkages, simultaneous graphical and analytical analysis of position, velocity, and acceleration, considering static and inertial forces. **On completing the course, the student will be able to:** 1. Understand the fundamentals of the theory of kinematics and dynamics of machines. 2. Understand techniques for studying motion of machines and their components. 3. Use computer software packages in modern design of machines.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**B. Learning Outcomes** Upon successful completion of this course, the student will be able to: 1. Distinguish kinematic and kinetic motion. 2. Identify the basic relations between distance, time, velocity, and acceleration. 3. Apply vector mechanics as a tool for solving kinematic problems. 4. Create a schematic drawing of a real-world mechanism. 5. Determine the degrees-of-freedom (mobility) of a mechanism.

	6. Use graphical and analytic methods to study the motion of a planar mechanism. 7. Use computer software to study the motion of a mechanism. 8. Design basic gear trains. 9. Design basic cam systems. This course contributes to the assessment of the following program (student) outcomes: a. an ability to apply knowledge of mathematics, science and engineering e. an ability to identify, formulate, and solve engineering problem
Indicative Contents المحتويات الإرشادية	Al-Furat Al-Awsat Technical University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Disability Services on Al-Furat Al-Awsat Technical University's Diversity, Equity, and Inclusion
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**C. Assessment** **1. ATTENDANCE** Attendance is considered very important for maximizing the learning benefits of this course and therefore regular attendance is expected. Learning is motivated through active discussion, demonstration and practice of the topics being studied. Students are responsible for all completed work, schedule adjustments and assigned work addressed during class. Please inform your instructor if you are unable to attend any scheduled class session, and obtain notes from any missed lecture (s). It is your responsibility to make arrangements for any planned or unplanned absences (i.e. interviews, illnesses, personal emergencies, etc.). **2. HOMEWORK** Homework is considered very important for understanding the course material. Homework will be assigned from the text or the references after completing the discussion of an independent topic or chapter. All homework will be collected,

graded and returned. You are encouraged to work with your friends for better understanding of the material. HOWEVER, YOU ARE REQUIRED TO COMPLETE THE ASSIGNMENTS INDIVIDUALLY IN YOUR OWN WAY. IDENTICALLY LOOKING ASSIGNMENTS WILL BE CONSIDERED COPIED WORK UNLESS PROVED OTHERWISE BY THE STUDENTS. A ZERO GRADE WILL BE GIVEN TO ALL SUCH DUPLICATES IRRESPECTIVE OF THE REASONS.

Homework is due the class period after it has been assigned unless another due date is announced. Circumstances beyond your control (i.e. illness, computer system failure, weather, acts of nature, etc.) will be addressed as required.

As well:

• Each problem must have clearly identified sections: Given, Find, Solution.

• The units must be clear for every numeric value.

• All computations must first show equations symbolically and then with numeric values, without any rearrangement of variables.

• All vector equations must clearly distinguish vector variables and show vector diagrams. Solutions with missing vector diagrams will not be graded.

• Submitted work must be neat, on engineering paper. Use a ruler and compass for diagrams; underline or put boxes around answers.

• Convince me you have the correct answer.

3. EXAMS

Two mid-term exams will be given during the semester and a final exam will be given during exam week. All exams will be closed-book, closed-notes, but self-written formula sheet (s) will be allowed. (The maximum number of pages will be stated in class.)

The formula sheet (s) may contain figures, equations, formulas, procedures, etc.; but they may not contain any numerical solutions or worked examples. The mid-terms will be in-class during the regular lecture time. The final exam will be given according to the university / college and department schedule.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**52**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	5, 7, and 10	LO #1-4, LO#5-6, and LO#7-9
	Assignments	2	10% (10)		
	Projects / Lab.	2	10% (10)		
	Report	2	10% (10)		
Summative assessment	**Midterm Exam**	2hr	10% (10)	14	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction - **Mechanisms** - Machine - Theory of machines - Structure - Links - Kinematics pair - Kinematics chain
Week 2	**Velocity of Mechanisms -1** - Velocity diagram. - Relative velocity of two bodies moving in straight line - Relative velocity of point on link - Relative velocity of slider cranks mechanism. - Rubbing velocity of a pin joint
Week 3	**Velocity of Mechanisms -2** - Relative velocity of slider cranks mechanism. - Rubbing velocity of a pin joint
Week 4	**Acceleration in mechanisms** - Acceleration diagrams - Tangential component - Radial component
Week 5	**Balancing of rotating masses -1** - Single mass rotating in same plane - Several masses rotating in same plane - Graphical solution - Masses rotating in different planes
Week 6	**Balancing of rotating masses -2**

	- Masses rotating in different planes
Week 7	**Friction Belts - 1** - Belt drive - Types of belts - Velocity ratio of belt - Power transmitted
Week 8	**Friction Belts - 2** - Ratio of driving tension for flat belt - Angle of contact
Week 9	**Friction Belts - 3** - The effect of centrifugal tension - The effect of initial tension
Week 10	**Spur Gear -1** - Pitch circle diameter - Condition for transmission of constant velocity ratio - Velocity of sliding
Week 11	**Spur Gear -2** - Path of contact - Arc of contact - Interference
Week 12	**Gear Trains -1** - Simple gear trains - Compound gear trains
Week 13	**Gear Trains -2** - Simple epicyclic gear trains - Compound epicyclic gear trains

Week 14	Semester exam	
Week 15	**Preparatory week before the final Exam**	
Week 16	**Final Exam**	
Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	R.S.KHURMI A Textbook of Theory of Mach	Yes
Recommended Texts	R.S.KHURMI A Textbook of Theory of Mach	yes
Websites	https://www.academia.edu/43543661/R_S_KHURMI_A_Textbook_of_Theory_of_Mach	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**Mechanics of Materials**	**Module Delivery**
Module Type	Support learning activities	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	**ATU13058**	
ECTS Credits	**3**	
SWL (hr/sem)	**75**	

Module Level	3	**Semester of Delivery**	5
Administering Department	ATU13	**College**	TEC
Module Leader	Name: **Dina Ali Abdulrazzaq**	**e-mail**	dinaaliabdalrazaq@gmail.com
Module Leader's Acad. Title	Assistant 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	01/06/2026	**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	In this course, the student will be able to understand the basic meaning of different types of combined stresses and strains. The student will learn the equations and formulas necessary to analyze the combined stresses in engineering structures and also will be able to draw the Mohr circle which can make the student more familiar with engineering problems
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	61. Learn the different types of combined engineering stresses and strains 62. Learn to draw Mohr circle for stress and strain 63. Deal with various types of torsion stress 64. Learn how to analyze rosettes strain gauge 65. Define the elastic failure theories
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Combined stress and strain Combined Engineering stresses and strains, mohr circle . [20 hrs] Part B – Torsional stresses (20hrs) Part C- Elastic failure theories analysis (10hrs). Part C- Short columns [5 hrs] Part D- Euler equation for short columns [10hrs] Part E-Rosettes stain gauges [10hrs]
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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #3, #4 and #9, #10
	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	All
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 1-3	**Torsion of Circular Shaft** -Study the pure torsion for solid and hollow circular shafts -Study the stress induced due to torsion -Study the angular deformation induced due to torsion
Week 4-5	**Stress Transformation** - Plane stress Transformation - General Equation of Plane stress Transformation
Week 6-7	**Mohr's Circle for stress** -Graphical representation of stress at a point using Mohr's circle -Systematic procedure of graphical representation of stresses at a point using Mohr's circle
Week 8-9	**Strain Transformation** - Plane strain Transformation - General Equation of Plane strain Transformation
Week 10	**Mohr Circle for strain transformation**
Week11	**Strain Rosettes**
Week 12-13	**Theories of Failure**
Week 14-15	**Short Columns** -Study the stress induced in Short Columns -Euler equation

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Tension Test
Week 3-4	Compression Test
Week 5-6	Hardness Test
Week 6-7	Impact Test
Week 8-9	Bending Test
Week 10-11	Heat Treatment
Week 12-13	Torsion Test
Week 14-15	Fatigue Test

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Mechanics of Materials R.C Hibbler	Yes
Recommended Texts	Mechanics of Materials E J Hearn	No
Websites		

Third Year / Sixth semester

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	Aerodynamics: Applications	Module Delivery
Module Type	Core learning activities	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	ATU13061	
ECTS Credits	4	
SWL (hr/sem)	100	

Module Level	3	Semester of Delivery	6
Administering Department	ATU13	College	TEC
Module Leader	Name: Ali Yasir Hasan	e-mail	aliyasir1961@gmail.com
Module Leader’s Acad. Title	Lech.	Module Leader’s Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	E-mail
Scientific Committee Approval Date	01/06/2026	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	14. Understand the incompressible flow over airfoils and wings. 15. Understand main characteristics of air foils . 16. Understanding the lift optimization methods. 17. To build basic understanding of lift control devices. 18. To build basic understanding of propellers. 19. To build basic understanding of computational fluid dynamics.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 66. Recognize the main characteristics of flow over airfoils and wings. 67. Understand different theories of airfoil design. 68. Discuss the main tests and parameters of airfoils. 69. Discuss the maximum lift parameters. 70. Understanding wing stall. 71. Discuss the lift control devices. 72. Recognize the propellers main parameters and theory. 73. Recognize the blade theory. 74. Discuss the propeller performance. 75. Understand the concepts of computational fluid dynamics. 76. Discuss the method used in airfoil and wing designs.		
Indicative Contents المحتويات الإرشادية	Indicative content includes the following.		

	Part A: incompressible flow over airfoils and wings - **Kutta condition** - **Thin airfoil theory.** **Part B : propellers** **Part C : componential fluid dynamics**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	3,5,8,11,13 and 15	LO #2, #4, #7, #8 and #10, #11

	Assignments	2	10% (10)	2 and 12	LO #1, #5 and #9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6, #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	Incompressible flow over airfoils, Kutta condition
Week 2	Thin airfoil theory
Week 3	Airfoil characteristics
Week 4	Airfoil maximum lift characteristics
Week 5	Incompressible flow over wings
Week 6	Finite wing theory
Week 7	Wing stall
Week 8	Lift control devices
Week 9	Propellers: momentum theory
Week 10	Propellers: simple blade element theory.
Week 11	Propellers: combined blade and momentum theory

Week 12	Propellers: performance
Week 13	Componential fluid dynamics
Week 14	Introduction to panel methods for airfoils
Week 15	**Introduction to panel method for wings**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 3	Lab 1: stream flow visualizing
Week 5	Lab 2: velocity distribution over airfoil
Week 9	Lab 3: velocity distribution over wings
Week 12	Lab 4: pressure distribution over wings

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Aerodynamics for Engineering Students by E. L. Houghton & P. W. Carpenter & Steven Collicott & Daniel Valentine	Yes
Recommended Texts	Understanding Aerodynamics: Arguing from the Real Physics by Doug McLean	yes
Websites		

Module Description Form

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">Mechanical Engineering Design-Applied</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Core</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13062</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">6</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">150</td></tr>
<tr><td colspan="2">Module Level</td><td>3</td><td colspan="2">Semester of Delivery</td><td>6</td></tr>
<tr><td colspan="2">Administering Department</td><td></td><td>College</td><td colspan="2"></td></tr>
<tr><td>Module Leader</td><td colspan="2">Name: Abbas Ahmed Ayoob</td><td>e-mail</td><td colspan="2">dr.abbas.alasady@gmail.com</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>lecturer</td><td colspan="2">Module Leader’s Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td colspan="2"></td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td></td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>1/06/2026</td><td>Version Number</td><td colspan="2">2.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="3"></td><td>Semester</td><td></td></tr>
<tr><td>Co-Requisites module</td><td colspan="3"></td><td>Semester</td><td></td></tr>
<tr><td colspan="6">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td colspan="5">1. Enabling the students to use the bases of advanced mechanical design.
2. Enhancing the design applications through exploiting the computer aided design and optimizing the final model.</td></tr>
</table>

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Building a strong designer contribute to select: suitable material, influential design, economic mechanical system, and good planning steps with low cost and minimum time.
Indicative Contents المحتويات الإرشادية	**The indicative contents of this subject are:** **Part (A) Design Applications: Shaft** Material Used for Shafts, Manufacturing of Shafts, Types of Shafts, Standard Sizes of Transmission Shafts, Shafts Subjected to Combined Twisting Moment and Bending Moment, Shafts Subjected to Fluctuating Loads, Shafts Subjected to Axial Load in addition to Combined Torsion and Bending Loads, Design of Shafts on the basis of Rigidity. **(3 hrs)** **Part (B) Design Applications: Levers** Lever concept, Hand Levers, Foot Lever, Cranked Lever, Lever for a Lever Safety Valve, Bell Crank Lever, Rocker Arm for Exhaust Valve, Miscellaneous Levers. **(3 hrs)** **Part (C) Design Applications: Column and Strut** Classification of Pressure Vessels, Failure of a Column or Strut, Types of End Conditions of Columns, Euler's Column Theory, Assumptions in Euler's Column Theory, Euler's Formula, Slenderness Ratio, Limitations of Euler's Formula, Equivalent Length of a Column, Rankine's Formula for Columns, Johnson's Formulae for Columns. **(3 hrs)** **Part (D) Design Applications: Power Screws** Types of Screw Threads used for Power Screws, Multiple Threads, Torque Required to Raise Load by Square Threaded Screws, Torque Required to Lower Load by Square Threaded Screws, Efficiency of Square Threaded Screws, Efficiency of Self Locking Screws, Coefficient of Friction, Acme or Trapezoidal Threads, Stresses in Power Screws, Design of Screw Jack, Differential and Compound Screws. **(3 hrs)** **Part (E) Design Applications: Belts** Belt Concept, Selection of a Belt Drive, Types of Belt Drives, Types of Belts, Material used for Belts, Working Stresses in Belts, Density of Belt Materials, Belt Speed, Coefficient of Friction Between Belt and Pulley, Standard Belt Thicknesses and Widths, Belt Joints, Types of Flat Belt Drives, Velocity Ratio of a Belt Drive, Slip of the Belt, Creep of Belt. **(3 hrs)** **Part (F) Design Applications: Chain** Relation Between Pitch and Pitch Circle Diameter, Velocity Ratio of Chain Drives, Length of Chain and Centre Distance, Characteristics of Roller Chains, Factor of Safety for Chain Drives, Power Transmitted by Chains, Number of Teeth on the Smaller or Driving Sprocket or Pinion, Principal Dimensions of Tooth Profile, Design Procedure of Chain Drive. **(3 hrs)** **Part (G) Design Applications: Flywheel** Maximum Fluctuation of Energy, Coefficient of Fluctuation of Energy, Energy Stored in a Flywheel, Stresses in a Flywheel Rim, Stresses in Flywheel Arms, Design of Flywheel Arms, Design of Shaft, Hub and Key, Construction of Flywheels. **(3 hrs)**

<table>
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Part (H) Design Applications: Springs

Types of Springs, Material for Helical Springs, Standard Size of Spring Wire, Terms used in Compression Springs, End Connections for Compression Helical Springs, Stresses in Helical Springs of Circular Wire, Deflection of Helical Springs of Circular Wire, Eccentric Loading of Springs, Buckling of Compression Springs, Surge in Springs, Energy Stored in Helical Springs of Circular Wire. **(3 hrs)**

Part (I) Design Applications: Clutches

Types of Clutches, Considerations in Designing a Friction Clutch, Design of a Disc or Plate Clutch, Multiple Disc Clutch, Cone Clutch, Design of a Cone Clutch, Centrifugal Clutch. **(3 hrs)**

Part (J) Design Applications: Brakes

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, Differential Band Brake, Internal Expanding Brake. **(3 hrs)**

Part (K) Design Applications: Bearings

Classification of Bearings, Properties of Lubricants, Terms used in Hydrodynamic Journal Bearing, Bearing Characteristic, Coefficient of Friction for Journal Bearings, Basic Static Load Rating of Rolling Contact Bearings, Static Equivalent Load for Rolling Contact Bearings, Reliability of a Bearing. **(9 hrs)**

</td></tr>
<tr><td colspan="2">Learning and Teaching Strategies
استراتيجيات التعلم والتعليم</td></tr>
<tr><td>Strategies</td><td>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 CAD techniques using SOLIDWORKS to create an un-boring education environment.</td></tr>
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<table>
<tr><td colspan="4">Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</td></tr>
<tr><td>Structured SWL (h/sem)
الحمل الدراسي المنتظم للطالب خلال الفصل</td><td>78</td><td>Structured SWL (h/w)
الحمل الدراسي المنتظم للطالب أسبوعيا</td><td>5</td></tr>
<tr><td>Unstructured SWL (h/sem)
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الحمل الدراسي غير المنتظم للطالب أسبوعيا</td><td>3</td></tr>
<tr><td>Total SWL (h/sem)</td><td colspan="3">150</td></tr>
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الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (0)	all	
	Assignments	2	10% (30)	6, 9, 12	
	Projects / Lab.	2	10% (10)	5 and 10	
	Report	1	10% (0)	all	
Summative assessment	Midterm Exam	1	10% (20)	7	
	Final Exam	1	50% (40)	15	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Shaft design concept.
Week 2	Levers design concept.
Week 3	Column and strut design.
Week 4	Power Screw concept.
Week 5	Belt drive concept.
Week 6	Chain drive design.
Week 7	Mid Exam.
Week 8	Flywheel design.
Week 9	Spring design and concept.
Week 10	Clutches design.

