نموذج وصف البرنامج الأكاديمي

اسم الجامعة: جامعة الكتاب

الكلية/المعهد: كلية هندسة التقنيات

القسم العلمي: قسم تقنية هندسة الطيران

اسم البرنامج الأكاديمي أو المهني: بكالوريوس تقنية هندسة الطيران

اسم الشهادة النهائية: درجة البكالوريوس في تقنية هندسة الطيران

النظام الدراسي: النظام السنوي

تاريخ اعداد الوصف :2025/10/20

تاريخ الانتهاء من الملف: 2025/11/8

توقيع:

اسم رئيس القسم: ا.م.د.حسن عبدالوهاب عنجل

التاريخ: 2025/11/11

توقيع:

اسم المعاون العلمي: د. خارسا السنامي

تاريخ: ٢٠٢٥/١١/١٢

دقق الملف من قبل

شعبة ضمان **الجودة والأداء الجامعي**

اسم **مدير** شعبة **ضمان الجودة والأداء الجامعي**

التاريخ: ٢٠٢٥/١١/١٥

التوقيع

م.د. نبراس عبد الحميد

مصادقة السيد العميد

15/11/2025

وزارة التعليم العالي والبحث العلمي
جهاز الاشراف والتقويم العلمي
دائرة ضمان الجودة والاعتماد الأكاديمي
قسم الاعتماد

دليل وصف البرنامج الأكاديمي والمقرر
2026 – 2025

المقدمة:

يُعد البرنامج التعليمي بمثابة حزمة منسقة ومنظمة من المقررات الدراسية التي تشتمل على إجراءات وخبرات تنظم بشكل مفردات دراسية الغرض الأساس منها بناء وصقل مهارات الخريجين مما يجعلهم مؤهلين لتلبية متطلبات سوق العمل يتم مراجعته وتقييمه سنوياً عبر إجراءات وبرامج التدقيق الداخلي أو الخارجي مثل برنامج الممتحن الخارجي.

يقدم وصف البرنامج الأكاديمي ملخص موجز للسمات الرئيسة للبرنامج ومقرراته مبيناً المهارات التي يتم العمل على اكسابها للطلبة مبنية على وفق اهداف البرنامج الأكاديمي وتتجلى أهمية هذا الوصف لكونه يمثل الحجر الأساس في الحصول على الاعتماد البرامجي ويشترك في كتابته الملاكات التدريسية بإشراف اللجان العلمية في الأقسام العلمية.

ويتضمن هذا الدليل بنسخته الثانية وصفاً للبرنامج الأكاديمي بعد تحديث مفردات وفقرات الدليل السابق في ضوء مستجدات وتطورات النظام التعليمي في العراق والذي تضمن وصف البرنامج الأكاديمي بشكلها التقليدي نظام (سنوي، فصلي) فضلاً عن اعتماد وصف البرنامج الأكاديمي المعمم بموجب كتاب دائرة الدراسات ت م٣/٢٩٠٦ في ٢٠٢٣/٥/٣ فيما يخص البرامج التي تعتمد مسار بولونيا أساساً لعملها.

وفي هذا المجال لا يسعنا إلا أن نؤكد على أهمية كتابة وصف البرامج الاكاديمية والمقررات الدراسية لضمان حسن سير العملية التعليمية.

مفاهيم ومصطلحات:

وصف البرنامج الأكاديمي: يوفر وصف البرنامج الأكاديمي ايجازاً مقتضباً لرؤيته ورسالته وأهدافه متضمناً وصفاً دقيقاً لمخرجات التعلم المستهدفة على وفق استراتيجيات تعلم محددة.

وصف المقرر: يوفر إيجازاً مقتضياً لأهم خصائص المقرر ومخرجات التعلم المتوقعة من الطالب تحقيقها مبرهناً عما إذا كان قد حقق الاستفادة القصوى من فرص التعلم المتاحة. ويكون مشتق من وصف البرنامج.

رؤية البرنامج: صورة طموحة لمستقبل البرنامج الأكاديمي ليكون برنامجاً متطوراً وملهماً ومحفزاً وواقعياً وقابلاً للتطبيق.

رسالة البرنامج: توضح الأهداف والأنشطة اللازمة لتحقيقها بشكل موجز كما يحدد مسارات تطور البرنامج واتجاهاته.

اهداف البرنامج: هي عبارات تصف ما ينوي البرنامج الأكاديمي تحقيقه خلال فترة زمنية محددة وتكون قابلة للقياس والملاحظة.

هيكلية المنهج: كافة المقررات الدراسية / المواد الدراسية التي يتضمنها البرنامج الأكاديمي على وفق نظام التعلم المعتمد (فصلي، سنوي، مسار بولونيا) سواء كانت متطلب (وزارة، جامعة، كلية وقسم علمي) مع عدد الوحدات الدراسية.

مخرجات التعلم: مجموعة متوافقة من المعارف والمهارات والقيم التي اكتسبها الطالب بعد انتهاء البرنامج الأكاديمي بنجاح ويجب أن يُحدد مخرجات التعلم لكل مقرر بالشكل الذي يحقق اهداف البرنامج.

استراتيجيات التعليم والتعلم: بأنها الاستراتيجيات المستخدمة من قبل عضو هيئة التدريس لتطوير تعليم وتعلم الطالب وهي خطط يتم إتباعها للوصول إلى أهداف التعلم. أي تصف جميع الأنشطة الصفية واللاصفية لتحقيق نتائج التعلم للبرنامج.

نموذج وصف البرنامج الأكاديمي

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الكلية/المعهد: كلية هندسة التقنيات

القسم العلمي: قسم تقنية هندسة الطيران

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التاريخ:

توقيع:

اسم المعاون العلمي:

تاريخ:

دقق الملف من قبل

شعبة ضمان **الجودة والأداء الجامعي**

اسم **مدير** شعبة **ضمان الجودة والأداء الجامعي**

التاريخ:

التوقيع

مصادقة السيد العميد

1. رؤية البرنامج

رؤية البرنامج هي تحقيق الجودة الممتازة والقيادة في جميع الجوانب الأكاديمية والمهنية للأنشطة الجوية وخدمة المجتمع والبحث في مجال الهندسة الجوية.

2. رسالة البرنامج

رسالة البرنامج هي أن يساهم خريج القسم في تلبية احتياجات الدولة في مجال تكنولوجيا هندسة الطيران (الأكاديمية والبحثية) وكافة القطاعات العامة والخاصة.

3. أهداف البرنامج

يهدف البرنامج إلى إعداد كوادر هندسية متخصصة في هندسة تكنولوجيا الطيران، تكون مسئولة عن دراسة احتياجات الدولة للتنمية والتقدم، وتزويد سوق العمل وقطاعات الصناعة بالمهندسين المحترفين القادرين على مواصلة الدراسات العليا لمواكبة التطور التقني الحديث في مجال الطيران. جميع هذه القيم متطابقة مع قسم، هندسة الطيران التابع لكلية تكنولوجيا الهندسة / جامعة *الفرات الأوسط التقني

4. الاعتماد البرامجي

AICBA

5. المؤثرات الخارجية الاخرى

المختبرات والمكتبة

6. هيكلية البرنامج				
هيكل البرنامج	عدد المقررات	وحدة دراسية	نسبة مئوية	الملاحظات
متطلبات المؤسسة	1	4	%9	مساعد
متطلبات الكلية	6	21	%17.5	أساسي
متطلبات القسم	23	111	%79.6	أساسي
التدريب الصيفي	2	0	%0	أساسي

1. وصف البرنامج

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type
						CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)						
One	1	ATUU113	English for Acadimic U.	لغة إنكليزية	English	1						3	18	32	50	2.00	S
	2	ATU1111	Computer Principals	مبادئ حاسوب	English	1		2				3	48	27	75	3.00	S
	3	ATU13013	single variable calculas	حساب التفاضل والتكامل متغير واحد	English	3				2		3	78	72	150	6.00	B
	4	ATU13014	Workshop	معامل	English				4			3	63	62	125	5.00	B
	5	ATU13015	Fundamentals of Thermodynamics	مبادئ الثرموداينمك	English	3		1		1		3	78	72	150	6.00	B
	6	ATU13016	CAD Drawing	رسم باستخدام الحاسوب	English			5		1		3	93	57	150	6.00	B
	7	ATUU112	Arabic	لغة عربية	Arabic	1						3	18	32	50	2.00	S
					Total	9	0	8	4	4	0	21	396	354	750	30.00	

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type
						CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)						
Two	1	ATU13021	Multi-variables calculas	حساب التفاضل والتكامل معاملات متعددة	English	3				2		3	78	72	150	6.00	B
	2	ATU13022	Engineering Materials	مواد هندسية	English	2						3	33	67	100	4.00	B
	3	ATU13023	physics	الفيزياء	English	3		1		1		3	78	72	150	6.00	B
	4	ATU13024	Engineering Mechanics-Static	الميكانيك الهندسي السكوني	English	4				2		3	93	57	150	6.00	B
	5	ATU13025	Fundemantals of Electricity	مبادئ كهربائية	English	3		1		1		3	78	72	150	6.00	B
	6	ATUU111	Human Right and Democracy	حقوق الانسان والديمقراطية	Arabic	2						3	33	17	50	2.00	S
					Total	17	0	2	0	6	0	18	393	357	750	30.00	

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type
						CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)						
Three	1	ATU13031	fundamental of Fluid Mechanics	مبادئ جريان الموائع	English	2		1		1		3	63	62	125	5.00	B
	2	ATU13032	Fundemantls of Electronics	مبادئ الكترونيات	English	2		1		1		3	63	62	125	5.00	B
	3	ATU13033	Theory of flight	نظرية الطيران	English	4				1		3	78	72	150	6.00	C
	4	ATU13034	Thermodynamic - Steam	الثرموداينمك- بخار	English	2		1		1		3	63	37	100	4.00	B
	5	ATU13035	Manufacturing Processes	عمليات صناعية	English	2			1			3	48	52	100	4.00	B
	6	ATU13036	Fundamentals of Engineering Mechanics-I	اساسيات الميكانيك الهندسي الحركي	English	2				1		3	48	52	100	4.00	B
	7	ATUU211	Baath Party Crimes	جرائم حزب البعث	Arabic	2						3	33	17	50	2.00	S
					Total	16	0	3	1	5	0	21	396	354	750	30.00	

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type
						CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)						
Four	1	ATU13041	Fluid Mechanics-Dynamics	جريان موائع حركي	English	2		1		1		3	63	62	125	5.00	B
	2	ATU222	Computer 2nd	حاسوب 2	English	1		2				3	48	27	75	3.00	B
	3	ATU13043	Engineering Mechanics-Applied of Dynam	الديناميكيات التطبيقية	English	3				2		3	78	47	125	5.00	B
	4	ATU13044	Strength of Materials	مقاومة مواد	English	2		1		2		3	78	47	125	5.00	B
	5	ATU13045	Algebraic equations and Programming MA	المعادلات الجبرية وبرنامج ماتلاب	English	1		2		1		3	63	37	100	4.00	B
	6	ATU220	Arabic 2nd	اللغة العربية	Arabic	1						3	18	32	50	2.00	S
	7	ATU221	English 2nd	اللغة الإنكليزية	English	1						3	18	32	50	2.00	S
	8	ATU13046	Thermodynamic - ideal Gas	ثرموداينمك غاز مثالي	English	2		1		1		3	63	37	100	4.00	B
					Total	13	0	7	0	7	0	24	429	321	750	30.00	

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL	USSWL	SWL	ECTS	Module Type
						CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)		hr/sem	hr/sem	hr/sem		
Five	1	ATU13051	Aerodynamic -Fundamentals	مبادئ الايروداينمك	English	2		2				3	63	37	100	4.00	C
	2	ATU13052	Aircraft electricity	كهربائية طائرات	English	2		2				3	63	37	100	4.00	C
	3	ATU13053	Eng. Analyses	تحليلات هندسية	English	3						3	48	27	75	3.00	B
	4	ATU13054	Gas Dynamics-fundamentals	مبادئ كازدايمك	English	2				1		3	48	52	100	4.00	C
	5	ATU13055	Aircraft Engines	محركات طائرات عامة	English	1			2			3	48	52	100	4.00	C
	6	ATU13056	Mechanical Eng. Design-fundamentals	مبادئ التصميم الميكانيكي	English	2		2				3	63	37	100	4.00	C
	7	ATU13057	Theory of Machines	نظرية مكائن	English	1		2				3	48	52	100	4.00	B
	8	ATU13058	Mechanics of Materials	ميكانيك المواد	English	1		2				3	48	27	75	3.00	C
					Total	14	0	10	2	1	0	24	429	321	750	30	