Week 11	Brakes design.
Week 12	Bearing design.
Week 13	Bearing design.
Week 14	Bearing design.
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Solidworks-Excel Design Integrated: Computing shaft and modeling.
Week 2	Solidworks-Excel Design Integrated: Computing Levers and modeling.
Week 3	Solidworks-Excel Design Integrated: Column deflection.
Week 4	Solidworks-Excel Design Integrated: Computing Power Screw and modeling.
Week 5	Solidworks-Excel Design Integrated: Computing belts and pulley and modeling.
Week 6	Solidworks-Excel Design Integrated: Computing Chains and modeling.
Week 7	Mid Exam.
Week 8	Solidworks-Excel Design Integrated: Computing Flywheel and modeling.
Week 9	Solidworks-Excel Design Integrated: Computing Spring and modeling.
Week 10	Solidworks-Excel Design Integrated: Computing Clutches and modeling.
Week 11	Solidworks-Excel Design Integrated: Computing Heat generated in brake.
Week 12	Solidworks-Excel Design Integrated: Computing Bearing hole and modeling.
Week 13	Solidworks-Excel Design Integrated: Computing Ball bearing and modeling.
Week 14	Solidworks-Excel Design Integrated: Bearing system assembly.

Week 15	Final practical exam

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		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Heat Transfer**		**Module Delivery**		
Module Type	**Core**		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	**ATU13063**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	. 3		**Semester of Delivery**	6	
Administering Department	ATU13		**College**	TEC	
Module Leader	Name: **Yasin Khdear Salman**		**e-mail**	yksalman06@yahoo.com	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**	E-mail: Inj.adel@atu.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	

Scientific Committee Approval Date	01/06/2026	**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	20. To develop problem-solving skills and an understanding of methods of heat transfer through the application. 21. To understand conduction, convection, and radiation heat transfer 22. This course deals with the basic concept of fins. 23. This is an essential subject for all thermal applications. 24. To perform mesh and Node analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	77. Recognize how the heat is transferred by three methods 78. Define the Fourier's law, Newton’s law of cooling and Stefan–Boltzmann law. 79. Explain the general Heat Conduction Equation 80. Summarize what is meant by the Boundary and Initial Conditions 81. Discuss the type of heat exchangers. 82. Describe the convection heat transfer systems
Indicative Contents	Indicative content includes the following.

المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

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	Introduction - General concepts and definitions - Heat conduction - Convective heat transfer - Thermal radiation
Week 2	Conduction heat transfer (general equation) - General heat conduction equation - One-dimensional, steady state, conduction through plane wall, Conduction heat transfer (1-D, steady state) - Composed wall - Cylinder, composed cylinder - Sphere, composed sphere
Week 3	Conduction heat transfer (1-D, steady state, with heat generation) in - Plane wall - Composed wall - Solid cylinder - Hollow cylinder - Sphere - Critical thickness of insulation,
Week 4	Heat transfer through extended surfaces (fins) - General equation for temperature distribution. - Very long fin - short fin - End insulated fin - Effectiveness of the fin - Applications for previous subjects
Week 5	unsteady state heat conduction equation, lumped system analysis, Transient Heat Conduction in Large Plane Walls, Long Cylinders, and Spheres with Spatial Effects, Formulation of One-Dimensional Transient Temperature Distribution. T (x, t), Approximate Analytical Solution, Approximate Graphical Solution

Week 6	Transient Heat Conduction in Semi-infinite Solids, Sudden Change in Surface Temperature, Suddenly Imposed Surface Heat Flux, Specified surface heat flax, Suddenly Imposed Convection Boundary condition
Week 7	Transient Heat Conduction in Semi-infinite Solids, Sudden Change in Surface Temperature, Suddenly Imposed Surface Heat Flux, Specified surface heat flax, Suddenly Imposed Convection Boundary condition
W eek 8	Transient Heat Conduction in Semi-infinite Solids, Sudden Change in Surface Temperature, Suddenly Imposed Surface Heat Flux, Specified surface heat flax, Suddenly Imposed Convection Boundary condition
Week 9	Convective heat transfer - Fluid flow background - Laminar and turbulent flow - Boundary layer growth for external flow and internal flow, Forced convection - Energy equation -
Week 10	Convective heat transfer - Fluid flow background - Laminar and turbulent flow - Boundary layer growth for external flow and internal flow, Forced convection - Energy equation
Week 11	Convective heat transfer - Fluid flow background - Laminar and turbulent flow - Boundary layer growth for external flow and internal flow, Forced convection - Energy equation
Week 12	Heat exchanger - General concepts - Types of heat exchangers - Heat exchangers performance by LMTD method - Heat exchanger's effectiveness. - NTU method
Week 13	Heat exchanger - General concepts - Types of heat exchangers - Heat exchangers performance by LMTD method - Heat exchanger's effectiveness. - NTU method
Week 14	Heat exchanger - General concepts - Types of heat exchangers - Heat exchangers performance by LMTD method - Heat exchanger's effectiveness. - NTU method
Week 15	Heat exchanger - General concepts - Types of heat exchangers - Heat exchangers performance by LMTD method - Heat exchanger's effectiveness. - NTU method
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Thermal conductivity
Week 2	Lab 2: Pin Fins
Week 3	Lab 3: Fins
Week 4	Lab 4: forced convection 1
Week 5	Lab 5: forced convection2
Week 6	Lab 6: Free convection
Week 7	Lab 7: Heat exchangers

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Heat Transfer A Practical Approach, YUNUS A. CENGEL, McGraw-Hill Education	Yes
Recommended Texts	**Heat Transfer,** J. P. Holman	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Gas Turbine Engines			Module Delivery	
Module Type	Core learning activities			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	ATU13064				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	3		Semester of Delivery		6
Administering Department	TATU13		College	TTEC	
Module Leader	Name: **Taif Mahdi Oudah**		e-mail	Taifmahde96@gmail.com	
Module Leader's Acad. Title	Asst. Lech.		Module Leader's Qualification		MSc.
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name	Name		e-mail	E-mail	
Scientific Committee Approval Date	01/6/2026		Version Number	1.0	
Relation with other Modules العلاقة مع المواد الدراسية الأخرى					
Prerequisite module			Semester		

<table>
<tr><td>Co-requisites module</td><td></td><td>Semester</td><td></td></tr>
<tr><td colspan="4">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td colspan="3">25. Gain knowledge about the most type of gas turbine engines for single and double spool.
26. This course deals with the gas turbine engine construction (Intake, Fan/ Propeller/ Rotor, Compressor, Combustion section, Turbine section, Afterburner, jet pipe, Nozzle)
27. To understand and knowledge of operation principle and thermodynamic cycle analysis of aircraft propeller engines.
28. To understand and knowledge of operation principle and thermodynamic cycle analysis of turbojet and turbofan engines.
29. To develop problem solving skills of shaft power for the (shaft based) gas turbine engines.
30. To develop deriving and problem solving skills of thrust power for the (reaction) gas turbine engines.
31. Understand and knowledge the function and operation of auxiliary power units (APUs)
32. To develop the skill of troubleshoot for a gas turbine engine mechanic.</td></tr>
<tr><td>Module Learning Outcomes

مخرجات التعلم للمادة الدراسية</td><td colspan="3">Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.
83. Recognize the types of aircraft gas turbine engines.
84. Understand the engine power augmentation systems.
85. Understand and knowledge the function and operation of auxiliary power units (APUs)
86. Recognize the difference between single spool and double spool gas turbine engines.
87. Recognize the difference in thermodynamic analysis between the shaft base engines and the reaction engines.
88. Understand how thrust power is generated in the different types of aircraft gas turbine engines.
89. Ability to calculate the engine speed and thrust power in gas turbine engines (turboprop).
90. Ability to calculate the shaft power in gas turbine engines (turboshaft).</td></tr>
</table>

	91. Ability to calculate the engine speed and thrust power in gas turbine engines (turbojet and turbofan). 92. Identify the function and thermodynamic analysis of each major part of gas turbine engines (Intake, Fan/ Propeller/ Rotor, Compressor, Combustion section, Turbine section, jet pipe, Nozzle).
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: **Part A - Power Augmentation Systems** • Operation and applications • Water injection • Afterburner systems - Gas turbine (shaft-based) engines • Turboprop engines (Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller) • Turboshaft (Helicopter) engines (Arrangements, drive systems, reduction gearing) - Gas turbine (turbine-based) engines • Turbojet engines • Bypass (turbofan) engines - Auxiliary Power Units (APUs) (Purpose, operation, Configuration). **Part B – Thermodynamic Cycle Analysis of Gas turbine (shaft-based) engines** - Turboprop engines (single and double spool) - Turboshaft (Helicopter) engines (single and double spool) **Part C – Thermodynamic Cycle Analysis of Gas turbine (turbine-based) engines** - Turbojet engines (single and double spool) - Bypass (turbofan) engines (single and double spool)
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 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	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

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 / lap.	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	Engine Indication: Exhaust Gas Temperature/Interstage Turbine Temperature; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Air and Fuel flow; Engine speed.
Week 2	Power augmentation systems - Operation and applications - Water injection - Afterburner
Week 3	Operation principle and thermodynamic cycle analysis of gas turbine (shaft-based) turboprop engines (single and double spool)
Week 4	Applications to single and double spool turboprop engines.
Week 5	Auxiliary Power Units (APUs) (Purpose, operation, Configuration).
Week 6	Operation principle and thermodynamic cycle analysis of gas turbine (shaft-based) turboshaft helicopter engines (single spool)
Week 7	Applications to single spool turboshaft helicopter engines
Week 8	Thermodynamic cycle analysis of double turboshaft helicopter engines.
Week 9	Applications to double spool turboshaft helicopter engines.

Week 10	Operation principle and thermodynamic cycle analysis of gas turbine (turbine-based) turbojet engines (single spool)
Week 11	Applications to single spool turbojet engines.
Week 12	Thermodynamic cycle analysis of double spool turbojet engines.
Week 13	Applications to thermodynamic cycle analysis of double spool turbojet engines.
Week 14	Operation principle and thermodynamic cycle analysis of forward fan unmixed flow turbofan engine
Week 15	Applications to forward fan unmixed flow turbofan engine
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly workshop Syllabus) المنهاج الاسبوعي للورشة	
	Material Covered
Week 2	Workshop 1: Operation of turboprop engine start systems.
Week 3	Workshop 2: Turboprop engines (Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller)
Week 5	Workshop 3: Operation of turboshaft helicopter engine start systems.
Week 6	Workshop 4: Turboshaft (Helicopter) engines (Arrangements, drive systems, reduction gearing)
Week 10	Workshop 5: Operation of turbojet engine start systems.
Week 11	Workshop 6: Turbofan, Turbojet engine (Intake, Fan, Compressor, Combustion section, Turbine section, Afterburner)
Week 12	Workshop 7: Fuel and ignition systems

Week 13	Workshop 8: Gearbox: Purpose, lubrication system

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Aircraft Propulsion and Gas Turbine Engines (Ahmed F. El-Sayed).	Yes
Recommended Texts	Fundamentals of Aircraft and Rocket Propulsion (Ahmed F. El-Sayed).	No
Websites	- http://part66.blogspot.com/2012/05/module-5-digital-techniques-electronic.html# - https://www.aviationonline.co.uk/part66Syllabus.htm	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**Gas Dynamics-Applied**	**Module Delivery**
Module Type	**Core**	☒ **Theory** ☐**Lecture** ☐**Lab** ☒ **Tutorial** ☐ **Practical**
Module Code	**ATU13065**	
ECTS Credits	**4**	
SWL (hr/sem)	**100**	

		☐ Seminar

Module Level	3	**Semester of Delivery**	6
Administering Department	ATU!3	**College**	TEC
Module Leader	Name **Mohammed Ajmi Mahan**	**e-mail**	mohamedalshamary43@gmail.com
Module Leader's Acad. Title	Ass.Lech.	**Module Leader's Qualification**	MSc.
Module Tutor		**e-mail**	
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	01/06/2026	**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	33. Understand the difference between ideal and real fluid. 34. Know the main difference between stream and potential flow. 35. Understanding the flow patterns. 36. To build basic understanding of Navier-stoke. 37. To build basic understanding of boundary layer. 38. To build basic understanding of separation on wings.
Module Learning Outcomes	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.

مخرجات التعلم للمادة الدراسية	93. Recognize the main difference between fluids. 94. Ability to analyses the flow using continuity equation and vorticity equation. 95. Derive and use the stream function to describe the flow patterns. 96. Discuss the application of stream and potential flow. 97. Recognize the difference between basic and super impose flow patterns. 98. Derive and use Navier -stoke equation and it is application. 99. Recognize the flow properties between parallel plates. 100. Recognize the types of boundary layers. 101. Discuss the application of the boundary layer. 102. Calculate the drag and lift in laminar and turbulent boundary layer. 103. Discuss the separation and pressure drag.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A: potential flow** - **Potential flow theory, continuity equation, vorticity flow.** - **Basic concept in potential flow.** - **Basic flow patterns.** - **Superimpose of basic flow** **Part B : Navier- stoke equation** - **Laminar flow between parallel plates.** - **Couette flow** **Part C : boundary layer theory** - Displacement, - Momentum equation for the boundary layer. - Transient of boundary layer - Separation and pressure drag
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	

Strategies	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 للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	3,5,8,11,13 and 15	LO #2, #4, #7, #8 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #1, #5 and #9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6, #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	**Introduction to Non-Isentropic Flow** • Review of Isentropic Flow Concepts • Causes of Non-Isentropic Behavior • Types of Non-Isentropic Processes: Shocks, Friction, Heat Transfer • Thermodynamic Perspective of Entropy Rise
Week 2	**Normal Shock Waves – Fundamentals** • Shock Waves, definitions and types • Conservation Equations Across a Shock
Week 3	**Normal Shock Waves – Governing Equations** • Governing Equations (Continuity, Momentum, Energy) • Normal Shock Relations (Mach Number, Pressure, Temperature, Density Ratios)
Week 4	**Normal Shock Waves – Applications** • Shock Tables • Area-Mach Number Relationship with Shocks • Use of Normal Shocks in Supersonic Inlets
Week 5	**Oblique Shock Waves – Theory** • Oblique Shock Formation: Wedges and Compression Corners • Shock Angle, Flow Deflection Angle, and Mach Number Relationship • θ-β-M Diagram • Strong vs Weak Shocks

Week 6	**Shock Waves – Practice Problems**
Week 7	**Fanno Flow – Introduction** • Adiabatic Flow with Friction in a Constant Area Duct • Fanno Line on h-s and T-s Diagrams
Week 8	**Fanno Flow – Governing Equations** • Governing Equations and Assumptions • Fanno Flow Equations • Fanno Tables
Week 9	**Fanno Flow – Detailed Analysis** • Flow Choking in Ducts due to Friction • Applications in Pipe and Nozzle Design
Week 10	**Rayleigh Flow – Introduction** • Heat Addition in Constant Area Ducts • Rayleigh Line on h-s and T-s Diagrams • Governing Assumptions and Applications
Week 11	**Rayleigh Flow – Detailed Analysis** • Rayleigh Flow Equations • Effect of Heat Addition/Removal on Flow Properties • Flow Choking due to Heat Addition • Applications in Combustion Chambers and Heat Exchangers
Week 12	**Shock Tube and Wave Propagation** • Working Principle of Shock Tubes

	• Wave Diagrams: Incident, Reflected, Transmitted Waves • Experimental Applications in Supersonic Flow Testing
Week 13	**Duct Flow with Multiple Effects** • Duct Flow with Combined Shock, Friction, and Heat • Sequential Process Analysis (e.g., shock + Fanno, Rayleigh + shock) • Real Engineering Examples (e.g., Rocket Nozzles, Gas Turbines)
Week 14	**Review of Non-Isentropic Flow Applications** • Flow Separation in Supersonic Diffusers • Gas Dynamics in High-Speed Wind Tunnels • Supersonic and Hypersonic Flight Challenges
Week 15	**Final Review and Case Studies** • Summary of All Flow Models • Comparison between Isentropic, Shock, Fanno, and Rayleigh Flows • Case Study: Supersonic Intake Design • Problem-Solving Session and Q&A
Week 16	**Preparatory week before the final Exam**

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

Week 9	
Week 12	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Modern Compressible Flow" by John D. Anderson	No
Recommended Texts	Gas Dynamics" by E. Rathakrishnan	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Digital Techniques & Electronic Instrument System**		**Module Delivery**		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	**ATU13066**				
ECTS Credits	**4**				
SWL (hr/sem)	100				
Module Level	3		**Semester of Delivery**		6
Administering Department	3		**College**	1	
Module Leader	Name: Abd-Alrazak Kshash		**e-mail**		

Module Leader's Acad. Title	Ass. Lech.		**Module Leader's Qualification**		MSc.
Module Tutor			**e-mail**		
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2026		**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	• To understand the fundamentals of digital systems and logic design. • To learn the architecture and applications of data acquisition systems. • To understand electronic instrumentation systems used in measurement and control. • To familiarize with sensors, signal conditioning, and ADC/DAC interfaces.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. **Understand and Apply Number Systems & Boolean Logic** ○ Explain binary, octal, decimal, and hexadecimal number systems and perform conversions. ○ Interpret and simplify Boolean expressions using algebraic methods and Karnaugh Maps. 2. **Design and Analyze Digital Logic Circuits** ○ Implement combinational circuits such as adders, multiplexers, and decoders.