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL	USSWL	SWL	ECTS	Module Type
						CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)		hr/sem	hr/sem	hr/sem		
Six	1	ATU13061	Aerodynamic -Applied	تطبيقات الايروداينمك	English	2		2				3	63	37	100	4.00	C
	2	ATU13062	Mechanical Eng. Design-applied	تطبيقات التصميم الميكانيكي	English	2		3				3	78	72	150	6.00	B
	3	ATU13063	Heat Transfer	انتقال حرارة	English	2		2				3	63	37	100	4.00	B
	4	ATU13064	Gas Turbine Engines	محركات توربينية غازية	English	2		2				3	63	37	100	4.00	C
	5	ATU13065	Gas Dynamics-Applied	تطبيقات الكاز دايمك	English	2				1		3	48	52	100	4.00	C
	6	ATU13066	Digital Techniques & Electronic instrumen	منظومات القياس الالكترونية وتقنيات رقمية	English	2		2				3	63	37	100	4.00	C
	7	ATU13067	Numerical Analyses	تحليلات عددية	English	2						3	33	67	100	4.00	B
					Total	14	0	11	0	1	0	21	411	339	750	30	

المرحلة الدراسية	رمز المقرر أو المساق	اسم المقرر أو المساق	الساعات المعتمدة	
			النظري	العملي
الرابعة	ANTE 435	محركات الطائرات والدفع	3	1
	ANTE 438	استقرارية وسيطرة الطائرة	3	1
	ANTE 434	هياكل طائرات	3	1
	ANTE 439	منظومات وصيانة الطائرة	2	2
	CREQ 449	الهندسة المعززة بالحاسبة		3
	ANTE 418	سيطرة طوعية	3	1
	ANTE 437	اهتزازات الطائرة	2	2
	CREQ 4410	مشروع التخرج		4

1. مخرجات التعلم المتوقعة للبرنامج	
المعرفة	
مخرجات التعلم 1	بيان نتائج التعلم 1
أ) نتائج المعرفة والفهم :يتمتع الأشخاص الخريجون من البرنامج بالمهارات التالية؛	أ -**1**-مستوى عال من الفهم والمعرفة في بناء وتحلي وتطوير أفكار الهندسة الجوية. أ -**2**-أن يكونوا قادرين على تحليل المشاكل الهندسية والعلمية من خلال تطبيق القوانين المناسبة في العلوم والرياضيات والهندسة والالتزام بالتعليمات لأي فعالية في الإطار التنظيمي والإداري في تنفيذ مشروع أو مواجهة مشكلة هندسية وحلها وتقييمها وتقديم مقترح أو خطة أو إعادة صياغتها أو ترجمتها أو تفسيرها. أ -**3**-أن يكون الطالب قادراً على التحدث والكتابة بأسلوب علمي وهندسي فعال باللغتين العربية والإنجليزية. أ -**4**-تحفيز طلبتنا للمشاركة الفاعلة في نهضة وتقدم المجتمع من خلال إقامة الندوات والمؤتمرات والتعليم المستمر وتقديم الاستشارات الأكاديمية في مجالات تقنية هندسة الطيران. أ -**5**-أن يكون الطالب قادراً على إجراء البحوث العلمية والتطبيقية في مجالات تقنيات الطيران بهدف حل المشاكل الصناعية.

المهارات	
مخرجات التعلم 2	**بيانات نتائج التعلم 2**
ب) المهارات المتعلقة بالموضوع.	**ب -1**-القدرة على استخدام التقنيات الهندسية. **ب -2**-تحليل المشاكل الفنية وإيجاد الحل المناسب لها. **ب -3**-البحث العلمي والتقييم.
مخرجات التعلم 3	**بيانات نتائج التعلم 3**
ج) مهارة التفكير	
مخرجات التعلم 4	**بيانات نتائج التعلم 4**
د) القيم	د -1مهارة الاتصال والتواصل وتكنولوجيا المعلومات د - 2مهارة التعاون والعمل الجماعي. د -3مهارات اللغة الإنجليزية والعربية) تشمل القراءة والكتابة والاستماع (والتي يمكن أن تساعد في فن الإدراج والإقناع والحوار. د -4اكتساب صفة القيادة وقوة الذاكرة والحدس السريع والقدرة على التنبؤ والاستقراء.

9. أساليب التدريس والتعلم
هناك العديد من طرق التدريس والتعلم المستخدمة في قسم تقنيات هندسة الطيران. يتم التعلم من خ التطبيقات العملية والمحاضرات النظرية باستخدام التدريس التقليدي، وعرض PPT، ومجموعات المناقشة، والندوات، ويُطلب من الطالب دائمًا التحقيق في الموضوعات والمشاكل من خلال الإنترنت. سيتم تطبيق طريقة نظام بولونيا بدءًا من هذا العام الدراسي.

10. طرق التقييم

1. الندوات.
2. المناقشة الأكاديمية والحوار الشفهي والامتحانات الكتابية النظرية والعملية الفصلية والنهائية.
3. كتابة وتقديم التقارير وتدوين الملاحظات حول الخبرة الفنية المكتسبة خلال الزيارات الميدانية.

اعتمد القسم على أساليب وأدوات تقييم واضحة وعالية الجودة وذلك للحفاظ على الجودة والسمعة العلمية العالية للتخرج، حيث تعد جودة الخريج أمراً مهماً للغاية لأنه يشكل المنتج النهائي للعملية التعليمية، ومن أهم أساليب التقييم المستخدمة في القسم:

a) **الاختبارات الموضوعية :الهدف من الاختبار هو قياس قدرة الطلاب على التعرف على الحقائق الهندسية واستيعابها، ويمكن القيام بذلك باستخدام ما يلي:**
أ -1-أسئلة الصواب والخطأ.
أ -2-أسئلة اختيارية متعددة.
أ-3-أسئلة المقابلة (أسئلة فارغة)
أ -4-أسئلة الاستكمال.

b) **الاختبارات الهندسية :الهدف من الاختبار هو قياس قدرة الطالب على فهم المواد العلمية ومبادئ الهندسة، والتذكر والربط والتفسير، فضلاً عن القدرة على تحليل البيانات واستخدامها لتشخيص المشكلات الهندسية .ويمكن القيام بذلك باستخدام ما يلي :**
ب -1-اختبار الاتصال / الأسئلة المفتوحة.
ب -2-الأسئلة التي لها إجابة محددة.

c) **اختبارات أخرى:**
ج -1-الندوات.
ج -2-المناقشة العلمية والحوار الشفهي والامتحانات النظرية والعملية الفصلية والنهائية.
ج -3-كتابة التقارير
ج -4-الزيارات الميدانية.

11. هيئة التدريس

أعضاء هيئة التدريس

الرتبة العلمية	التخصص		المتطلبات الخاصة / المهارات (إن وجدت)	طاقم عمل	
	عام	خاص		ملاك	محاضر
أ.د.حسن عبد الوهاب	الهندسة الميكانيكية	الاحتراق		☒	
أ.م.د. دلير عبيد رمضان	الهندسة الميكانيكية	ميكانيك تطبيقي		☒	
م.م. مؤمن حسن حمد	علوم المكائن والآلات الزراعية	علوم المكائن والآلات الزراعية		☒	
د. شيروان محمد نجم	الهندسة الميكانيكية	تشكيل معادن			☒
م.م. محمد حامد ذنون	الهندسة الميكانيكية	هندسة الطيران			☒

12. معيار القبول

يتم قبول الطلبة في قسم هندسة الطيران بالكلية من خريجي الدراسات التحضيرية في فرعها العلمي بمعدل 60 % ومتطلبات التخرج هي:

-أداء 136 ساعة دراسية على مدار سنوات الدراسة
-اجتياز الامتحانات المقررة بمعدل 50% أو أكثر
-إجراء التدريب الصيفي قبل المرحلة النهائية.
-تقديم بحث تخرج في أحد موضوعات التخصص.

خطة تطوير البرنامج

A. تحليل الوضع الحالي :ويتم ذلك من خلال تقييم المناهج الحالية وتحليل نقاط القوة والضعف فيها والبحث عن فرص التحسين وتحديد المجالات التي تحتاج إلى تطوير.
B. تحديد الأهداف :يعتبر تحديد الأهداف الرئيسية لتطوير المناهج الأكاديمية من أهم الخطوات في تطوير أي برنامج، حيث يمكن أن تشمل الأهداف زيادة الجودة التعليمية وتحسين تجربة الطالب وتعزيز التطور الأكاديمي والشخصي.
C. التقييم والمراجعة المستمرة :من خلال إجراء تقييم ومراجعة دورية للمناهج وطرق التدريس والتواصل مع الطلاب والأساتذة لجمع الملاحظات والتعليقات، واستخدام هذه الملاحظات لتحسين وتعزيز منهجك الأكاديمي.

13. .أهم مصادر المعلومات عن البرنامج

الجامعات الحكومية العراقية والجامعات العالمية ذات العلاقة بالتخصص.

15. خطة تطوير البرنامج

Program Skills Outline																	
			مطلوب برنامج تعلُّم النتائج														
السنة/المستوى	كود الدورة	اسم الدورة	Basic or optional	Knowledge				Skills				Ethics					
				أ1	أ2	أ3	أ4	ب1	ب2	ب3	ب4	ج1	سي 2	سي 3	سي 4		
المرحلة الثانية	ANTE 223	سائل الميكانيكا1	متخصص	☒	☒	☒		☒	☒			☒	☒	☒	☒		
	ANTE 215	عمليات التصنيع	متخصص	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒		
	MATH 252	الرياضيات2	مساعد	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒		
	CREQ 246	الرسم الميكانيكي	مساعد	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒		
	ANTE 213	الميكانيكاII	متخصص	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒			
	ANTE 214	قوة المواد	متخصص	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒			
	ANTE 231	نظرية الطيران	متخصص	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒		
	ANTE 222	الديناميكا الحرارية2	متخصص	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒			
	CREQ 245	البرمجةII	مساعد	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒		

Ethics				Skills				Knowledge				Basic or optional	اسم الدورة	كود الدورة	السنة/المستوى
سي 4	سي 3	سي 2	ج1	ب4	ب3	ب2	ب1	أ4	أ3	أ2	أ1				
	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	متخصص	الديناميكا الهوائية	ANTE 324	المرحلة الثالثة
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	متخصص	كهرباء الطائرات والأجهزة	ANTE 332	
	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	متخصص	تصميم الهندسة الميكانيكية1	ANTE 316	
			☒			☒	☒	☒	☒	☒	☒	مساعد	الهندسة والتحليل العددي	CREQ 347	
☒	☒	☒	☒	☒	☒	☒	☒			☒	☒	متخصص	انتقال الحرارة	ANTE 325	
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	مساعد	الهندسة الصناعية	CREQ348	
☒	☒	☒	☒	☒	☒	☒	☒		☒	☒	☒	متخصص	نظرية الآلات	ANTE 317	
	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	متخصص	الغاز الديناميكي	ANTE326	
	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	متخصص	محركات الطائرات	ANTE 333	

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**	C	
Module Leader	**Name : Mohammed Omar Ali**		**e-mail**	**E-mail:** mohammad.ali@atu.edu.iq	
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	**01/02/2024**		**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	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. <u>Part B - Analogue Electronics</u> 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	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Theory of flight**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13033**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	ATU13		**College**	1	
Module Leader	Sadiq emad sadiq		**e-mail**	Sadaiq.emad@atu.edu.iq	
Module Leader's Acad. Title	lecture		**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	01/02/2024		**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	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) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	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 N◌ACA 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 an airplane
Week 10	Take off performance
Week 11	Climb performance
Week 12	Steady 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	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Fluid Mechanics -static**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒**Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13031**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	4
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	1. Define what is a fluid 2. Describe the fundamental fluid properties 3. Understand pressure 4. Find the forces on submerged planar objects of arbitrary shapes 5. Find the forces on submerged objects of curved shapes 6. 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] <u>Part B - Fluid Statics</u> - Definitions, Pressure at a point, Variation of Pressure in a static fluid, Basic Equations 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 Forc, 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) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**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**	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: Hydrostatic 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	FLUID MECHANICS FUNDAMENTaLS AND APPLICAtIONS, 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	

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

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

Module Objectives أهداف المادة الدراسية	**Module Information** معلومات المادة الدراسية اللغة العربية S ATU13017 2 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.

SWL (hr/sem)	**50**	**Module Delivery** ☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	

Module Level	1	**Semester of Delivery**	1
Administering Department	ATU12	**College**	PMTE
Module Leader	Name	**e-mail**	E-mail
Module Leader's Acad. Title		**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

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسي

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

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) 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)		

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
Wee	الضاد والظاء

k 6	
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/	

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
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	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

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**Thermodynamic - Steam**	**Module Delivery**	
Module Type	**B**	☒ 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**	
Module Leader	Nawfel Mohammed Baqer	**e-mail**	Nawfel.mohammed@atu.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Basemah	**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. The course provides the student with knowledge about: 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 gas based 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 constitute 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 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.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	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) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**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% (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)		

	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* $T_{low,avg}$) - Superheating the Steam to High Temperatures (*Increases* $T_{high,avg}$) - Increasing the Boiler Pressure (*Increases* $T_{high,avg}$) -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		

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

Module Information
معلومات المادة الدراسية

Module Title	**Computer Principals**	**Module Delivery**	
Module Type	**B**	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13012**		
ECTS Credits	**3**		
SWL (hr/sem)	**75**		
Module Level	1	**Semester of Delivery**	1
Administering Department	ATU13	**College**	PMTE
Module Leader	Name	**e-mail**	E-mail
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	01/06/2023	**Version Number**	1.0

Note: Marks with Decimal places above or below 0.5 will be rounded to the nearest 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.