	○ Demonstrate understanding of sequential logic elements such as flip-flops, counters, and shift registers. 3. **Explain Data Conversion Techniques** ○ Describe the operation and characteristics of ADCs and DACs. ○ Interface ADC/DAC components with microcontrollers or systems. 4. **Utilize and Interface Sensors** ○ Identify and classify different types of sensors used in measurement systems. ○ Implement signal conditioning circuits for sensor integration. 5. **Understand Electronic Instrumentation Systems** ○ Illustrate the block diagram of a typical instrumentation system. ○ Discuss the characteristics of measurement systems and sources of error. 6. **Operate Electronic Measuring Instruments** ○ Use digital multimeters, oscilloscopes (CRO, DSO), and function generators effectively. ○ Analyze waveforms and electrical parameters using electronic instruments. 7. **Apply Knowledge in Real-world Applications** ○ Integrate smart sensors in instrumentation applications (e.g., biomedical or industrial domains). ○ Demonstrate basic IoT-based measurement and monitoring systems.
Indicative Contents المحتويات الإرشادية	1. **Number Systems & Codes** ○ Binary, Octal, Decimal, Hexadecimal conversions ○ Signed numbers: 1's and 2's complement ○ Binary arithmetic and coding systems (BCD, Gray) 2. **Boolean Algebra & Logic Gates** ○ Boolean postulates and theorems

	◦ Logic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR ◦ Simplification using Karnaugh Maps (2 to 4 variables) **3. Combinational Circuits** ◦ Half Adder, Full Adder, Subtractor ◦ Multiplexers, Demultiplexers ◦ Encoders, Decoders ◦ Design of simple logic systems **4. Sequential Circuits** ◦ Flip-Flops: SR, JK, D, T (characteristics, excitation tables) ◦ Counters: Asynchronous and Synchronous ◦ Shift Registers: Serial-in/serial-out and parallel configurations **5. Data Conversion Techniques** ◦ Analog-to-Digital Converters (ADC): Flash, SAR ◦ Digital-to-Analog Converters (DAC): R-2R Ladder, Weighted Resistor ◦ Resolution, accuracy, and quantization error **6. Sensors & Transducers** ◦ Classification: Active/Passive, Analog/Digital ◦ Sensors: RTD, Thermocouple, LVDT, Strain gauge, Light sensors ◦ Selection criteria and sensor characteristics **7. Signal Conditioning** ◦ Amplification, Filtering, Isolation ◦ Op-Amp configurations for sensor interfacing ◦ Importance of noise reduction and impedance matching **8. Instrumentation Systems** ◦ Block diagram and components of instrumentation systems ◦ Static and dynamic characteristics ◦ Errors in measurement and calibration techniques **9. Electronic Instruments** ◦ Digital Multimeter (DMM): Functions and operation ◦ Cathode Ray Oscilloscope (CRO) and Digital Storage Oscilloscope (DSO) ◦ Function Generator, Logic Analyzer **10. Display & Interface Devices** ◦ Display technologies: 7-segment, LCD, OLED ◦ Basics of data acquisition systems (DAQ) ◦ Interfacing sensors and ADC/DAC with microcontrollers **11. Applications & Emerging Trends** ◦ Industrial and biomedical instrumentation case studies ◦ Smart sensors and IoT-based instrumentation systems ◦ Overview of LabVIEW, MATLAB, and Arduino applications
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course employs a blended teaching strategy combining conceptual lectures, hands-on laboratory sessions, and demonstration-based learning to ensure a strong foundation in digital techniques and electronic instrumentation systems. Lectures are

	interactive and supported by visual aids and simulations, while lab sessions provide practical experience using instruments like CROs, multimeters, sensors, and microcontrollers. Students participate in mini-projects and group activities that promote collaboration and develop practical problem-solving skills in real-world contexts. Case studies, assignments, and the integration of tools such as Arduino, MATLAB, and LabVIEW further reinforce learning. Continuous assessment through quizzes, lab evaluations, and feedback ensures progressive improvement and application-oriented understanding.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	3,5,8,11,13 and 15	LO #2, #4, #7, #8 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #1, #5 and #9
	Projects	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6, #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	**1: Number Systems** • Binary, Octal, Decimal, Hexadecimal conversions • Signed numbers, 1's and 2's complement
Week 2	**2: Logic Fundamentals**

	• Boolean Algebra, Logic Gates, De Morgan's Theorems • Simplification using Karnaugh Maps (up to 4 variables)
Week 3	**3: Combinational Logic Design (Adders)** • Adders: Half and Full Adders
Week 4	4: **Combinational Logic Design (Multiplexers)** • Multiplexers, Demultiplexers, Encoders, Decoders • Design examples using logic gates and combinational circuits
Week 5	**5: Sequential Logic Circuits (Flip-Flops)** • Flip-Flops: SR, JK, D, T, and Master-Slave
Week 6	**6:Sequential Logic Circuits (Counters)** • Counters (asynchronous and synchronous), Shift Registers • Introduction to Finite State Machines (FSMs)
Week 7	**7: Data Converters** • Analog to Digital Converters (ADC): Flash, SAR • Digital to Analog Converters (DAC): Weighted Resistor, R-2R
Week 8	**8: Data Interfacing** • Interfacing ADC/DAC with Microcontroller **basics**
Week 9	**9: Sensors and Transducers (Sensors)** • Classification: Active vs Passive, Analog vs Digital • Temperature (RTD, Thermocouple), Displacement (LVDT), Pressure, Light sensors
Week 10	**10: Sensors and Transducers (Transducers)** • Signal conditioning: Amplifiers, Filters, Isolation
Week 11	**11: Instrumentation Systems and Measurement (**instrumentation) • Block diagram of instrumentation systems • Static & dynamic characteristics of instruments
Week 12	**12: Instrumentation Systems and Measurement (Measurement)** • Errors in measurement: systematic & random • Data acquisition systems (DAQ): block diagram and working
Week 13	**13: Electronic Instruments & Display Devices (Instruments)** • Digital Multimeter (DMM), Cathode Ray Oscilloscope (CRO) • Digital Storage Oscilloscope (DSO) • Function Generator, Logic Analyzer
Week 14	**14: Electronic Instruments & Display Devices (Display)** • Display systems: 7-segment, LCD, OLED basics
Week 15	**15: Case Studies & Applications (Lecture 15)** • Industrial measurement & control systems • Biomedical instrumentation: ECG, BP Monitor • Smart sensors and IoT-based instrumentation systems

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Week	**1: Number System Conversion** 1. Implement conversion between Binary, Decimal, Octal, and Hexadecimal systems using a microcontroller or PC-based program. 2. Verify complement representations with binary inputs.
	2: Logic Gates and Boolean Expressions 1. Design and verify logic circuits using basic gates (AND, OR, NOT, NAND, NOR, XOR). 2. Use breadboard or simulation software (e.g., Multisim, Proteus).
	3: Combinational Logic Circuits
	1. Implement Half Adder and Full Adder using logic gates. 2. Verify outputs using LEDs or a digital logic simulator. **4: Multiplexers and Decoders** 1. Design and simulate 4:1 MUX and 2-to-4 decoder. 2. Verify the truth table using logic switches.
	5: Flip-Flop Circuits 1. Construct SR and JK Flip-Flops using ICs or simulate with logic software. 2. Analyze timing diagrams and state transitions.
	6: Counters and Shift Registers 1. Build a 4-bit asynchronous and synchronous counter. 2. Design a shift register and observe serial/parallel data movement.
	7: ADC Implementation 1. Interfacing an 8-bit ADC (e.g., ADC0808) with Arduino or microcontroller. 2. Measure analog voltages and convert to digital values.
	8: DAC Implementation 1. Construct a DAC using R-2R ladder network. 2. Generate analog waveform using microcontroller DAC outputs.
	9: Sensor Interfacing 1. Interface a temperature sensor (e.g., LM35 or RTD) with microcontroller. 2. Display sensor output on LCD or Serial Monitor.
	10: Signal Conditioning 1. Design a signal conditioning circuit using Op-Amps (amplifier, low-pass filter). 2. Test with different analog sensors.

	11: Instrumentation System Simulation 1. Model a basic instrumentation system using LabVIEW or MATLAB. 2. Simulate signal acquisition and processing.
	12: DAQ System 1. Build a data acquisition system using Arduino + PC interface. 2. Acquire and plot data from sensors in real-time.
	13: Digital Multimeter & CRO 1. Measure voltage, current, and resistance using a DMM. 2. Observe waveforms using CRO and understand controls.
	14: DSO and Signal Generators 1. Use DSO to capture fast-changing signals. 2. Generate different waveforms using a function generator and observe them.
	15: IoT and Instrumentation Application 1. Create a smart sensor project (e.g., temperature monitor using Node MCU + cloud). 2. Demonstrate basic IoT instrumentation with data logging.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Digital Electronics** • M. Morris Mano – Digital Design, Pearson • R.P. Jain – Modern Digital Electronics, McGraw-Hill • A. Anand Kumar – Fundamentals of Digital Circuits, PHI • Thomas L. Floyd – Digital Fundamentals, Pearson **Electronic Instrumentation & Measurement** • A.K. Sawhney – A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai • H.S. Kalsi – Electronic Instrumentation, McGraw-Hill • D.V.S. Murty – Transducers and Instrumentation, PHI • W.D. Cooper & A.D. Helfrick – Modern Electronic Instrumentation and Measurement Techniques, Pearson **Microcontrollers and PLCs**	Yes

	• Muhammad Ali Mazidi – The 8051 Microcontroller and Embedded Systems, Pearson • Hughes & John Ridley – Programmable Logic Controllers, Pearson	
Recommended Texts		yes
Websites	**Online Resources** • NPTEL: Digital Circuits by Prof. Santanu Chattopadhyay (IIT Kharagpur) • NPTEL: Electronic Measurements and Instrumentation by Prof. D.C. Dutta Majumder (IISc) • All About Circuits – https://www.allaboutcircuits.com • Electronics Tutorials – https://www.electronics-tutorials.ws	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**Numerical Analyses**		**Module Delivery**	
Module Type	**Basic learning activities**		☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13067**			
ECTS Credits	4			
SWL (hr/sem)	**100**			
Module Level	3		**Semester of Delivery**	6

Administering Department	ATU!3	**College**	TEC
Module Leader	Name: **Dina Ali Abdulrazzaq**	**e-mail**	dinaaliabdalrazaq@gmail.com
Module Leader's Acad. Title		**Module Leader's Qualification**	
Module Tutor		**e-mail**	
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	1/6/2026	**Version Number**	

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	8. Understanding the theoretical and practical aspects of the use of numerical methods 9. Implementing numerical methods for a variety of multidisciplinary applications 10. Establishing the limitations, advantages, and disadvantages of numerical methods. 11. Understand Fundamentals: Familiarize with basic concepts in numerical analysis, such as accuracy and errors. 12. Solve Equations: Learn methods for numerically solving algebraic and differential equations. 13. Data Analysis: Use numerical techniques to analyze data and interpret results. 14. Evaluate Algorithms: Assess the effectiveness and accuracy of algorithms used in numerical solutions. 15. Critical Thinking: Enhance critical thinking skills by analyzing results and understanding limitations.
Module Learning Outcomes	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.

مخرجات التعلم للمادة الدراسية	8. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems 9. perform curve fitting • explain the least square method • find the determined function using least square method 10. construct a function which closely fits given n- points in the plane by using interpolation method 11. integration by using Trapozoidal rule, Simpson's 1/3 – rule, and Simpson's 3/8 – rule. 12. Find the solution of ordinary differential equation of first order by Euler, and Runge-Kutta methods 13. Find the derivatives using Newton's forward difference formula, Newton's backward difference formula. 14. investigate the solution of a nonlinear equation • express the intermediate value theorem • find the solution of an equation by the fixed-point iteration • find the solution of an equation by the Newton-Raphson method
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** <u>Part A – **Matrix**:</u> Solution of equation by Gauss Sidle and Jacobian method Eigen Value & Eigen Vector <u>Solution of non-linear equations:</u> Simple iteration method + Bisection method, Newton Raphson Method <u>Part C: Curve fitting</u> - linear Regression - Applications of linear regression - Transformation of nonlinear regression to linear regression <u>Part D: Numerical interpolation</u> - Introduction - Linear interpolation - Quadratic interpolation <u>Part E: Numerical Integration</u> - Trapezoidal rule

	- Simpson Rule (1/3) - Simpson Rule (3/8) Part F: Solution of ordinary differential equations O.D.E. - Taylor series method - Simple Euler method - Modified Euler method - Runge-kutta method Part G: Finite differences method - Introduction to finite differences method -Forward and Backward and center expressions

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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	4,9and 14	LO #1, #2 and #3, LO #5, #6, #7 and #8 LO #11, #12 and #13
	Assignments	5	10% (10)	2 and 13	LO #3, #4, #5,#6, and #12
	Projects / Lab.	1	10% (10)	0	0
	Report	1	10% (10)	0	0
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	
Week	Material Covered
Week 1	**Solution of equation by Gauss Sidle and Jacobian method**
Week 2	**Eigen Value & Eigen Vector**
Week 3	**Simple iteration method + Bisection method** - Introduction - Description of methods - Examples

Week 4 &5	**Newton –Raphson method** - Derivation - Applications Square Roots Roots of an arbitrary order Reciprocal of any number
Week 6&7	**Curve fitting** - linear Regression - Applications of linear regression - Transformation of nonlinear regression to linear regression
Week 8	**Mid Exam**
Week 9&10	**Numerical interpolation** - Introduction - Linear interpolation - Quadratic interpolation
Week 11	**Numerical Integration** - trapezoidal rule - Simpson Rule (1/3) - Simpson Rule (3/8)
Week 12&13	**Solution of ordinary differential equations O.D.E.** - Taylor series method - Simple Euler method - Modified Euler method - Runge-kutta method
Week 14	**Finite differences method + Forward and Backward and center expressions** - Introduction to finite differences method - Derivation of formulas with equal step size

Week 15	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	10T H E D I T I O N ADVANCED ENGINEERING MATHEMATICS ERWIN KREYSZIG	No
Recommended Texts	Advanced Engineering Mathematics (6th Ed) Dennis G. Zill Advanced Engineering Mathematics, Stroud, Advanced Engineering Mathematics, Stroud	No
Websites	https://www.mathsisfun.com/	

Fourth year / seventh semester

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><th colspan="4">Module Information
معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td>Aircraft Structure –Fundamentals</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td>Core learning activities</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td>ATU13071</td></tr>
<tr><td>ECTS Credits</td><td>4</td></tr>
<tr><td>SWL (hr/sem)</td><td>100</td></tr>
<tr><td>Module Level</td><td>4</td><td>Semester of Delivery</td><td>7</td></tr>
<tr><td>Administering Department</td><td>ATU13</td><td>College</td><td>TEC</td></tr>
<tr><td>Module Leader</td><td></td><td>e-mail</td><td></td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Lecturer</td><td>Module Leader’s Qualification</td><td>MS.C</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/06/2026</td><td>Version Number</td><td>1.0</td></tr>
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<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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<table>
<tr><th colspan="2">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td>In this course, the student will get a basic definition of stress and principle stresses and use the Mohr circle to evaluate the compound stresses and strain. Two dimensions’</td></tr>
</table>

<table>
<tr><td></td><td>problems of elasticity will be given and how to use the stress function. The students will study the materials like steel alloys, titanium and composite materials that are widely used in aircraft structures with most important engineering tests. The structural components of aircraft will be discussed in detail and airworthiness.</td></tr>
<tr><td>Module Learning Outcomes

مخرجات التعلم للمادة الدراسية</td><td>1. Define stress, strain and stress-strain relationship
2. Discuss principle stress and Mohr Circle.
3. Using stress function and saint venant equations.
4. Recognize the most important materials that are used in aircraft structure.
5. Explain the engineering tests that are used for aircraft structure materials.
6. Define the main structural components and their functions.
7. Explain the methods that are used to fabricate the components of aircraft.
8. Define airworthiness and load factor determination.
9. Study the airframe loads and their calculations.</td></tr>
<tr><td>Indicative Contents
المحتويات الإرشادية</td><td>Indicative content includes the following.