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-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 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	3
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	**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 **Week 4** **Week 5**	**Variables** - Variable Names - Examples on variable names - 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** - polyarea (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	**loops** - for - while - Program control - Example Problems
Week 14	
Week 15	**Matrices** - Matrices manipulation
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	Headway book for learning English	Yes
Recommended Texts	Skills in writing and Learning English	Yes
Websites	https://www.bbc.co.uk/learningenglish/	

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

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	ENGLISH			**Module Delivery**	
Module Type	S			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	ATU13011				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		1	**Semester of Delivery**		1
Administering Department		ATU13	**College**	PMTE	
Module Leader	Husam aldeen Nidhal Hadi		**e-mail**	hussam.aldeen475@atu.edu.iq	
Module Leader's Acad. Title		Asst. Lect.	**Module Leader's Qualification**		Master degree
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-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 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 #3, #5
	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	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	Reading comprehensive-Beginners level
Week 6	Sentences and their parts (simple, compound and complex) for beginner's level.
Week 7	Mid-term Exam
Week 8	Paraphrasing-1, writing in your own words. Beginners level
Week 9	Paraphrasing-2, writing in your own words. Beginners level (Practice)
Week 10	Effective writing, how to write in an effective way. Beginners level.
Week 11	Demonstrates knowledge about Offering and Inviting Why.? Would you like to...? Let's...? Free time activities
Week 12	Able to identify (Be going to weak forms (Hedging in writing): Maybe/perhaps….etc)
Week 13	Polite Requests in English Language
Week 14	Demonstrates knowledge about Transport, Prepositions of movement Address Demonstrates knowledge about (Writing Activities)
Week 15	Writing short essay
Week 16	Final Exam: Written 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	Headway book for learning English	Yes
Recommended Texts	Skills in writing and Learning English	Yes
Websites	https://www.bbc.co.uk/learningenglish/	

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
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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

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Algebraic and math. equations and Programming MATLAB			**Module Delivery**	
Module Type	**Basic learning activities**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ATU13045				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date			**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	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
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. 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.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** **Part A** – Vectors: -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], **Part B - Matrices** - 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] **Part C – I Complex Numbers** - 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	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	15% (15)	5,10 and 14	LO #1, #2 and #4, LO LO #5, #6 and #9
	Assignments	1	5% (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	**Vector** - Vector in Space - Parallel Vectors - Triple Product
Week 2	- Volume of Box - Projection of Two Vectors - Applications
Week 3	- Equation of Line in Space - Equation of Plane in space - Applications
Week 4	- Vector Valued Functions - Curvature - Motion of Particle
Week 5	**Matrices** - Elementary Operations with matrices and Vectors **Determinants and Properties** - Transpose and inverse of matrices
Week 6	**Determinants and Properties** - Transpose and inverse of matrices
Week 7	**Solution of non- linear equations** - Introduction - Application of non- linear equations
Week 8	- Rank of a matrix - Vectors - Linear transformation - Orthogonal transformation
Week 9	- Eigen values - Eigen vectors
Week 10	**Complex Numbers** - Introduction to complex numbers
Week 11	**Mathematical Operations for Complex Numbers** - Argrand diagrams and product quotients
Week 12	**Solution of simultaneously linear equations** - Definition of equations - Methods of solution
Week 13	**Direct methods** - Matrix inversion - Gauss- Elimination - Gauss -Jordan Elimination
Week 14	**Indirect methods** - Jacob's method - Gauss- Seidle method
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/	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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**		**e-mail**	**E-mail**	
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			**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 المحتويات الإرشادية	Indicative content includes the following. <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]

	Part – B: Resistance to flow in open and closed conduits [3 hrs] Part – C: Flow and losses in pipes laminar and turbulent flow, losses in pipes, Liner momentum equation and its Application, Closed system (bend pipes). [15hrs] Part – D: pumps and Turbines Introduction to pumps and Turbines[3hrs] Part – E: Dimensional analysis and Dynamic similitude 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?
Required Texts	FLUID MECHANICS FUNDAMENTaLS AND APPLICAtIONS, 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/	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A - Excellent**	امتياز	**90 - 100**	**Outstanding Performance**
	B - Very Good	جيد جدا	**80 - 89**	**Above average with some errors**
	C - Good	جيد	**70 - 79**	**Sound work with notable errors**
	D - Satisfactory	متوسط	**60 - 69**	**Fair but with major shortcomings**
	E - Sufficient	مقبول	**50 - 59**	**Work meets minimum criteria**
Fail Group (0 – 49)	**FX – Fail**	راسب (قيد المعالجة)	**(45-49)**	**More work required but credit awarded**
	F – Fail	راسب	**(0-44)**	**Considerable amount of work required**

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Fundamentals of Engineering Mechanics-Dynamics**			**Module Delivery**	
Module Type	**Support learning activity**			☒ **Theory** ☒ **Lecture** ☒ **Tutorial** ☐ **Lab** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13036**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Assaad Alsahlani, Ph.D		**e-mail**	alsahlan@msu.edu	
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		**Semester**	

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		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic roundinoutlined above.

Module Description Form

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Manufacturing Process**			**Module Delivery**	
Module Type	**B**			☒ **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			**College**		
Module Leader	Mohammed Abdulridha Abbas		**e-mail**	mohd.a.abbas@atu.edu.iq	
Module Leader's Acad. Title	Senior lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**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		

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
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rouning outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Applied of Thermodynamics- Ideal gas**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13046**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	ATU13		**College**		
Module Leader	Nawfel Mohammed Baqer		**e-mail**	Nawfel.mohammed@atu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Basemah		**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	The course provides the student with knowledge about: 1. Entropy and the 2nd law of thermodynamics. 2. Different **GAS POWER CYCLES** such as Carnot, Otto, Diesel and Brayton. The course gives the student insight about

	3. The quality of different forms of energy measured as the ability to produce work. 4. Destruction of energy quality in processes. 5. Ideal gas model, its assumptions, applications and limitations. 6. 7. Operation of gas based power stations, internal combustion engines, heat pumps. 8. The main components of heat & power processes, such as gas turbines compressors, pumps, fans, heat exchangers and valves. 9. Operation of **Refrigeration cycles** 10. Operation of **Air Refrigeration System** 11. **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	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 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) 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	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		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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	5				
SWL (hr/sem)	125				
Module Level	1		**Semester of Delivery**	1	
Administering Department			**College**	NETC	
Module Leader	Amar Abdulallah		**e-mail**		
Module Leader's Acad. Title	Lecturer		**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	01/06/2023		**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 Aims أهداف المادة الدراسية	1. Develop practical skills in electronics workshop operations, focusing on safety measures and proficiency in using measuring devices and tools. 2. Acquire knowledge and techniques related to welding, soldering, and handling electronic components on printed boards. 3. Gain familiarity with various electronic components, circuits, 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 والتدريس