<u>Part A – Introduction to stress and strain</u>
Stress, principle stress, equations of equilibrium and Mohr circle. [10 hrs]

<u>Part B-Two dimensions problem of elasticity</u>
_ Stress function, saint venant principle and bending of end of cantilever (10hrs)
<u>Part C- Materials</u> (10hrs).
Steel alloys, titanium, composite materials and aluminum. the main engineering tests such as tensile test, compression test, fatigue and creep.(10 hrs)
<u>Part D- Aircraft structural components</u>
Loads on structural components, functions of structural components and fabrication of structural components. (10 hrs).
<u>Part E – Airframe loads</u>
Symmetric maneuver loads, gust loads (8 hrs)</td></tr>
<tr><td colspan="2">Learning and Teaching Strategies
استراتيجيات التعلم والتعليم</td></tr>
<tr><td>Strategies</td><td>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.</td></tr>
</table>

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<tr><td colspan="4">Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</td></tr>
<tr><td>Structured SWL (h/sem)
الحمل الدراسي المنتظم للطالب خلال الفصل</td><td>48</td><td>Structured SWL (h/w)
الحمل الدراسي المنتظم للطالب أسبوعيا</td><td></td></tr>
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Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #4, #5 and #6,
	Assignments	2	10% (10)	8 and 12	LO #6, #7 and #8, #9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	all
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	Stress, principle stresses and principle strains
Week 2-4	Mohr Circle and experimental measuring of strains
Week 5-6	Two dimensions problems of elasticity
Week 7	Mid term exam
Week 8-9	Materials and engineering tests
Week 10-11	Structural components and their fabrication
Week12	Airworthiness
Week 13-14	Airframe loads
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Aircraft Structures for engineering students T. H. G. Megson	Yes

Recommended Texts		
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**Aircraft Vibration-free vibration**		**Module Delivery**	
Module Type	**Core**		☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13072**			
ECTS Credits	**4**			
SWL (hr/sem)	**100**			
Module Level	4		**Semester of Delivery**	7
Administering Department	ATU13		**College**	TEC
Module Leader	Name		**e-mail**	E-mail
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.
Module Tutor			**e-mail**	
Peer Reviewer Name	Name		**e-mail**	E-mail
Scientific Committee Approval Date	01/062026		**Version Number**	1.0

<table>
<tr><th colspan="4">Relation with other Modules

العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><th colspan="4">Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td colspan="3">In this course, students will learn about mechanical vibration in 1 DoF and 2 DoF systems. Students will learn the basic concepts of vibration, mathematical modeling of vibration systems, formulate equations of motion, and solve equations of motion to analyze vibration system response. Various mechanical vibration conditions are discussed in this course, among others, the response of the vibration of the system is not muffled and damped in the free condition of excitation or by force with various excitation. The goal is that students have the ability and experience to model and analyze mechanical vibration problems, especially in mechanical engineering, as well as learn to think critically about utilization in various other fields to provide the right decision.</td></tr>
<tr><td>Module Learning Outcomes

مخرجات التعلم للمادة الدراسية</td><td colspan="3">The student will:
1- Understand the engineering principles in mechanical systems to identify, formulate, and solve the problem of mechanical engineering.
2- Be able to find the source of engineering problems in mechanical systems through research that includes identification, formulation, analysis, and data interpretation based on engineering principles.
3- Be able to formulate solutions to engineering problems in mechanical systems by considering economy, safety, environment, and energy conservation.</td></tr>
<tr><td>Indicative Contents
المحتويات الإرشادية</td><td colspan="3">The focus of this course is as follows:
- basic concept of mechanical,
- Degree of freedom meaning,
- movement equation,
- Lagrange’s equation,</td></tr>
</table>

- Free undamped vibration response,

- Free damped vibration responses,

- Forced vibration,

- Base motion, transmissibility,

- Harmonic excitation, impulse, periodic excitation.

COURSE POLOCIES:

11. Attendance is expected at all classes.
12. Make-up examinations or quizzes will be given only for documented medical reasons, emergency circumstances, or University sponsored activities. Advance notice must be given well in advance for absence due to University sponsored activities.
13. Homework is assigned periodically in class and is due **at the beginning of class** on the day specified. Homework assignments will also appear on the web (Angel).
14. Late homework will not be accepted.
15. Homework will be done on an individual basis. You may check your results with others in the course, but the work done to solve the problems must be your own.
16. Short quizzes may be given periodically. Normally these quizzes will be announced.
17. Exams and quizzes will be closed book and closed notes. A one-page formula sheet (no worked problems) and use of a calculator is allowed.
18. You are advised to bring your calculator to class every day and you are responsible to make sure that it functions properly. Bring an extra set of batteries, or an extra calculator if necessary.
19. Engineers must adhere to a rigorous code of professional ethics. Unethical conduct in this class will result in the maximum disciplinary action permitted by the university. Unethical conduct in the class includes, but is not limited to, cheating on exams (this includes storing formulae and problem solutions within the memory of your calculator), and supplying information to others (students bear responsibility for ensuring the security of their examination papers).
20. Re-grading requests for exams must be submitted in writing within one week of the return of the exam outlining the specific concerns/questions. The entire exam may be re-graded, resulting in an increase or decrease in the final grade.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	In a mechanical vibration course, there are various learning and teaching strategies that can be employed to enhance student understanding and engagement. Here are some effective strategies commonly used : 6- Lectures: Lectures are a traditional teaching method where instructors present information to students. It allows for the delivery of foundational knowledge and theoretical concepts. To make lectures more interactive, instructors can incorporate multimedia presentations, demonstrations, and real-world examples. 7- Hands-on Projects and Experiments: Hands-on projects and experiments provide students with practical experience and promote active learning. These can include designing and building prototypes, conducting experiments in laboratories, or working on real-world case studies. Such activities help students develop problem-solving skills, enhance their understanding of theoretical concepts, and foster creativity. 8- Problem-based Learning: Problem-based learning involves presenting students with real or hypothetical problems related to mechanical engineering. Students work in groups to analyze and solve these problems, encouraging critical thinking, collaboration, and the application of knowledge. Instructors act as facilitators, guiding students through the problem-solving process. 9- Computer Simulations and Modeling: Computer simulations and modeling allow students to explore complex engineering systems and phenomena in a virtual environment. By using software tools, students can analyze and predict the behavior of mechanical systems, conduct simulations of experiments, and visualize concepts that are difficult to observe directly. 10- Group Discussions and Debates: Group discussions and debates provide an opportunity for students to share their perspectives, ask questions, and engage in critical analysis. This strategy encourages

	active participation, improves communication skills, and fosters a deeper understanding of concepts through peer interaction. 11- Industry Visits and Guest Speakers: Inviting industry professionals as guest speakers or arranging visits to manufacturing plants, research facilities, or engineering companies provides students with real-world exposure. They can learn about industry trends, gain insights into practical applications, and understand the relevance of their studies to the professional world.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	Bi-weekly	Every other lecture
	Assignments	2	10% (10)	Every week	Concludes the taken
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	All
	Midterm Exam	2hr	10% (10)	7	All

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1-2	**Introduction** - Basic concepts of vibration and applications - Calculation of degree of freedom for systems **Oscillatory motion** - Introduction to oscillatory motion - Simple harmonic motion - Displacement velocity and acceleration relations
Week 3-4	**Free vibration of an undamped single degree of freedom system** - Derivation of basic equation - Solving the eq. of motion and finding the natural frequency - Examples
Week 5-8	**Simple energy method (Raleigh principle)** - conservative and non-conservative systems

	- Applying the simple energy method for different systems to find eq. of motion and natural frequency
Week 9-12	**Free vibration of viscous damped** **single degree of freedom system** - Types of damping - Formulation and solving the equation of such system for different damping ratio - Examples **Equivalent springs and dampers** - Equivalent spring and damping for parallel and series connection - Examples
Week 13-15	**Logarithmic decrement** - Formulation of the basic eq. of logarithmic decrement - Calculation the time for the decay of signal - Examples
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Simple Oscillation

Week 2	Lab 2: Natural frequency of 1-DOF system
Week 3	Lab 3: Harmonic motion by direct force
Week 4	Lab 4: Harmonic motion by rotating unbalance
Week 5	Lab 5: Harmonic motion by base support
Week 6	Lab 6: 2-DOF system
Week 7	Lab 7: Harmonic motion of 2-DOF system

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	S. Rao, Mechanical Vibrations, 5th edition, Prentice Hall, 2011.	Yes
Recommended Texts	"Fundamentals of Vibrations" by Leonard Meirovitch	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><th colspan="6">Module Information
معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td colspan="3">A320 family, Airbus Aircraft system & Maintenance I</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Core</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☒ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13073</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td colspan="2">Module Level</td><td>4</td><td>Semester of Delivery</td><td colspan="2">7</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU13</td><td>College</td><td colspan="2">TEC</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Professor</td><td>Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Ali Sh. Baqir</td><td>e-mail</td><td colspan="2">E-mail: coj.alish@atu.edu.iq</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="2">1.0</td></tr>
<tr><th colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td colspan="3">None</td><td>Semester</td><td></td></tr>
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<table>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td colspan="4">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td colspan="3">39. Ensure safety and airworthiness: Guarantee the aircraft is safe to fly by maintaining its condition and meeting the standards of aviation authorities.
40. Perform technical tasks: Acquire the knowledge and skills to perform inspections, repairs, replacements, and modifications on aircraft systems.
41. Understand aircraft systems: Gain in-depth knowledge of how various aircraft systems operate, including mechanical, hydraulic, fuel, and electrical systems.
42. Manage maintenance programs: Learn how to create, manage, and optimize maintenance programs to enhance safety and productivity while controlling costs.
43. Adhere to regulations and standards: Understand and apply the rules and regulations set by international and national bodies like the FAA and EASA.
44. Apply troubleshooting and problem-solving: Develop the ability to identify, investigate, and formulate solutions for maintenance issues.
45. Utilize technical documentation: Learn to use digital technical documentation, engineering drawings, and other resources effectively.
46. Incorporate professional practices: Develop an awareness of professional ethics, leadership, teamwork, and the importance of continuous learning</td></tr>
<tr><td>Module Learning Outcomes</td><td colspan="3">Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.
10. 1. Apply the safe working practices associated with the care and</td></tr>
</table>

مخرجات التعلم للمادة الدراسية	control of tools and equipment used in the aircraft maintenance environment. 11. 2. Read and interpret aircraft engineering drawings and diagrams. 12. 3. Be responsible for the practices used to carry out Aircraft Workshop activities. 13. 4. Carry out metalwork exercises in the workshop. 14. 5. Describe the practical requirements of Electrical Wiring Interconnecting Systems (EWIS). 15. . Describe the practices and procedures necessary for aircraft weighing and balancing 16. Describe the maintenance practices and procedures directly associated with aircraft handling and storage 17. Discuss the techniques required to carry out proper disassembly, inspection, repair and assembly on aircraft, associated components and parts. 18. Describe the maintenance procedures and requirements to be followed in the event of abnormal occurrences during the flight. Explain the procedures and requirements associated with general Maintenance Procedures.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • **Daily, weekly, and pre-flight checks: Routine checks to ensure the aircraft is airworthy before each flight.** • **Preventive maintenance: Regular tasks to prevent future failures, such as lubrication, cleaning, and fluid replacement.** • **Component inspection:** ○ **Landing gear: Inspect tires, shock struts, and wheel bearings.** ○ **Empennage: Check the rudder, elevator, and stabilizers.** ○ **Engines: Inspect turbine blades, exhaust collectors, and igniter plugs.**

	○ **Fuel system: Check the fuel filter for contamination.** • **System checks: Inspect and test avionics, electrical systems, and communication equipment.** **Repair and servicing** • **Component repair: Dismantling, inspecting, testing, and reassembling engines, electrical systems, and structural parts.** • **Part replacement: Replacing small standard parts, oxygen system components, and other hardware.** • **Engine maintenance: Lubricating the propeller and cleaning spark plugs.** **Documentation and records** • **Maintenance logs: Keeping detailed records of all maintenance actions taken.** • **Airworthiness certification: Documenting history is essential for maintaining the aircraft's airworthiness and resale value.** **Specialized checks** • **"A, B, C, and D" checks: A classification system for different levels of heavy and light checks depending on the required maintenance.** • **Component-specific tasks: Tasks like draining fuel filters, inspecting magnetic chip detectors, or testing igniter plugs are based on their specific service intervals**
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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	22	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	3,5,8,11,13 and 15	LO #2, #4, #7, #8 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #1, #5 and #9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6, #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	**Aircraft systems** - Introduction - Basic definitions
Week 2	**Basic components used in aircraft mechanical systems** - Aircraft hardware - Pumps - Valves and pipes - Filters and cocks
Week 3	Fuel system components - Fuel system operating modes - Integrated civil aircraft systems
Week 4	Troubleshooting - Maintenance
Week 5	**Hydraulic system** - Hydraulic system components - Types of hydraulic systems used in the modern aircrafts
Week 6	Troubleshooting - Maintenance
Week 7	**Pneumatic system** - Pneumatic system components
Week 8	Troubleshooting - Maintenance

Week 9	**Environmental control systems** - The need for a controlled environment - Environmental control system design - Cooling systems - Air distribution system - Air conditioning system
Week 10	Oxygen system - cabin pressurization - De-ice systems
Week 11	Troubleshooting - Maintenance
Week 12	**Emergency systems** - Warning systems - Fire detection and suppression
Week 13	- Emergency power sources - Emergency oxygen - Emergency systems maintenance
Week 14	**Flight control systems** - Flight control surfaces - Flight control linkage systems - High lift control systems

	- Trim and feel - Flight control actuation - Fly-By-Wire control laws
Week 15	**Troubleshooting** **- Maintenance**
Week 16	**Preparatory week before the final Exam**
Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Aircraft Workshop:
Week 2	Aircraft Workshop:
Week 3	Aircraft Workshop:
Week 4	Aircraft Workshop:
Week 5	Aircraft Workshop:
Week 6	Aircraft Workshop:
Week 7	Aircraft Workshop:

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">Aircraft Heat Exchanger</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Core</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13074</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">3</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">75</td></tr>
<tr><td>Module Level</td><td>4</td><td colspan="2">Semester of Delivery</td><td colspan="2">7</td></tr>
<tr><td>Administering Department</td><td>ATU13</td><td>College</td><td colspan="3">TEC</td></tr>
<tr><td>Module Leader</td><td></td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Professor</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="3">1.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="3">None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td colspan="3">None</td><td>Semester</td><td></td></tr>
</table>

<table>
<tr><th colspan="4">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td colspan="3">1. To develop problem-solving skills and an understanding of methods of heat transfer through the application.
2. To understand conduction, convection, and radiation heat transfer
3. This course deals with the basic concept of fins.
4. This is an essential subject for all thermal applications.
5. To perform mesh and Node analysis.</td></tr>
<tr><td>Module Learning Outcomes
مخرجات التعلم للمادة الدراسية</td><td colspan="3">19. Recognize how the heat is transferred by three methods
20. Define the Fourier's law, Newton’s law of cooling and Stefan–Boltzmann law.
21. Explain the general Heat convection Equation
22. Summarize what is meant by the Boundary and Initial Conditions
23. Discuss the type of heat exchangers.
24. Describe the convection heat transfer systems</td></tr>
<tr><td>Indicative Contents
المحتويات الإرشادية</td><td colspan="3">Indicative content includes the following.</td></tr>
<tr><th colspan="4">Learning and Teaching Strategies
استراتيجيات التعلم والتعليم</th></tr>
<tr><td>Strategies</td><td colspan="3">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.</td></tr>
<tr><th colspan="4">Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</th></tr>
<tr><td>Structured SWL (h/sem)
الحمل الدراسي المنتظم للطالب خلال الفصل</td><td>48</td><td>Structured SWL (h/w)
الحمل الدراسي المنتظم للطالب أسبوعيا</td><td></td></tr>
<tr><td>Unstructured SWL (h/sem)</td><td>27</td><td>Unstructured SWL (h/w)</td><td></td></tr>
</table>

الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

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--3	**EXTERNAL FORCED CONVECTION**
Week 4-5	**INTERNAL FORCED CONVECTION**
Week 6-8	**NATURAL CONVECTION**

Week 9-15	Heat exchanger - General concepts - Types of heat exchangers - Fouling Factor- Heat exchangers performance by LMTD method - Heat exchanger’s effectiveness. - NTU method
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Pin Fins
Week 2	Lab 2: Fins
Week 3	Lab 3: forced convection 1
Week 4	Lab 4: forced convection2
Week 5	Lab 5: Free convection
Week 6	Lab 6: Heat exchangers

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Heat Transfer A Practical Approach, YUNUS A. CENGEL, McGraw-Hill Education	Yes
Recommended Texts	**Heat Transfer,** J. P. Holman	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Aircraft Design Fundamentals			Module Delivery	
Module Type	Core learning activity			☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	ATU13075				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	4	Semester of Delivery			7
Administering Department	ATU13	College	TEC		
Module Leader		e-mail			
Module Leader's Acad. Title	Asst. Pro. Dr.	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	01/06/2026	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	aircraft design course is about how aircraft designed and the related theoretical background which is the inevitable consequence of aeronautical engineer
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To give the basic concepts of design each part of aircraft like a. fuselage design b. wing design c. tail design d. undercarriage design 2. Know the distribution of the lifting force and its effect on the structure of the aircraft 3. Guess drag force
Indicative Contents المحتويات الإرشادية	**COURSE POLOCIES:** 21. Attendance is expected at all classes. 22. Make-up examinations or quizzes will be given only for documented medical reasons, emergency circumstances, or University sponsored activities. Advance notice must be given well in advance for absence due to University sponsored activities. 23. Homework is assigned periodically in class and is due **at the beginning of class** on the day specified. Homework assignments will also appear on the web (Angel). 24. Late homework will not be accepted. 25. Homework will be done on an individual basis. You may check your results with others in the course, but the work done to solve the problems must be your own. 26. Short quizzes may be given periodically. Normally these quizzes will be announced. 27. Exams and quizzes will be closed book and closed notes. A one-page formula sheet (no worked problems) and use of a calculator is allowed. 28. You are advised to bring your calculator to class every day and you are responsible to make sure that it functions properly. Bring an extra set of batteries, or an extra calculator if necessary. 29. Engineers must adhere to a rigorous code of professional ethics. Unethical conduct in this class will result in the maximum disciplinary action permitted by the university. Unethical conduct in the class includes, but is not limited to, cheating on exams (this includes storing formulae and problem solutions within the memory of your calculator), and supplying

	information to others (students bear responsibility for ensuring the security of their examination papers). 30. Re-grading requests for exams must be submitted in writing within one week of the return of the exam outlining the specific concerns/questions. The entire exam may be re-graded, resulting in an increase or decrease in the final grade.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	In a theory of flight course, there are various learning and teaching strategies that can be employed to enhance student understanding and engagement. Here are some effective strategies commonly used : 12- Lectures: Lectures are a traditional teaching method where instructors present information to students. It allows for the delivery of foundational knowledge and theoretical concepts. To make lectures more interactive, instructors can incorporate multimedia presentations, demonstrations, and real-world examples. 13- Hands-on Projects and Experiments: Hands-on projects and experiments provide students with practical experience and promote active learning. These can include designing and building prototypes, conducting experiments in laboratories, or working on real-world case studies. Such activities help students develop problem-solving skills, enhance their understanding of theoretical concepts, and foster creativity. 14- Computer Simulator and Modeling: Computer simulations and modeling allow students to explore complex engineering systems and phenomena in a virtual environment. By using software tools, students can analyze and predict the behavior of aircraft during fly. 15- Group Discussions and Debates: Group discussions and debates provide an opportunity for students to share their perspectives, ask questions, and engage in critical analysis. This strategy encourages active participation, improves communication skills, and fosters a deeper understanding of concepts through peer interaction. 16- Industry Visits and Guest Speakers: Inviting industry professionals as guest speakers or arranging visits to manufacturing plants, research facilities, or engineering companies provides students with real-world exposure. They can learn about industry trends, gain insights into

	practical applications, and understand the relevance of their studies to the professional world.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	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)		

<table>
<tr><th colspan="2">Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري</th></tr>
<tr><td></td><td>Material Covered</td></tr>
<tr><td>Week 1</td><td>Introduction,</td></tr>
<tr><td>Week 2</td><td>Airworthiness & Crashworthiness</td></tr>
<tr><td>Week 3</td><td rowspan="3">Fuselage design
- Main characteristics
- Fuselage design requirements
- Shape of fuselage
- Cabin cross section layouts
- Cabin cross-section dimensions
- Cabin length
- Cockpit
- Fuselage main dimensions
Quick method
General method
- Fuselage weight</td></tr>
<tr><td>Week 4</td></tr>
<tr><td>Week5</td></tr>
</table>

Week 6	**Wing design** - Basic requirements - Wing location
Week 7	- Wing geometric characteristics - Evaluation of wing size - Evaluation of SMC - Evaluation of MAC - Analytical method - Graphical method
Week 8	- Diagrammatical method - Airfoils, requirements & definitions - Airfoils coding - High lift devices - Wing aerodynamic characteristics - Lift coefficient increment due to T.E. flaps - Wing weight
Week 9	**Empennage design** - Tail surfaces functions - Types of surface control system
Week 10	- Tail surface configuration

<table>
<tr><td></td><td>- Horizontal tail plane
- Vertical tail plane
- Empennage weight</td></tr>
<tr><td>Week 11</td><td rowspan="3">Under-carriage design
- General requirements
- Runways classification
- Types of undercarriage
- Tailoring u.c. to bearing capacity of A/F
- LCN For single wheel
- LCN For two or more wheels
- Type, size and inflation pressure of tires
- Shock absorption. Leg length
- Ground load factor
- Ground load cases
- Structural load cases
- Weight of u.c</td></tr>
<tr><td>Week 12</td></tr>
<tr><td>Week 13</td></tr>
<tr><td>Week 14</td><td rowspan="2">Preliminary weight analysis</td></tr>
<tr><td>Week 15</td></tr>
<tr><td colspan="2">Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر</td></tr>
<tr><td></td><td>Material Covered</td></tr>
</table>

Week 1	Fuselage design
Week 2	Wing design
Week 3	Tail design
Week 4	Undercarriage design
Week 5	Weight

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Aircraft Design ; A Conceptual Approach(book4you.org)	No(online only)
Recommended Texts		
Websites	-https://www.nasa.gov/ Www. NACAtools.com	

Module Description Form

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Aided Manufacturing (CAM)**			**Module Delivery**	
Module Type	**Core**			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**ATU13076**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		4	**Semester of Delivery**		7
Administering Department			**College**		
Module Leader			**e-mail**		
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		01/06/2026	**Version Number**		1.0
Relation with other Modules العلاقة مع المواد الدراسية الأخرى					
Prerequisite module				**Semester**	

Co-requisites module		Semester	
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Objectives أهداف المادة الدراسية	1. To cover the topology problems in CAD files during interfacing procedures. 2. To present a brief survey of the fundamentals of Numerical Control in the NC system. 3. To comprehend the environment of CNC-Milling machines. 4. Introduce a simple vision to write and generate the blocks program in CNC-Milling machines. 5. To understand the medium of CNC-Lathe Machines. 6. Present a full vision of programming and generate a program in CNC-Lathe Machines. 7. Checking generated program and control of the operation.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enabling the student to overcome the overlapping problems in topology. 2. Boosting the student to write CNC-Milling block programs. 3. Contributing to control and generating the program of CNC-Milling. 4. Encouraging the student to cover all writing types for the CNC-Lathe program. 5. Enable the student to use a tool of generation a blocks program in CNC-Lathe. 6. Enabling the student to charge and utilize G-codes in virtual and real machines.		
Indicative Contents المحتويات الإرشادية	**The indicative contents of this subject are:** **Part (A) CAD Interface and topology:** Interface of extension file and limitations, Topology concept, how optimize a topology problematic, Advantages of Topology Optimization, Saving Money, Solving Design Challenges, Saving Time, Reducing Environmental Impact, Eliminating Errors, Applications of Topology Optimization, Topology Optimization Software. **(2 hrs)** **Part (B) Fundamentals of Numerical Control (NC) Machines:** Automation concept, Types of NC system, the main components of NC system, Features of NC systems, Computer Numerical Control (CNC) concept, Direct Numerical Control (DNC) concept, Comparison among NC, CNC, and DNC, Other types of CNC Machines, NC programming methods. **(2 hrs)** **Part (C) CNC Machine-Milling:** CNC Milling components, Coordinates system and mechanism of motion in CNC Milling, Limitations and advantages of CNC Milling, Machine zeros		

Points, Calculation of feeding rate and cutting speed, difference traditional and router CNC Milling machines, Keys-Function in Traditional CNC Milling. **(2 hrs)**

Part (D) Block program and programming in CNC Milling:

Block program function, Block program annotation, G-Code functions, M-Code Functions, Specify workpiece zero point (WZP), Absolute and incremental programming, Cutter length compensation, Cutter diameter compensation. **(2 hrs)**

Part (E) Operation control of CNC Milling:

Steps of operation, Axis moving operation, manage axis and spindle switch, install tool inside holder, Increment and jog, skills of writing NC program, specifying boundaries of workpiece, steps of implementation NC program, Program run. **(2 hrs)**

Part (F) Linear and rounded cutting in CNC Milling:

Concept of linear moving machine with and without feeding, Clock and counter clockwise rounded machine, Cycle call, Cycle operation table annotation design, user cycle DEF, Datum shaft, Mirror cycle DEF, rotating cycle DEF, Reaming and boring cycle DEF, Pocket cycle DEF, Pattern cycle DEF. **(4 hrs)**

Part (G) MasterCAM environment:

Install and operation MasterCAM X5, Highlight the tools of MasterCAM X5, Configuration setting, interfacing geometries, drawing toolbar, Modify toolbar. **(4 hrs)**

Part (H) MasterCAM/CNC-Milling blocks programs generation:

Geometry level, create solid raw material, extrude contour, extrude hole, specify machine type, specify toolpaths, Stock setup, specify a suitable cutting tool, specify cut parameter, cutting simulation. **(2 hrs)**

Part (I) CNC-Turning Machine:

Components of CNC turning, Keys-Function in Traditional CNC turning, steps of operation, Shutdown instructions, Control references points, Jog and manual operation, Setup workpiece, Changing tool, Skills of data machining, simulation toolpath, Tool functions. **(2 hrs)**

Part (J) CNC-Turning Machine/Miscellaneous operations:

	Steps of semi-finish and finish operation, facing operation, repetition, threading operation, holing operation, diameter compensation, linear and rounding, Block program function, Block program annotation, G-Code functions, M-Code Functions, Specify workpiece zero point (WZP), Absolute and incremental programming. **(2 hrs)** **Part (K) MasterCAM/CNC-Turning blocks programs generation:** Geometry level, create solid raw material, extrude contour, extrude hole, specify machine type, specify toolpaths, Stock setup, specify a suitable cutting tool, specify cut parameter, cutting simulation. **(2 hrs)** **Part (L) Swansoft and Mach3 Job:** Checking G-Codes, Functions keys, Simulation toolpath, and machining steps. **(4 hrs)**

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The simple and complex shapes machining, primarily in the airplane field, is required to reduce time, raw materials, and cost. Furthermore, it needs to employ skilled engineers to do this job, especially with advanced materials. Hence, CNC Machines is revolutionary and developed in cutting operation to meet these requirements. From here, the main strategy adopted is to enable students to have advanced skills in these machine types. Besides, it supplies full knowledge for the students about controlling Computer Aided Manufacturing (CAM) techniques.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 11	
	Assignments	2	10% (10)	6 and 12	
	Projects / Lab.	5	10% (10)	Continues	
	Report	2	10% (10)	all	
Summative assessment	Midterm Exam	2hr	10% (10)	7	
	Final Exam	3hr	50% (50)	16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	CAD Interface and topology.
Week 2	Fundamentals of Numerical Control (NC) Machines.
Week 3	CNC Machine-Milling.
Week 4	Block program and programming in CNC Milling.
Week 5	Operation control of CNC Milling.
Week 6	Linear and rounded cutting in CNC Milling.
Week 7	Mid Exam, Linear and rounded cutting in CNC Milling.

Week 8	MasterCAM environment.
Week 9	MasterCAM environment.
Week 10	MasterCAM/CNC-Milling blocks programs generation.
Week 11	CNC-Turning Machine.
Week 12	CNC-Turning Machine/Miscellaneous operations.
Week 13	MasterCAM/CNC-Turning blocks programs generation.
Week 14	Swansoft and Mach3 Job.
Week 15	Swansoft and Mach3 Job.
Week 16	Final Exam.
Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Topology optimization case: Design study.
Week 2	Writing program as a case study: Steel increasing hole, implement contour in AISI 304 steel.
Week 3	Writing program as a case study: Implement draft contour in 306 steel, round contour cutting S304.
Week 4	Writing program as a case study: Cycle call of round and linear mixing machine of alloy steel.
Week 5	MasterCAM X5: Training drawing toolbar with modeling.
Week 6	MasterCAM X5: Training modify toolbar with modeling.
Week 7	Mid test, MasterCAM X5: Generate G-Code for MAHO CNC Milling Machine (Case study-1).
Week 8	MasterCAM X5: Generate G-Code for MAHO CNC Milling Machine (Case study-2).

Week 9	Writing program as a case study: Longitudinal and facial lathing and oblique slashing-Steel st 37.
Week 10	Writing program as a case study: Longitudinal, facial, and grooving lathing -Steel st 37.
Week 11	MasterCAM X5: Generate G-Code for Fanuc CNC Turning Machine (Case study-1).
Week 12	MasterCAM X5: Generate G-Code for Fanuc CNC Turning Machine (Case study-2).
Week 13	Swansoft/Mach3 Job-Milling CNC: Checking Key-Function and G-Codes, Simulation, Machining.
Week 14	Swansoft/Mach3 Job-Turning CNC: Checking Key-Function and G-Codes, Simulation, Machining.
Week 15	Final test.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Mastercam Handbook Vol 2 X. United States: Solace Group, 2006. Peterson, Michael J.. CNC Programming: Basics & Tutorial Textbook. United States: CreateSpace Independent Publishing Platform, 2008.	No
Recommended Texts	Verma, Gaurav., Weber, Matt. Mastercam 2021 Black Book. N.p.: Cadcamcae Works, 2021.	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><th colspan="6">Module Information
معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td colspan="2">Industrial Engineering</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">B</td><td colspan="3" rowspan="4">☒ Theory
☐ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATU13077</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">3</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">75</td></tr>
<tr><td colspan="2">Module Level</td><td>4</td><td colspan="2">Semester of Delivery</td><td>7</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU!3</td><td>College</td><td colspan="2">TEC</td></tr>
<tr><td>Module Leader</td><td colspan="2">Name</td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Professor</td><td colspan="2">Module Leader’s Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>1/6/2026</td><td>Version Number</td><td colspan="2"></td></tr>
<tr><th colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td colspan="3">None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td colspan="3">None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To produce Industrial Engineering graduates having capabilities to assume challenging roles in Manufacturing and Service sectors in global environment; 2. To provide employers with graduates who are technically competent and possess decision making and problem solving abilities to enhance effectiveness; 3. To produce professionals who recognize that engineering is a global service profession that must be practiced ethically.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: 1. Evaluate the consequences of Sequence and Time consumption (PERT, Resource Smoothing and Line Balancing) 2. Understand the applicability of Industrial Engineering in Operations Management. 3. Assess user process Ergonomics and the associated Health and Safety Regulations at work including the guiding principles of application and assessment. 4. Provide a perspective on Approaches to Change, and how best to Negotiate Change. 5. Scope factory layout design to facilitate efficient, effective and productive use of people, space and facilities. 6. Appreciate the relevance and use of Method Study and Work Measurement. 7. Consider the ethical, social and legal requirements within the context of Industrial Engineering applications
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Construction Construction the frequency distribution, Representation the data in Histogram Frequency polygon and ogive, Measures of location and measures of variation[2 hrs] Part B – Probabilities

	Probabilities of simple or two events, Probabilities for combinations of three or more events, Permutations and combinations, The probability density function(p.d.f.) The distribution functions, The binomial and Poisson distributions, The gamma , chi-square and normal distributions ,Correlation and regression, The sample correlation coefficients ; computation of simple correlation- Testing hypotheses about the population correlation coefficient- Linear regression and testing hypotheses about the parameters in a simple linear regression- Multiple linear regression , Analysis of variance (ANOVA)- One- way analysis of variance with different sample sizes- Two- way analysis of variance [10 hrs] Part C – Linear programming Linear programming (L.P.), Definition of the L.P.- Forms of L.P. (general , canonical and standard)- Formulation of the mathematical model of the L.P- Solving the mathematical model using a graphical and simplex methods- Solving the mathematical model using M-technique and two- phase method [2 hrs] Part D – Transportation and Assignment models Transportation and Assignment models- Finding the starting solution using northwest corner method, Least cost method , Vogell's approximation method (VAM) and Russel's approximation method (RAM)- Finding the optimal solution using stepping stone and multipliers methods- Solving the assignment models in maximized or minimized [4 hrs] Part E - Network planning and Sequencing models Graph the network and find the critical path (CP) ; and the program evaluation and review technique (PERT)- Crashing the normal duration to execute the project with least costs Sequencing models- Processing n jobs through one machine (shortest and largest processing time Spt and Lpt); processing n jobs

	through two machines -Processing n jobs through m machines ; processing n jobs through two machines with randomly technical routes [4 hrs] <u>Part F - Replacement and maintenance models</u> Using the average total cost as a criterion to determine the period of replacement the machines - Cost of individual replacement for items of machines- Average cost group replacement per period as a criterion to determine the optimal replacement (individual or grouped)- Maintenance model [2 hrs] <u>Part G - Quality control</u> - Acceptance sampling- Calculation the OC-curve for single sampling schemes ; rectifying schemes; double sampling schemes, ISO - Total quality management (TQM) and ISO:9000 [4 hrs] <u>Part H – Reliability</u> Failure functions- Mean time to failure MTTF- Variance- Hazard rate function- Conditional reliability- Exponential and Weibull reliability functions- Reliability of system with serial and parallel configuration[2 hrs]
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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