	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		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Human Right and Democracy(الديمقراطية وحقوق الانسان)**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	ATU11				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	2		**Semester of Delivery**	2	
Administering Department			**College**		
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
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		**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	Strategy aims to support the establishment and consolidation of inclusive and accountable democracies to advance freedom, dignity, and development. To achieve this goal, the Strategy sets four strategic objectives: تهدف الاستراتيجية إلى دعم إنشاء وتوطيد ديمقراطيات شاملة وخاضعة للمساءلة لتعزيز الحرية والكرامة والتنمية. ولتحقيق هذا الهدف، حددت الاستراتيجية أربعة أهداف استراتيجية: (

	1. Promote participatory, representative, and inclusive political processes and government institutions.(1. تعزيز العمليات السياسية والمؤسسات الحكومية التشاركية والتمثيلية والشاملة.) 2. Foster greater accountability of institutions and leaders to citizens and to the law. (تعزيز قدر أكبر من مساءلة المؤسسات والقادة أمام المواطنين وأمام القانون.) 3. Protect and promote universally recognized human rights. حماية وتعزيز حقوق الإنسان (المعترف بها عالمياً.) 4. Improve development outcomes through the integration of DRG principles and practices across human right development portfolio. تحسين نتائج التنمية من خلال دمج (مبادئ وممارسات DRG عبر محفظة تنمية حقوق الإنسان.)
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The methods referred previously to in the role of institutions and mechanisms, the National Plan adopts a few methods formerly applied by the Iraqi Government, its human rights and other organizations in its activities and programs promoting respect for human rights. However, it also adopts an integrated systematic perspective for its coordination and organization to become more capable to work and realize the intended outcomes. من خلال الأساليب المشار إليها سابقاً في دور المؤسسات والآليات، تعتمد الخطة (الوطنية بعض الأساليب التي كانت تطبقها سابقاً الحكومة العراقية ومنظمات حقوق الإنسان وغيرها من المنظمات في أنشطتها وبرامجها التي تعزز احترام حقوق الإنسان. كما أنها تتبنى منظوراً منهجياً متكاملاً في تنسيقها وتنظيمها لتصبح أكثر قدرة على العمل وتحقيق النتائج المرجوة)
Indicative Contents المحتويات الإرشادية	The plan adopts an implementation vision that relies on benefiting from the various ongoing mechanisms in Iraq, which are important for the internal accumulation of human rights respect. According to the plan, an ad hoc committee will be established to follow up the plan completion and implementation procedures without being limited to specific means and tools. Like any short-, medium- or long-term plans, this plan requires the establishment of a widely representative national committee (governmental and non-governmental). The actors should follow up, coordinate and open essential channels for participation to enhance the plan activation. تتبنى الخطة رؤية تنفيذية تعتمد على الاستفادة من مختلف الآليات المستمرة في العراق والتي تعتبر مهمة (للتراكم الداخلي واحترام حقوق الإنسان. وبموجب الخطة سيتم تشكيل لجنة مخصصة لمتابعة إنجاز الخطة وإجراءات تنفيذها دون التقيد بوسائل وأدوات محددة. مثل أي خطط قصيرة أو متوسطة أو طويلة المدى، تتطلب هذه الخطة إنشاء لجنة وطنية ذات تمثيل واسع (حكومية وغير حكومية). وعلى الجهات الفاعلة المتابعة والتنسيق وفتح القنوات الأساسية للمشاركة لتعزيز تفعيل الخطة.)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Regarding the plan of action aspects and ongoing efforts promoting the human rights culture in the country, the plan mainly focuses on the following steps respectively: وفيما يتعلق بجوانب خطة العمل والجهود المستمرة لتعزيز ثقافة حقوق الإنسان في الدولة، تركز الخطة بشكل أساسي على الخطوات التالية على التوالي: 1. Survey and study previous efforts in spreading awareness of and training on human rights.حصر ودراسة الجهود السابقة في نشر الوعي والتدريب في مجال حقوق الإنسان . 2. The need to measure impacts of these efforts in a manner that ensures knowing

	the outcomes and consequences. ضرورة قياس آثار هذه الجهود بما يضمن معرفة النتائج والعواقب. 3. Review approaches and analyses applied in these activities. مراجعة المناهج والتحليلات المطبقة في هذه الأنشطة. 4. Analyze current and future needs and identify priorities. تحليل الاحتياجات الحالية والمستقبلية وتحديد الأولويات. 5. Develop a strategic vision on the methods and mechanisms spreading better awareness on the culture of human rights. وضع رؤية استراتيجية حول أساليب وآليات نشر الوعي بثقافة حقوق الإنسان. 6. Link these efforts to others related to drafting a national program for human rights education. ربط هذه الجهود بجهود أخرى تتعلق بإعداد برنامج وطني للتربية على حقوق الإنسان. 7. Adopt an integrated human rights media strategy promoting respect for human and citizenship rights and enhance awareness of values for the public. تبني استراتيجية إعلامية حقوقية متكاملة تعزز احترام حقوق الإنسان والمواطنة وتعزز الوعي بالقيم لدى الجمهور. 8. Continuous development and review of efforts aiming to introduce human rights in the annual and substantial curriculum. التطوير والمراجعة المستمرة للجهود الرامية إلى إدخال حقوق الإنسان في المناهج الدراسية السنوية والموضوعية.

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
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	15% (15)	5 and 10	LO #1, #2 and #7, #8
	Assignments	2	15% (15)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	----	--	--	--
	Report	1	10% (10)	13	LO #5, #6 and #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	**تعريف الحق** وعناصره مفهوم الشخصية القانونية
Week 2	مميزات الشخصية الانسانية نشأت مصطلح حقوق الانسان
Week 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
Week 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	**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		Yes
Recommended Texts		No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	C - Good	جيد	70 – 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	اللغة العربية			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	ATU13017				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ATU12		**College**	PMTE	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title			**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.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.