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	Preview - Construction the frequency distribution - Representation the data in Histogram , Frequency polygon and ogive - Measures of location and measures of variation
Week 2	Probability density function - Probabilities of simple or two events - Probabilities for combinations of three or more events - Permutations and combinations - The probability density function(p.d.f.)
Week 3	The distribution functions - The binomial and Poisson distributions - The gamma , chi-square and normal distributions
Week 4	Correlation and regression - The sample correlation coefficients ; computation of simple correlation - Testing hypotheses about the population correlation coefficient - Linear regression and testing hypotheses about the parameters in a simple linear regressio- Multiple linear regression
Week 5	Analysis of variance (ANOVA)

	- One- way analysis of variance with different sample sizes - Two- way analysis of variance
Week 6	Linear programming (L.P.) - Definition of the L.P. - Forms of L.P. (general , canonical and standard) - Formulation of the mathematical model of the L.P. - Solving the mathematical model using a graphical and simplex methods - Solving the mathematical model using M-technique and two- phase method
Week 7	Transportation and Assignment models - Finding the starting solution using northwest corner method, Least cost method , Vogell's approximation method (VAM) and Russel's approximation method (RAM) - Finding the optimal solution using stepping stone and multipliers methods - Solving the assignment models in maximized or minimized
Week 8	Network planning - Graph the network and find the critical path (CP) ; and the program evaluation and review technique (PERT) - Crashing the normal duration to execute the project with least costs
Week 9	Sequencing models

	- Processing n jobs through one machine (shortest and largest processing time Spt and Lpt); processing n jobs through two machines - Processing n jobs through m machines ; processing n jobs through two machines with randomly technical routes
Week 10	Replacement and maintenance models - Using the average total cost as a criterion to determine the period of replacement the machines - Cost of individual replacement for items of machines - Average cost group replacement per period as a criterion to determine the optimal replacement (individual or grouped) - Maintenance model
Week 12	Correlation and regression - The sample correlation coefficients ; computation of simple correlation - Testing hypotheses about the population correlation coefficient - Linear regression and testing hypotheses about the parameters in a simple linear regression - Multiple linear regression
Week 13	ISO - Total quality management (TQM) ; and ISO:9000
Week 14	Quality control - Acceptance sampling

	- Calculation the OC-curve for single sampling schemes ; rectifying schemes; double sampling schemes
Week 15	Reliability - Failure functions - Mean time to failure MTTF - Variance - Hazard rate function - Conditional reliability - Exponential and Weibull reliability functions - Reliability of system with serial and parallel configuration - Combined series – parallel system and high –level and low – level redundancy

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Darwish, H., & Van Dyk, L. (2016). The Industrial Engineering Identity: From Historic Skills to Modern Values, Duties, and Roles. South African Journal of Industrial Engineering, 27(3), 50-63.	No
Recommended Texts	Fraser, M.(2019). Introduction To Industrial Engineering. Retrieved from www.introtoie.com/IntroV2.pdf;	No
Websites	https://www.coursera.org/courses?query=industrial%20engineering	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	AI in Aero. Legislation & Aero. Eng. Ethics	Module Delivery	
Module Type	Core	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	ATU13078		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	4	Semester of Delivery	7
Administering Department	ATU13	College	TEC
Module Leader		e-mail	
Module Leader’s Acad. Title	Lecturer	Module Leader’s Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/02/2024	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	• To build an understanding of regulatory structures and safety certification frameworks (EASA, FAA, ICAO) governing autonomous systems in aviation. • To examine the ethical responsibilities of aeronautical engineers regarding data privacy, software liability, and algorithmic bias in critical safety systems. • To explore artificial intelligence applications within aircraft systems, highlighting airworthiness challenges and risk assessment methodologies. • To develop critical analytical skills for assessing failure accountability in automated or AI-assisted flightdecks and unmanned aerial systems (UAS).
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	LO #1: Recognize international aerospace legislation frameworks and certification challenges introduced by AI systems. LO #2: Define safety-critical software engineering ethics protocols, focusing on liability and engineering professionalism. LO #3: Explain operational risk standards and explain machine learning validation paradigms within aviation software. LO #4: Summarize autonomous flight oversight rules, regulatory mandates, and airworthiness directives. LO #5: Discuss ethical trade-offs regarding automated flight deck configurations and human-in-the-loop dependencies. LO #6: Describe formal engineering reporting workflows when validating safety compliance parameters for flight systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: International aviation rule-making bodies, software assurance levels (DO-178C adaptations for AI), algorithmic ethics benchmarks, engineering accountability parameters, and risk-mitigation verification frameworks.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Strategies: The module is delivered through interactive lectures alongside safety-case laboratory modeling. Students analyze high-profile automated systems engineering challenges, engage in regulatory policy review sessions, and simulate standard compliance auditing frameworks for advanced software verification. Practical labs involve designing algorithmic evaluation guardrails and drafting technical validation reports complying with international aviation law.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

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 1-3	Introduction to Aerospace Legislation Frameworks: Global rule-making bodies (ICAO, FAA, EASA). Airworthiness directives and the certification process for airborne computer systems.
Week 4-5	Software Assurance & Autonomous Autonomy: DO-178C standards and compliance criteria. Challenges of validating non-deterministic neural networks in safety-critical systems.
Week 6-8	Aeronautical Engineering Ethics: Classical ethical frameworks applied to aerospace engineering. Professional codes of conduct, product liability, whistleblowing, and public safety mandates.
Week 9-15	AI Accountability & Operational Risk Management: Algorithmic bias, explainable AI (XAI) in flight decks, human-machine interface safety boundaries, UAS integration regulations, and ethical liability templates for failure analysis.
Week 16	Preparatory week before the final Exam.

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Lab 1: Evaluating standard aviation software validation checklists (DO-178C structures).
Week 3-4	Lab 2: Case analysis of automated systems engineering challenges (e.g., MCAS/MC-21 autopilot loops).
Week 5-7	Lab 3: Simulated auditing of an AI-based sensor fusion safety compliance pipeline.
Week 8-9	Lab 4: Design risk verification using Failure Mode and Effects Analysis (FMEA) for neural nets.
Week 10	Lab 5: Formulating safety arguments and assurance templates using Goal Structuring Notation (GSN).
Week 11-13	Lab 6: Mock aviation accident tribunal simulation: Reviewing engineering code liabilities.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Introduction to Aerospace Law, Pablo Mendes de Leon, Wolters Kluwer	Yes
Recommended Texts	Ethics in Engineering, Mike W. Martin & Roland Schinzinger, McGraw-Hill	yes
Websites		

Fourth year / eighth semester

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Aircraft Design applied			Module Delivery	
Module Type	Core learning activity			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	ATU13081				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level	4		Semester of Delivery		8
Administering Department	ATU13		College	1TEC	
Module Leader			e-mail		
Module Leader's Acad. Title	Asst. Pro. Dr.		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	01/06/2026		Version Number	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

<table>
<tr><th colspan="2">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td>aircraft design course is about how aircraft designed and the related theoretical background which is the inevitable consequence of aeronautical engineer</td></tr>
<tr><td>Module Learning Outcomes
مخرجات التعلم للمادة الدراسية</td><td>4. To give the basic concepts of design each part of aircraft like
a. fuselage design
b. wing design
c. tail design
d. undercarriage design
5. Know the distribution of the lifting force and its effect on the structure of the aircraft
6. Guess drag force</td></tr>
<tr><td>Indicative Contents
المحتويات الإرشادية</td><td>COURSE POLOCIES:
31. Attendance is expected at all classes.
32. Make-up examinations or quizzes will be given only for documented medical reasons, emergency circumstances, or University sponsored activities. Advance notice must be given well in advance for absence due to University sponsored activities.
33. Homework is assigned periodically in class and is due at the beginning of class on the day specified. Homework assignments will also appear on the web (Angel).
34. Late homework will not be accepted.
35. Homework will be done on an individual basis. You may check your results with others in the course, but the work done to solve the problems must be your own.
36. Short quizzes may be given periodically. Normally these quizzes will be announced.
37. Exams and quizzes will be closed book and closed notes. A one-page formula sheet (no worked problems) and use of a calculator is allowed.
38. You are advised to bring your calculator to class every day and you are responsible to make sure that it functions properly. Bring an extra set of batteries, or an extra calculator if necessary.
39. Engineers must adhere to a rigorous code of professional ethics. Unethical conduct in this class will result in the maximum disciplinary action permitted by the university. Unethical conduct in the class includes, but is not limited to, cheating on exams (this includes storing formulae and problem solutions within the memory of your calculator),</td></tr>
</table>

	and supplying information to others (students bear responsibility for ensuring the security of their examination papers). 40. Re-grading requests for exams must be submitted in writing within one week of the return of the exam outlining the specific concerns/questions. The entire exam may be re-graded, resulting in an increase or decrease in the final grade.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	In a theory of flight course, there are various learning and teaching strategies that can be employed to enhance student understanding and engagement. Here are some effective strategies commonly used : 17- Lectures: Lectures are a traditional teaching method where instructors present information to students. It allows for the delivery of foundational knowledge and theoretical concepts. To make lectures more interactive, instructors can incorporate multimedia presentations, demonstrations, and real-world examples. 18- Hands-on Projects and Experiments: Hands-on projects and experiments provide students with practical experience and promote active learning. These can include designing and building prototypes, conducting experiments in laboratories, or working on real-world case studies. Such activities help students develop problem-solving skills, enhance their understanding of theoretical concepts, and foster creativity. 19- Computer Simulator and Modeling: Computer simulations and modeling allow students to explore complex engineering systems and phenomena in a virtual environment. By using software tools, students can analyze and predict the behavior of aircraft during fly. 20- Group Discussions and Debates: Group discussions and debates provide an opportunity for students to share their perspectives, ask questions, and engage in critical analysis. This strategy encourages active participation, improves communication skills, and fosters a deeper understanding of concepts through peer interaction. 21- Industry Visits and Guest Speakers: Inviting industry professionals as guest speakers or arranging visits to manufacturing plants, research facilities, or engineering companies provides students with real-world exposure. They can learn about industry trends, gain insights into

	practical applications, and understand the relevance of their studies to the professional world.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	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)		

<table>
<tr><th colspan="2">Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري</th></tr>
<tr><td></td><td>Material Covered</td></tr>
<tr><td>Week 1</td><td rowspan="2">Choice of engines

- Take off stages

- Computing of static thrust

- Computing minimum required thrust</td></tr>
<tr><td>Week 2</td></tr>
<tr><td>Week 3</td><td rowspan="3">Span wise air and inertia load distribution

- Air load distribution Schrenk method

- Air load distribution Diederich method

- Wing group inertia load distribution

- Fuselage group inertia load distribution</td></tr>
<tr><td>Week 4</td></tr>
<tr><td>Week 5</td></tr>
<tr><td>Week 6</td><td rowspan="2">Aerodynamic Load Simulation Using ANSYS Fluent

Structural Response of Wing under Aerodynamic and Inertia Loads</td></tr>
<tr><td>Week 7</td></tr>
<tr><td>Week 8</td><td>Drag estimation

- Area drag method:</td></tr>
</table>

Week 9	Wing Empennage Fuselage - Area drag method: Cockpit Undercarriage Nacelle Wing/fuselage interference - Empirical method for cruising stage - Induced drag coefficient of wing with part-span flap
Week 10	**Drag estimation for , climb, cruise, descent and landing**
Week 11	**Flight and gust envelope** - Load factor - Load factor at steady pullout - Load factor at correctly banked turn -Load factor at steady level flight -Load factor at steady decent - Flight envelope - Gust envelope - Flight - gust envelope
Week 12	
Week 13	
Week 14-15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Engine selection
Week 2	Lift distribution

Week 3	
Week4	Drag estimation
Week 5	
Week 6	- Load factor

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Aircraft Design ; A Conceptual Approach(book4you.org)	No(online only)
Recommended Texts		
Websites	-https://www.nasa.gov/ Www. NACAtools.com	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Propulsion Systems**		**Module Delivery**		
Module Type	**Core**		☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**		
Module Code	**ATU13082**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	4	**Semester of Delivery**	8		
Administering Department	3	**College**	1		
Module Leader		**e-mail**			
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D.		
Module Tutor		**e-mail**			
Peer Reviewer Name	Name	**e-mail**	E-mail		
Scientific Committee Approval Date	01/6/2026	**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	6. Understand the difference jet engines. 7. Know the main difference compressors and turbines. 8. Understanding the design of Inlet & nozzles. 9. To build basic understanding of combustion chamber design. 10. To build basic understanding inlet and nozzle technology. 11. To build basic understanding of axial compressor.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 25. The course of Aircraft Propulsion gives basic knowledge of 26. principles, 27. design, 28. materials, 29. operating characteristics 30. maintenance of modern aircraft engines. 31. Students will be able to assess engines according their function, and economical operation
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. The Aircraft Engines course provides a comprehensive overview of the principles of operations, work cycles, and the design of aviation propulsion units. In the course the students will get a knowledge about the work of piston, turbine and ramjet aircraft engines. Construction layout and auxiliary systems are discussed in detail to ensure their operation. Students are acquainted with the technological and physical constraints of various types of propulsion units and the current technologies used in their construction. Part of the course is also a more detailed analysis of environmental and certification requirements for aircraft engines and directions for their future development. The course also focuses on the maintenance of modern propulsion units.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	

Strategies	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 للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	6	10% (10)	3,5,8,11,13 and 15	LO #2, #4, #7, #3
	Assignments	2	10% (10)	2 and 12	LO #1, #5 and #6
	Projects / Lab.	1	10% (10)		
	Report	1	10% (10)	13	LO #6, #3
	Midterm Exam	2hr	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	
	Material Covered
Week 1	Theory of jet propulsion: Turbo jet engine, turbo fan engine
Week 2	Turbo prop, turbo shaft and ram jet
Week 3	Design of centrifugal compressor: impeller design
Week 4	Design of centrifugal compressor: diffuser design, volute design
Week 5	Design of axial flow compressors:
Week 6	Design of axial flow compressors
Week 7	Compressor technology
Week 8	Design of combustion system
Week 9	Design of combustion system: after burner
Week 10	Design of axial flow turbine
Week 11	Mechanical design of axial flow turbine
Week 12	Design of inlet
Week 13	Design of nozzle
Week 14	Design of nozzle
Week 15	Inlet and nozzle technology

Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 3	
Week 5	
Week 9	
Week 12	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Elements of Propulsion, Gas Turbines and Rockets by Jack D. Mattingly	Yes
Recommended Texts	Aero Engines and Gas Turbines Ahmed Alsyed	yes
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Green & Sustainable Aviation Technology Engineering		Module Delivery		
Module Type	core		☒ Theory ☒ Lecture ☐ Tutorial ☐ Lab ☐ Practical ☐ Seminar		
Module Code	ATU13083				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	4		Semester of Delivery	8	
Administering Department	TATU13		College	TEC	
Module Leader	Name		e-mail	E-mail	
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.	
Module Tutor	r		e-mail		
Peer Reviewer Name	Name		e-mail	E-mail	
Scientific Committee Approval Date	01/06/20246		Version Number	1.0	
Relation with other Modules العلاقة مع المواد الدراسية الأخرى					
Prerequisite module			Semester		
Co-requisites module			Semester		
Module Aims, Learning Outcomes and Indicative Contents					