	.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.
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 الصوتى: 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 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)		

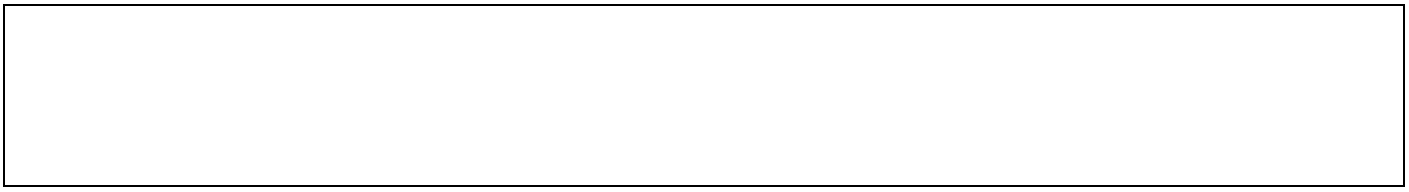
Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	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/	

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



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Fundamentals of Thermodynamics**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13015**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	ATU13		**College**		
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**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. 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. 7. Unconventional sources of energy
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 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	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 11	**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 - Flow, Shaft Work - Energy Equation
Week 13	**Application of steady flow Energy Eq.** - Boiler & Condenser Compressor & Turbine - Nozzle & throttling Heat Exchanger
Week 14	**The Second Law of Thermodynamics** - 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**

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

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Engineering Materials			**Module Delivery**	
Module Type	Support or related learning activity			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	ATU13022				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**		

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Materials Science & Engineering is the study of mechanical, physical, and chemical properties of engineering materials, such as metals, ceramics, polymers, and composites. 2. The objective of a Materials Engineer is to predict and control material properties through an understanding of atomic, molecular, crystalline, and microscopic structures of engineering materials. 3. A Materials Engineer is an essential member of an engineering team responsible for synthesis and processing of advanced materials for manufacturing. 4. A graduate's work may be in areas as diverse as automobile, aerospace, biomedical, or microelectronics manufacturing. Opportunities are available through these industries in the area of research, quality control, product development, design, synthesis, and processing operations.
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. Utilize the structure-properties relationship to predict the properties of a material. 2. Select the materials and properties appropriate for a specific application. 3. Assess needs, formulate problem statement, structure and evaluate solutions in solving real-world materials engineering problems. 4. Apply thermodynamics and kinetics in the process design of materials system in order to produce desired structure and properties. 5. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. 6. Select appropriate materials characterization tools, utilize the tool safely, and interpret experimental results. 7. Utilize modern tools and techniques to alter, characterize, and measure materials properties and to design processes according to accepted standards. 8. Demonstrate use of materials engineering in emerging applications. 9. Design and analyze appropriate experiments to measure or optimize specific engineering properties, incorporating statistical procedures. 10. Select and evaluate economic impact of the materials, design, and/or processes.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** **Part A - Engineering materials:** -Introduction to ores, elements and materials {Iron ores, Periodic table of elements, Engineering materials}., **Classification of engineering materials** **-Crystal structure**: atomic arrangement {BCC, FCC and HCP structures}, Atomic packing factor. **-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.} [8 hrs], **Part B - 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. [5hrs] **Part C – Mechanical properties of metals:** - Specifications and standards, Normal stress and shear stress, Strain, Tensile and compression tests, Stress-strain diagram. **-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 [4 hrs] **Part D – Iron and Steel:** - Fe-Fe3C phase diagram, Allotropy, Microstructure of carbon steels, Effect of carbon content on microstructure & mechanical properties of carbon steel. **Carbon steel** -Types, Properties and uses of carbon steel, Low, medium, and high carbon steel, Tool carbon steel. **-Cast Iron** Types, properties and uses of cast iron White, grey, nodular and malleable cast iron. [4 hrs]. **Part E– Non- destructive inspection:** - Liquid penetrant, Magnetic particle, X-rays, Ultrasonic. [2 hrs] **Part F–Materials** **-Nano materials**, Characterization of nano particles and nano structures, Classification, Applications of nano materials in technology and medicine. **-Plastics**, Introduction to plastics technology, Microstructure and polymerization , Structure of plastics materials., Classification, properties and uses of plastics. - **Ceramics and glass**, Structure, defects, properties and uses of ceramics., Structure, properties and uses of glasses. **-Composite Materials**, Classification: metal matrix, ceramic matrix and polymer matrix composites, Reinforcing phase: fibers, flakes, and particles. Composite's structure and volume fraction, Properties and uses of composites [7 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	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	70	**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**	3	10% (10)	5,17 and 14	LO #1, #2, #3 and #4, LO #5, and #6 LO #11, #12 and #13
	Assignments	2	10% (10)	4 and 13	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	0	0
	Report	2	10% (10)	6,10	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	
	Material Covered
Week 1	**Introduction** -Introduction to ores, elements and materials -Iron ores -Periodic table of elements -Engineering materials. **-Classification of engineering materials**
Week 2	**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
Week 4	**- Structure of ingots chilled** - Columnar and central equi-axed grains - Dendritic segregation.
Week 5	**Thermal equilibrium diagrams** - Solubility in the solid state - Phases - Solid solutions, compounds and mechanical mixtures.
Week 6	**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 7	**Mechanical properties of metals** - Specifications and standards - Normal stress and shear stress - Strain - Tensile and compression tests - Stress-strain diagram.
Week 8	**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 9	- **Iron and Steel** - Fe-Fe_3C phase diagram - Allotropy - Microstructure of carbon steels - Effect of carbon content on microstructure & mechanical properties of carbon steel. **-Heat treatment of steel** - Non-equilibrium cooling - TTT diagrams - Annealing, normalizing, hardening and tempering of steel.
Week 10	**Carbon steel** - Types, Properties and uses of carbon steel - Low, medium, and high carbon steel - Tool carbon steel. **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.
Week 12	**Nano materials** - Characterization of nano particles and nano structures - Classification - Applications of nano materials in technology and medicine.
Week 13	**Plastics** - Introduction to plastics technology - Microstructure and polymerization - Structure of plastics materials. - Classification, properties and uses of plastics
Week 14	**Ceramics and glass** - Structure, defects, properties and uses of ceramics. - Structure, properties and uses of glasses.
Week 15	**Composite Materials** - Classification: metal matrix, ceramic matrix and polymer matrix composites - Reinforcing phase: fibers, flakes, and particles. - Composites structure and volume fraction - Properties and uses of composites.
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	E I G H T H E D I T I O N Materials Science and Engineering An Introduction [William D. Callister, Jr. and David G. Rethwisch]	No
Recommended Texts	Essentials of Materials Science and Engineering Second Edition, SI	No
Websites	https://youtube.com/@WkhalifaMr	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors

	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**single variables calculus**			**Module Delivery**	
Module Type	B			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ATU13013				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ATU13		**College**	PMTE	
Module Leader			**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	01/06/2023		**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	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	4
Total SWL (h/sem)	**125**		

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% (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.	4	10% (10)		
	Report	1	10% (10)	13	LO #5, #8 and #10
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	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

Week 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		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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	5				
SWL (hr/sem)	125				
Module Level	1		**Semester of Delivery**	1	
Administering Department			**College**	NETC	
Module Leader	Amar Abdulallah		**e-mail**		
Module Leader's Acad. Title	Lecturer		**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	01/06/2023		**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 Aims أهداف المادة الدراسية	1. Develop practical skills in electronics workshop operations, focusing on safety measures and proficiency in using measuring devices and tools. 2. Acquire knowledge and techniques related to welding, soldering, and handling electronic components on printed boards. 3. Gain familiarity with various electronic components, circuits, 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 والتدريس		
	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		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group	**A** - Excellent	امتياز	90 - 100	Outstanding Performance

(50 - 100)	**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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.