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Here are the **Module Objectives** condensed into four concise, high-impact statements tailored for an engineering curriculum under the Bologna Process: 1. **Quantify and Mitigate Aviation's Environmental Footprint:** To equip students with the analytical skills to evaluate the climate impact of aviation (CO_2, non-CO_2 emissions, and noise) and apply regulatory frameworks to mitigate these effects. 2. **Evaluate Next-Generation Propulsion and Energy Systems:** To develop a rigorous engineering understanding of the thermodynamic and structural tradeoffs associated with Sustainable Aviation Fuels (SAF), hydrogen fuel cells, and hybrid-electric propulsion. 3. **Apply Eco-Design and Structural Optimization Principles:** To train students to minimize aircraft weight and drag by utilizing advanced laminar flow aerodynamics, lightweight bio-composites, and additive manufacturing. 4. **Implement Lifecycle Assessments and Circular Economy Models:** To instill a holistic "cradle-to-cradle" engineering mindset, enabling students to model the environmental footprint of aerospace components from raw material extraction to end-of-life recycling.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this module, the student will be able to: • **MLO 1: Analyze and Quantify Climate Impact** Assess the comprehensive environmental footprint of commercial aviation by calculating CO_2 and non-CO_2 (such as NO_x and contrails) emissions, and evaluate compliance with international climate regulations like ICAO's CORSIA. • **MLO 2: Evaluate Alternative Propulsion Systems** Perform thermodynamic, aerodynamic, and structural trade-off analyses on alternative energy architectures, including hybrid-electric configurations, hydrogen fuel cells, and various blends of Sustainable Aviation Fuels (SAF). • **MLO 3: Design Eco-Efficient Structures and Systems** Apply advanced aerodynamic drag-reduction techniques, topology optimization, and lightweight bio-composite materials to design aircraft components that minimize fuel consumption. • **MLO 4: Model Lifecycle Assessments (LCA)** Conduct standard "Cradle-to-Grave" Lifecycle Assessments on aerospace parts using professional engineering tools, and formulate

	strategic plans for sustainable aircraft decommissioning and material recycling. •
Indicative Contents المحتويات الإرشادية	All course materials presented in class will also be posted on our Department website. The majority of the material will be organized by topic in the Modules and the links to lectures from a previous semester and the current semester (if available) are available on the Home page.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	10% (10)	Bi-weekly	Every other lecture
	Assignments	4	10% (10)	Every week	Concludes the taken

	Projects / Lab.	1	10% (10)		
	Report	2	10% (10)	13	LO #10, #11 and #12
Summative assessment	**Midterm Exam**	2hr	10% (20)	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 Green Aviation** • *Lecture:* Climate change drivers; Contribution of aviation to global warming CO2, NOx soot, water vapor). • *Practical/Lab:* Case study analysis of global aviation emission trends.
Week 2	**International Regulations & Net-Zero Targets** • *Lecture:* ICAO standards, CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation), and Horizon Europe targets for 2050. • *Practical/Lab:* Reviewing airline sustainability reports and regulatory compliance metrics.
Week 3	**Contrails and Non-CO_2 Climate Impacts** • *Lecture:* Formation of condensation trails (contrails) and cirrus clouds; mitigation through flight trajectory rerouting. • *Practical/Lab:* Simulating contrail formation conditions using atmospheric data.
Week 4	**Sustainable Aviation Fuels (SAF)** • *Lecture:* Biofuels, Synthetic fuels (e-fuels), Power-to-Liquid (PtL) technologies; Drop-in capabilities and chemical blending limits. • *Practical/Lab:* Fuel properties comparison lab (viscosity, energy density, flashpoint of SAF vs. Jet-A1).
Week 5	**Hydrogen Propulsion Technology**

	• *Lecture:* Cryogenic liquid hydrogen (LH_2) storage, fuel cells vs. direct hydrogen combustion in gas turbines. • *Practical/Lab:* Thermodynamic calculation of hydrogen combustion efficiency.
Week 6	**Electric and Hybrid-Electric Aircraft** • *Lecture:* Battery energy density limitations, electric motors, power electronics, and hybrid architecture configurations (Parallel vs. Serial). • *Practical/Lab:* MATLAB/Simulink modeling of a small hybrid-electric UAV power distribution.
Week 7	**Mid-Term Review & Examination** • *Evaluation:* Written mid-term exam + submission of preliminary project proposals.
Week 8	**Advanced Aerodynamic Drag Reduction** • *Lecture:* Natural Laminar Flow (NLF), Active Drag Reduction, and advanced winglet geometries (e.g., split-scimitar, blended). • *Practical/Lab:* CFD (Computational Fluid Dynamics) simulation comparing standard wings vs. high-efficiency green wing designs.
Week 9	**Lightweight Materials & Bio-Composites** • *Lecture:* Next-generation Carbon Fiber Reinforced Polymers (CFRPs), smart structures, and bio-degradable matrices. • *Practical/Lab:* Tensile testing of lightweight sustainable composite samples.
Week 10	**Additive Manufacturing (3D Printing) in Aviation** • *Lecture:* Topology optimization, reducing the "Buy-to-Fly" ratio, and printing engine components for weight reduction. • *Practical/Lab:* Designing and 3D printing a topologically optimized aircraft bracket.
Week 11	**Eco-efficient Flight Operations & ATM** • *Lecture:* Continuous Descent Approach (CDA), optimized tactical routing, and Green Air Traffic Management (ATM) systems. • *Practical/Lab:* Flight simulator exercise optimizing descent profiles for fuel savings.

Week 12	**Aircraft Life Cycle Assessment (LCA)** • *Lecture:* Cradle-to-Grave and Cradle-to-Cradle methodologies applied to aerospace components. • *Practical/Lab:* Introduction to LCA software tools (e.g., OpenLCA, GaBi) for evaluating aircraft parts.
Week 13	**aircraft Decommissioning & End-of-Life (EoL)** • ***Lecture:* Fleet retirement strategies, dismantling processes, and high-value material recycling (Titanium, Aluminum, CFRP scrap).** • ***Practical/Lab:* Developing an EoL dismantling plan for a commercial airliner structure.**
Week 14	**Student Project Presentations (Green Capstone)** • *Practical/Lab:* Peer-reviewed team presentations of sustainable aviation design projects.
Week 15	**Final Course Review & Future Horizons** • *Lecture:* Summary of core competencies; Future outlook on Urban Air Mobility (UAM) and supersonic green flight.
Week 16	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	These books directly cover the weekly syllabus requirements from propulsion thermodynamic metrics to structural aerodynamics: • **Maleviti, E. (2023).** *Fundamentals of Sustainable Aviation* (1st ed.). Routledge. *Recommended for: Part I (Environmental Foundations) and Part IV (Economics and Market-based measures like CORSIA).*	

- **Buse, J. (2024).** *Sustainable Aviation Fuels: Transitioning Towards Green Aviation*. CRC Press.

Recommended for: Part II (Week 4 - Chemical properties, SAF blending limits, and supply-chain logistics).

- **Karakoc, T. H., Colpan, C. O., Altuntas, O., & Sohret, Y. (Eds.). (2019).** *Sustainable Aviation: Greening the Flight*. Springer.

Recommended for: Part III (Aerodynamic optimizations, eco-efficient aircraft design, and green airport management).

- **Kadyradzhiev, T., et al. (2024).** *Life Cycle Assessment in Aviation: Theory and Applications*. Springer.

Recommended for: Part IV (Weeks 12 & 13 - Cradle-to-Grave modeling and aircraft decommissioning).

🔬 **Supplementary Engineering References (Technical Depth)**

For MATLAB/Simulink modeling, advanced fluid mechanics (CFD), and composite materials testing:

- **Weisbrich, G. (2026).** *Electric-Oriented Aviation*. Springer.

Crucial for: Week 5 & Week 6 (Battery energy densities, hybrid-electric powertrains, and motor power electronics).

- **Anderson, J. D.** *Fundamentals of Aerodynamics* (Latest Edition). McGraw-Hill.

Crucial for: Week 8 (Laminar flow control calculations and active drag reduction fundamentals).

	• **Ashby, M. F.** *Materials and the Environment: Eco-Informed Material Choice* (Latest Edition). Butterworth-Heinemann. *Crucial for: Week 9 & Week 10 (Material indices for structural weight reduction and topology optimization limits).*	
Recommended Texts		
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Aircraft Structure -Applied**			**Module Delivery**	
Module Type	**Core learning activities**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13084**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		4	**Semester of Delivery**		8
Administering Department		ATU13	**College**	TEC	
Module Leader			**e-mail**		

<table>
<tr><td>Module Leader's Acad. Title</td><td>Lecturer</td><td>Module Leader's Qualification</td><td>MS.C</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td>1.0</td></tr>
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العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

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<tr><td colspan="2">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td>In this course, the student will be able to understand the Fatigue of materials which will be given in general and especially for aircraft failure and learn how to use the equation to calculate the fatigue life and measure the crack length in aircraft structure. Students will recognize bending for open and closed thin-walled beams and study the deflection for symmetric and unsymmetrical beams. Students will be able to deal with composite materials and use analytical solutions for general and special orthotropic ply and recognize the bending and shear in composite materials.</td></tr>
<tr><td>Module Learning Outcomes
مخرجات التعلم للمادة الدراسية</td><td>32. Study the fatigue failure of materials in general and especially for aircraft.
33. Using fatigue formulas to calculate fatigue life.
34. Measuring the crack length in the engineering structure.
35. Discuss the bending for closed and open thin-walled beams
36. Using singularity function for deflection in beams.
37. Calculation of section properties and temperature effect on bending.
38. Define the composite materials for general and special orthotropic lamina.
39. Discuss laminated composite materials.
40. Discuss the shear and bending of composite materials.</td></tr>
</table>

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Fatigue and crack propagation Safe Life and Fail-Safe Structures, Fatigue Strength of Components, predication aircraft fatigue life, crack propagation and stress concentration factor. [10 hrs] Part B – Bending for closed and open thin-walled beams Symmetric and unsymmetrical bending, singularity functions, temperature effect _ (15hrs) Part C- Composite materials (23hrs). Composite materials for special and general orthotropic, laminates, thin-walled composite materials, bending and shear for composite materials.

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 للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #2, #3 and #5, #6
	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
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	General Introduction to Fatigue failure
Week 2-3	Design against fatigue and fatigue strength of the component
Week 4-5	Crack propagation equations
Week 6-7	Bending of open and closed, thin-walled beams
Week 7-8	Singularity functions and deflection of beams
Week 9	Calculation of section properties and temperature effects

Week 10	Mid-term Exam
Week 11-12	Elastic constants of the simple lamina equations for special and general orthotropic ply
Week 13-14	Laminated composite materials
Week 13-14	Thin walled composite materials ,shear and bending.
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Aircraft Structures for engineering students T. H. G. Megson	Yes
Recommended Texts	Composite Airframe Structures Michael Chun-Yu Niu	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Aircraft Vibration-forced vibration</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Core</td><td colspan="3" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATU13085</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">100</td></tr>
<tr><td>Module Level</td><td>4</td><td colspan="2">Semester of Delivery</td><td colspan="2">8</td></tr>
<tr><td>Administering Department</td><td>ATU13</td><td>College</td><td colspan="3">TTEC</td></tr>
<tr><td>Module Leader</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Professor</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/06/2026</td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="2">None</td><td>Semester</td><td colspan="2"></td></tr>
<tr><td>Co-requisites module</td><td colspan="2">None</td><td>Semester</td><td colspan="2"></td></tr>
<tr><td colspan="6">Module Aims, Learning Outcomes and Indicative Contents</td></tr>
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<table>
<tr><th colspan="2">أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td>In this course, students will learn about mechanical vibration in 1 DoF and 2 DoF systems. Students will learn the basic concepts of vibration, mathematical modeling of vibration systems, formulate equations of motion, and solve equations of motion to analyze vibration system response. Various mechanical vibration conditions are discussed in this course, among others, the response of the vibration of the system is not muffled and damped in the free condition of excitation or by force with various excitation. The goal is that students have the ability and experience to model and analyze mechanical vibration problems, especially in mechanical engineering, as well as learn to think critically about utilization in various other fields to provide the right decision.</td></tr>
<tr><td>Module Learning Outcomes
مخرجات التعلم للمادة الدراسية</td><td>The student will:
4- Understand the engineering principles in mechanical systems to identify, formulate, and solve the problem of mechanical engineering.
5- Be able to find the source of engineering problems in mechanical systems through research that includes identification, formulation, analysis, and data interpretation based on engineering principles.
6- Be able to formulate solutions to engineering problems in mechanical systems by considering economy, safety, environment, and energy conservation.</td></tr>
<tr><td>Indicative Contents
المحتويات الإرشادية</td><td>The focus of this course is as follows:
- basic concept of mechanical,
- Degree of freedom meaning,
- movement equation,
- Lagrange’s equation,
- Free undamped vibration response,
- Free damped vibration responses,
- Forced vibration,
- Base motion, transmissibility,
- Harmonic excitation, impulse, periodic excitation.</td></tr>
</table>

	COURSE POLOCIES: 41. Attendance is expected at all classes. 42. Make-up examinations or quizzes will be given only for documented medical reasons, emergency circumstances, or University sponsored activities. Advance notice must be given well in advance for absence due to University sponsored activities. 43. Homework is assigned periodically in class and is due **at the beginning of class** on the day specified. Homework assignments will also appear on the web (Angel). 44. Late homework will not be accepted. 45. Homework will be done on an individual basis. You may check your results with others in the course, but the work done to solve the problems must be your own. 46. Short quizzes may be given periodically. Normally these quizzes will be announced. 47. Exams and quizzes will be closed book and closed notes. A one-page formula sheet (no worked problems) and use of a calculator is allowed. 48. You are advised to bring your calculator to class every day and you are responsible to make sure that it functions properly. Bring an extra set of batteries, or an extra calculator if necessary. 49. Engineers must adhere to a rigorous code of professional ethics. Unethical conduct in this class will result in the maximum disciplinary action permitted by the university. Unethical conduct in the class includes, but is not limited to, cheating on exams (this includes storing formulae and problem solutions within the memory of your calculator), and supplying information to others (students bear responsibility for ensuring the security of their examination papers). 50. Re-grading requests for exams must be submitted in writing within one week of the return of the exam outlining the specific concerns/questions. The entire exam may be re-graded, resulting in an increase or decrease in the final grade.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	In a mechanical vibration course, there are various learning and teaching strategies that can be employed to enhance student understanding and engagement. Here are some effective strategies commonly used : 22- Lectures: Lectures are a traditional teaching method where instructors present information to students. It allows for the delivery of

	foundational knowledge and theoretical concepts. To make lectures more interactive, instructors can incorporate multimedia presentations, demonstrations, and real-world examples. 23- Hands-on Projects and Experiments: Hands-on projects and experiments provide students with practical experience and promote active learning. These can include designing and building prototypes, conducting experiments in laboratories, or working on real-world case studies. Such activities help students develop problem-solving skills, enhance their understanding of theoretical concepts, and foster creativity. 24- Problem-based Learning: Problem-based learning involves presenting students with real or hypothetical problems related to mechanical engineering. Students work in groups to analyze and solve these problems, encouraging critical thinking, collaboration, and the application of knowledge. Instructors act as facilitators, guiding students through the problem-solving process. 25- Computer Simulations and Modeling: Computer simulations and modeling allow students to explore complex engineering systems and phenomena in a virtual environment. By using software tools, students can analyze and predict the behavior of mechanical systems, conduct simulations of experiments, and visualize concepts that are difficult to observe directly. 26- Group Discussions and Debates: Group discussions and debates provide an opportunity for students to share their perspectives, ask questions, and engage in critical analysis. This strategy encourages active participation, improves communication skills, and fosters a deeper understanding of concepts through peer interaction. 27- Industry Visits and Guest Speakers: Inviting industry professionals as guest speakers or arranging visits to manufacturing plants, research facilities, or engineering companies provides students with real-world exposure. They can learn about industry trends, gain insights into practical applications, and understand the relevance of their studies to the professional world.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem)	78	**Structured SWL (h/w)**	

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	Bi-weekly	Every other lecture
	Assignments	2	10% (10)	Every week	Concludes the taken
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1-2	**Forced vibration of single degree of freedom system** **- Formulation of the basic eq . of**

	motion for damped and undamped forced vibration **- Behavior of the amplitude with w/wn (eq . of resonance)** **Forced vibration for constant force** - Behavior of the system with constant excitation force - Formulating the steady state and transient solution - Examples
Week 3-4	**Forced vibration for sinusoidal force** **(Resonance conditions)** **- Behavior of the system with** **sinusoidal force** **- Formulation and solution of eq.** **- Equation for resonance** **- Examples** **Rotating unbalance** - Explaining the unbalance forces - Applications and examples **Support motion** - Support motion and how this motion affect the motion of the system - Examples
Week 5-8	**Vibration isolation** **- Transmissibility**

	- Discussion of transmissibility behavior with w/wn for different damping ratios **- Examples** **Vibration measuring instrument** - The eq. of motion if the measuring device excited by a base force - Amp., Vel., and acceleration that the device measure - Examples
Week 9-12	**Two degree of freedom system** **- The equations of motion for** **2- degree system** **- Estimating the natural frequency and their mode shap** **- Coordinate coupling** **- Semi definite system** **- Examples** **Mode shapes** - The mode shapes for different systems of two Degree of freedom - Examples **Dynamic absorber (undamped)** - formulation of the eq. of

	dynamic absorber without damping - Examples **Damped vibration absorber** - formulation the eq. of dynamic absorber with damping - Examples
Week 13-15	**Multiple degree of freedom system** **- Formulating the eq, of** **motion for multiple degree of freedom systems** **- Finding the natural freq and their mode shapes** **Torsional vibration** - Single degree of freedom systems - Two degree of freedom systems - Multiple degree of freedom systems (using holzer method) - Torsional vibration for stepped shaft - Torsional vibration for shaft with Gears
Week 16	**Final Exam**
Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	

	Material Covered
Week 1	Lab 1: Simple Oscillation
Week 2	Lab 2: Natural frequency of 1-DOF system
Week 3	Lab 3: Harmonic motion by direct force
Week 4	Lab 4: Harmonic motion by rotating unbalance
Week 5	Lab 5: Harmonic motion by base support
Week 6	Lab 6: 2-DOF system
Week 7	Lab 7: Harmonic motion of 2-DOF system

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	S. Rao, Mechanical Vibrations, 5th edition, Prentice Hall, 2011.	Yes
Recommended Texts	"Fundamentals of Vibrations" by Leonard Meirovitch	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><th colspan="6">Module Information
معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td colspan="3">Automatic Control</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Core</td><td colspan="2" rowspan="5">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ATU13086</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td>Module Level</td><td>4</td><td colspan="2">Semester of Delivery</td><td colspan="2">8</td></tr>
<tr><td>Administering Department</td><td>Type Dept. Code</td><td>College</td><td colspan="3">Type College Code</td></tr>
<tr><td>Module Leader</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Assistant Lecturer</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">MSc</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="3">1.0</td></tr>
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<table>
<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course aims to introduce the basic concepts, control principles and definitions of automatic control, transfer function, time domain analysis and stability of control systems. Automatic control is one of the basic necessary courses for teaching aerospace engineering students.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The students who succeeded in this course; . Be able to explain the basic concepts and principles of automatic control. . Be able to express various dynamic systems (mechanical, electrical, etc.). . Be able to obtain transfer functions of a dynamic systems. . Be able to define open loop and closed loop control systems. . Be able to analyze the stability of linear systems. . Be able to reduction the block diagrams of the control systems.
Indicative Contents المحتويات الإرشادية	The focus of this course is as follows: . Introduction to Control Systems . MATHEMATICAL MODELLING OF DYNAMIC SYSTEMS . Block Diagram Representation of Control Systems . Signal-Flow Graphs . Mason’s Rule . Time Domain Analysis 1st and 2nd order of Control systems . Steady-State Errors . Stability of control systems . Test signals of control systems **COURSE POLOCIES:** 51. Attendance is expected at all classes. 52. Make-up examinations or quizzes will be given only for documented medical reasons, emergency circumstances, or University sponsored activities. Advance notice must be given well in advance for absence due to University sponsored activities. 53. Homework is assigned periodically in class and is due **at the beginning of class** on the day specified. Homework assignments will also appear on the web (Angel). 54. Late homework will not be accepted.

	55. Homework will be done on an individual basis. You may check your results with others in the course, but the work done to solve the problems must be your own. 56. Short quizzes may be given periodically. Normally these quizzes will be announced. 57. Exams and quizzes will be closed book and closed notes. A one-page formula sheet (no worked problems) and use of a calculator is allowed. 58. You are advised to bring your calculator to class every day and you are responsible to make sure that it functions properly. Bring an extra set of batteries, or an extra calculator if necessary. 59. Engineers must adhere to a rigorous code of professional ethics. Unethical conduct in this class will result in the maximum disciplinary action permitted by the university. Unethical conduct in the class includes, but is not limited to, cheating on exams (this includes storing formulae and problem solutions within the memory of your calculator), and supplying information to others (students bear responsibility for ensuring the security of their examination papers). 60. Re-grading requests for exams must be submitted in writing within one week of the return of the exam outlining the specific concerns/questions. The entire exam may be re-graded, resulting in an increase or decrease in the final grade.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	In the Automatic Control course, there are various learning and teaching strategies that can be employed to enhance student understanding and engagement. Here are some effective strategies commonly used : Lectures: Lectures are a traditional teaching method where instructors present information to students. It allows for the delivery of foundational knowledge and theoretical concepts. To make lectures more interactive, instructors can incorporate multimedia presentations, demonstrations, and real-world examples. 28- Hands-on Projects and Experiments: Hands-on projects and experiments provide students with practical experience and promote active learning. These can include designing and building prototypes, conducting experiments in laboratories, or working on real-world case studies. Such activities help students develop problem-solving skills, enhance their understanding of theoretical concepts, and foster creativity.

	29- Problem-based Learning: Problem-based learning involves presenting students with real or hypothetical problems related to mechanical engineering. Students work in groups to analyze and solve these problems, encouraging critical thinking, collaboration, and the application of knowledge. Instructors act as facilitators, guiding students through the problem-solving process. 30- Computer Simulations and Modeling: Computer simulations and modeling allow students to explore complex engineering systems and phenomena in a virtual environment. By using software tools, students can analyze and predict the behavior of mechanical systems, conduct simulations of experiments, and visualize concepts that are difficult to observe directly. 31- Group Discussions and Debates: Group discussions and debates provide an opportunity for students to share their perspectives, ask questions, and engage in critical analysis. This strategy encourages active participation, improves communication skills, and fosters a deeper understanding of concepts through peer interaction. 32- Industry Visits and Guest Speakers: Inviting industry professionals as guest speakers or arranging visits to manufacturing plants, research facilities, or engineering companies provides students with real-world exposure. They can learn about industry trends, gain insights into practical applications, and understand the relevance of their studies to the professional world.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5	10% (10)	Bi-weekly	Every other lecture
	Assignments	2	10% (10)	Every week	Concludes the taken
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #10, #11 and #12
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 1-2	Introduction to Control System—Mathematical Of Dynamic Systems
Week 3-4	Block Diagram Representation of Control Systems-- Closed-Loop System Subjected to a Disturbance
Week 5-8	Signal-Flow Graphs-- Mason's Rule- (Midterm Exam)
Week 9-12	Time Domain Analysis of Control systems-- Ramp Response of 1st and 2nd Order System--Steady-State Errors
Week 13-15	Stability of control systems—Routh Criterion (**Final Exam review session**)

Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Laplace transformation by using MATLAB –Inverse Laplace transformation
Week 2	Lab 2: Polynomials in MATLAB
Week 3	Lab 3: Transfer function programing by MATLAB
Week 4	Lab 4: Block diagram programming by MATLAB
Week 5	Lab 5: modeling of control system with Simulink—root locus by Simulink
Week 6	Lab 6: Electrical control system by Simulink-time response Analysis
Week 7	Lab 7: system response characteristics -frequency domain response data plots

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	CONTROL SYSTEMS ENGINEERING /Sixth Edition/ Norman S. Nise	Yes
Recommended Texts	Control Theory Tutorial Basic Concepts Illustrated by Software Examples/ Steven A. Frank	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	A320 family, Airbus Aircraft system & Maintenance II		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☒ Practical ☐ Seminar	
Module Code	ATU13087			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	4		Semester of Delivery	7
Administering Department	ATU13		College	TEC
Module Leader	Name		e-mail	E-mail
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.
Module Tutor	Ali Sh. Baqir		e-mail	E-mail: coj.alish@atu.edu.iq
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/02/2024		Version Number	1.0
Relation with other Modules العلاقة مع المواد الدراسية الأخرى				

Prerequisite module	A320 family, Airbus Aircraft system & Maintenance I	**Semester**	7
Co-requisites module	None	**Semester**	
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Objectives أهداف المادة الدراسية	12. To develop basic understanding for the main Aircraft systems 13. To understand nature of work, inspection, check lists. 14. To build basic understanding of engineering Aircraft (turnoff, cruise). 15. To build basic understanding of fuel and refuel. 16. To build basic understanding of engineering tools. 17. To build basic understanding of all the ECAM.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 41. 1. Apply the safe working practices associated with the care and control of tools and equipment used in the aircraft maintenance environment. 42. 2. Read and interpret aircraft engineering drawings and diagrams. 43. 3. Be responsible for the practices used to carry out Aircraft Workshop activities. 44. 4. Carry out metalwork exercises in the workshop. 45. 5. Describe the practical requirements of Electrical Wiring Interconnecting Systems (EWIS). 46. . Describe the practices and procedures necessary for aircraft weighing and balancing 47. Describe the maintenance practices and procedures directly associated with aircraft handling and storage 48. Discuss the techniques required to carry out proper disassembly, inspection, repair and assembly on aircraft, associated components		

	and parts. 49. Describe the maintenance procedures and requirements to be followed in the event of abnormal occurrences during the flight. 50. Explain the procedures and requirements associated with general Maintenance Procedures.

Indicative Contents
المحتويات الإرشادية
	• **Daily, weekly, and pre-flight checks: Routine checks to ensure the aircraft is airworthy before each flight.**
	• **Preventive maintenance: Regular tasks to prevent future failures, such as lubrication, cleaning, and fluid replacement.**
	• **Component inspection:**
	  ○ **Landing gear: Inspect tires, shock struts, and wheel bearings.**
	  ○ **Empennage: Check the rudder, elevator, and stabilizers.**
	  ○ **Engines: Inspect turbine blades, exhaust collectors, and igniter plugs.**
	  ○ **Fuel system: Check the fuel filter for contamination.**
	• **System checks: Inspect and test avionics, electrical systems, and communication equipment.**
	Repair and servicing
	• **Component repair: Dismantling, inspecting, testing, and reassembling engines, electrical systems, and structural parts.**
	• **Part replacement: Replacing small standard parts, oxygen system components, and other hardware.**
	• **Engine maintenance: Lubricating the propeller and cleaning spark plugs.**
	Documentation and records
	• **Maintenance logs: Keeping detailed records of all maintenance actions taken.**
	• **Airworthiness certification: Documenting history is essential for maintaining the aircraft's airworthiness and resale value.**

	Specialized checks • **"A, B, C, and D" checks: A classification system for different levels of heavy and light checks depending on the required maintenance.** • **Component-specific tasks: Tasks like draining fuel filters, inspecting magnetic chip detectors, or testing igniter plugs are based on their specific service intervals**

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 للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	22	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	3,5,8,11,13 and 15	LO #2, #4, #7, #8 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #1, #5 and #9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6, #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	**Landing gear systems** - Construction - Landing gear system maintenance - Inspection and maintenance of brake system and Tires
Week 2	Electric system I
Week 3	Electric system II
Week 4	APU
Week 5	Pressure cabinet

Week 6	**Inspection fundamentals** - General - Required inspections - CHECKLIST
Week 7	- Aircraft Logs - Special inspections - Publications Bulletins Maintenance manual Overall manual Structural repair manual Parts catalog
Week 8	Federal Aviation Regulation (FAR) - Airworthiness directives - Type certificate data sheets
Week 9	**Ground handling and support** **equipment** - General - Starting engines - Power units
Week 10	Air conditioning and heating units - Ground support air start units - Preoiling equipment
Week 11	Aircraft fueling

	- Servicing aircraft with oil - Aircraft Tiedown - Movement of aircraft - Maintenance safety
Week 12	Engines I
Week 13	Engines II
Week 14	CAA License - Qualifications structure - EASA66/JAR66 syllabus modules and applicability
Week 15	**Examinations and levels**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Aircraft Workshop:
Week 2	Aircraft Workshop:
Week 3	Aircraft Workshop:
Week 4	Aircraft Workshop:
Week 5	Aircraft Workshop:
Week 6	Aircraft Workshop:

Week 7	Aircraft Workshop:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Aircraft Stability</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Core learning activities</td><td colspan="3" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ATU13088</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">3</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">75</td></tr>
<tr><td colspan="2">Module Level</td><td>4</td><td colspan="2">Semester of Delivery</td><td>8</td></tr>
<tr><td colspan="2">Administering Department</td><td>ATU13</td><td>College</td><td colspan="2">TEC</td></tr>
<tr><td>Module Leader</td><td colspan="2"></td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td colspan="2">Module Leader's Acad. Title</td><td>Asst. Professor</td><td colspan="2">Module Leader's Qualification</td><td>Ph. D.</td></tr>
<tr><td>Module Tutor</td><td colspan="2"></td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>01/06/2026</td><td>Version Number</td><td colspan="2">1.0</td></tr>
<tr><td colspan="6">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td colspan="3"></td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td colspan="3"></td><td>Semester</td><td></td></tr>
<tr><td colspan="6">Module Aims, Learning Outcomes and Indicative Contents</td></tr>
</table>

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	18. Gain knowledge about the control surfaces in the fixed and rotary wing aircraft. 19. To understand and knowledge the type and function of each control surface. 20. To recognize the types of motion and axes in aircraft. 21. To knowledge the operation and effect of the motion control in aircraft: roll control: ailerons and spoilers; pitch control: elevators, stabilators, variable incidence stabilisers; yaw control: rudder limiters. 22. This course deals with the concept of the stability and important it for aircraft. 23. To understand and knowledge the types of stability (static stable and dynamic stable). 24. To recognize the types of static stable (Longitudinal, lateral and directional) and knowledge the conditions that affect them. 25. To develop deriving and problem solving skills of conditions the longitudinal static stable. 26. To develop deriving skills of equations of motion as a function of stability derivatives. 27. To distinguish the types of disturbance that the aircraft may be exposed to. 28. To recognize the types of dynamic stable (Longitudinal, lateral and directional) and knowledge the conditions that affect them. 29. To develop deriving and problem solving skills of conditions the dynamic stable (longitudinal, lateral and directional). 30. To understand and explanation the response of aircraft to any disturbance. 31. To understand the function and operation of autopilot.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 51. Recognize the types of control surfaces in the fixed and rotary wing aircraft. 52. Understand the function of each control surface. 53. Recognize the types of motion and axes in aircraft. 54. Understand the operation and effect of the motion control in aircraft. 55. Understand the concept of the stability and important it for aircraft.

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56. Identify the types of stability (static stable and dynamic stable).
57. Basic understand of equations of motion as a function of stability derivatives.
58. To develop deriving and problem solving skills of conditions the static and dynamic stable (longitudinal, lateral and directional).
59. Students will be able to explain the response of aircraft to any disturbance.

</td></tr>
<tr><td>Indicative Contents
المحتويات الإرشادية</td><td>

Indicative content includes the following:

Part A – Control surfaces and aircraft motions and the concept of stability

- Operation and function of each control surface.
- Types of motion and axes in aircraft.
- Static stable
- Longitudinal static stable
- Application to Longitudinal static stable
- Lateral and directional static stable

Part B – Equations of motion

- The equations of motion of a rigid symmetric aircraft
- The linearised equations of motion
- Types of disturbances

Part C – Dynamic stability

- Longitudinal dynamic stable
- Lateral and directional dynamic stable
- Dutch roll motion in aircraft

</td></tr>
<tr><td colspan="2" align="center">Learning and Teaching Strategies
استراتيجيات التعلم والتعليم</td></tr>
<tr><td>Strategies</td><td>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.</td></tr>
<tr><td colspan="2" align="center">Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</td></tr>
</table>

Structured SWL (h/sem)	78	**Structured SWL (h/w)**	

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

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 / lap.	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	Operation and function of each control surface.

Week 2	Types of motion and axes in aircraft and concept of static stable.
Week 3	Static stable: Longitudinal static stable
Week 4	Application to Longitudinal static stable
Week 5	Lateral and directional static stable
Week 6	Concept of Equations of motion in aircraft
Week 7	The equations of motion of a rigid symmetric aircraft
Week 8	The generalized force equations
Week 9	The generalized moment equations
Week 10	The linearized equations of motion
Week 11	Types of disturbances
Week 12	Concept of Dynamic stability
Week 13	Longitudinal dynamic stable
Week 14	Lateral and directional dynamic stable
Week 15	Dutch roll motion in aircraft
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly workshop Syllabus)

المنهاج الاسبوعي للورشة

	Material Covered
Week 2	Workshop 1: Type and function of each control surface in fixed wing aircraft.
Week 3	Workshop 2: Type and function of each control surface in rotor wing helicopter aircraft.
Week 4	Workshop 3: Types of motion and axes in aircraft.

Week 8	Lap. of computer 4: MATLAb program to solve the applications on equation of motion
Week 9	Lap. of computer 5: MATLAb program to solve the applications on equation of motion (generalized force equations)
Week 10	Lap. of computer 6: MATLAb program to solve the applications on equation of motion (generalized moment equations)
Week 13	Lap. of computer 7: MATLAb program to solve the applications on longitudinal dynamic stable
Week 14 and 15	Lap. of computer 8 and 9: MATLAb program to solve the applications on lateral and directional dynamic stable

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Flight Dynamics Principles (Micael.V. Cook)	Yes
Recommended Texts	Aircraft Stability and Control (Michael Carley), Website	No
Websites	- http://part66.blogspot.com/2012/05/module-5-digital-techniques-electronic.html# - https://www.aviationonline.co.uk/part66Syllabus.htm	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Final year project**		**Module Delivery**		
Module Type	**Core learning activities**		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	**ATU13089**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	4		**Semester of Delivery**		8
Administering Department	ATU13		**College**	TEC	
Module Leader			**e-mail**		
Module Leader's Acad. Title	Asst. Professor		**Module Leader's Qualification**		Ph. D.
Module Tutor			**e-mail**		
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2026		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	