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	Hayder Hashim Khaleel		**e-mail**	hayderhashim@atu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MS.C	
Module Tutor	Name (if available)		**e-mail**	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	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	1. Learn the different types of engineering stresses 2. Recognize the various types of engineering strains. 3. Deal with thermal stress problems. 4. Using the superposition method and saint venant equations to solve stress problems. 5. Define the mechanical properties of ductile and brittle materials. 6. Analyze the loads on engineering structures by drawing the shear force and bending moment diagrams 7. Discuss the symmetrical and unsymmetrical bending moment. 8. 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 types and 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		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Multi Variable Calculus			**Module Delivery**	
Module Type	**Basic learning activities**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ATU13021				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	1
Co-requisites module	Algebra	**Semester**	4

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 mathematical Equations through the application of techniques. 2. The ability to apply knowledge in mathematics, science, and engineering. 3. To understand **Differential Equations**, Double Integrals and Triple Integrals, etc. 4. To understand **Polar Coordinates** and **Special Functions** problems. 5. To Sketching of Geometric Shapes
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. Selects and applies knowledge of mathematics, engineering, technology, and other sciences to solve engineering problems that require the application of applied principles, procedures, or methodologies. 2. To Recognize between type of Differential Equations. 3. understanding with solving skills of Differential Equations. 4. To understand various method associated with Non-Homogeneous Differential Equations**.** 5. Definition with understand the Mechanism **Partial Differentiation** 6. understanding Chain Rule and Total Differential. 7. Learning how to Sketch the Geometric Shapes 8. Understanding the Double Integrals, Triple Integrals and Applications. 9. Learning how to solve Gama Function, Beta Function. 10. To recognize Special Curve (Line, Circle, Conic Section) and Rotation of Axis
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** **Part A -Ordinary Linear Differential Equations.** - 1st order differential equations. {Separable, Homogeneous, Exact, Linear Bernoulli}, 2nd Order Differential Equations. {Reducible to 1st order, Homogeneous. Non-Homogeneous} Higher Order Differential Equations. {Homogeneous, Non-Homogeneous, Applications}. [16 hrs], **Part B - Partial Differentiation** Definition, Mechanism of Differentiation, Functions of Two Variables, Functions of Higher Variables., Transformation {Chain Rule, Total Differential}, Directional Derivative {Maxima, Minima and Saddle Points, Lagrange Theorem}. [15 hrs] **Part C – Integrals:** Sketching of Geometric Shapes, Double Integrals and Triple Integrals, Applications. [6 hrs] **Part D – Special Functions:** Gama Function and Beta Function. [6 hrs]. **Part E– Polar Coordinates:** Polar Curve Representation, Sketching of Polar Curve, General Curve., Special Curve (Line, Circle, Conic Section), Rotation of Axis, The Arc Length of Polar Curve, Surface

	Area of Rotation, The Angle Between the Tangent Line and Radius Vector for a Polar Curve, Slope of Tangent {Asymptotes, Plane Area} [15 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	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**	3	10% (10)	6,10 and 14	LO #1, #2 and #5, LO #6, #7 and #10 LO #11, #12 and #13
	Assignments	2	10% (10)	2 and 13	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10	0	all
	Report	2	10% (10	0	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	**Ordinary Linear Differential Equations** - 1st order differential equations - Separable - Homogeneous.
Week 2	- Exact - Linear - Bernoulli
Week 3	- 2nd Order Differential Equations - Reducible to 1st order - Homogeneous.
Week 4	- Non-Homogeneous
Week 5	- Higher Order Differential Equations - Homogeneous - Non-Homogeneous - Applications
Week 6	**Partial Differentiation** - Definition - Mechanism of Differentiation - Functions of Two Variables - Functions of Higher Variables
Week 7	- Transformation - Chain Rule - Total Differential
Week 8	-Gradient, Divergence, and Curl of Vector - Equation of Normal Line and Tangent Plane
Week 9	- Directional Derivative - Maxima, Minima and Saddle Points - Lagrange Theorem
Week 10	- Sketching of Geometric Shapes - Double Integrals - Triple Integrals - Applications
Week 11	**Special Functions** - Gama Function - Beta Function
Week 12	**Polar Coordinates** - Polar Curve Representation - Sketching of Polar Curve - General Curve
Week 13	- Special Curve (Line, Circle, Conic Section)

	- Rotation of Axis
Week 14	- The Arc Length of Polar Curve - Surface Area of Rotation - The Angle Between The Tangent Line and Radius Vector For a Polar Curve.
Week 15	- Slope of Tangent - Asymptotes - Plane Area
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/	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mechanics-Static**			**Module Delivery**	
Module Type	**Support learning activity**			☒ **Theory** ☒ **Lecture** ☒ **Tutorial** ☐ **Lab** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13024**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**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 develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering 2. To understand and use the general ideas of force vectors and equilibrium of rigid body and particle 3. To understand and use the general ideas of structural analysis and internal force friction 4. To understand and use the general ideas of centre of gravity, centroids and moment of inertia
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Determine the components of a force in rectangular or nonrectangular coordinates. 2. Determine the resultant of a system of forces. 3. Draw complete and correct free-body diagrams and write the appropriate equilibrium equations from the free-body diagram. 4. Determine the support reactions on a structure. 5. Determine the connection forces in trusses and in general frame structures. 6. Determine the internal reactions in a beam 7. Analyze systems that include frictional forces. 8. Locate the centroid of an area. 9. Calculate the second moment of an area, calculate the principal second moments of an area.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – forces vectors ,Forces ,3D forces ,Moments OF FORCES ,Couples ,Resultant of a force system, (56 hrs) Equilibrium of a force system and analysis of internal force (8 hrs) Friction ,Application of friction on bearings (16 hrs) Part B – truss Trusses, planes, joint method , Frame and Machines (16 hrs) Part C – centroid Centered of line, area and volume, Moment of inertia, Theory of parallel axes(24 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 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	**200**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	2 - 10 Every other lecture	All
	Assignments	2	10% (10)	2 and 12	LO#3, LO#7 and LO#9
	Projects / Lab.	1	10% (10)		
	Report	2	10% (10)	13	LO #5, #8 and #9
Summative assessment	**Midterm Exam**	2hr	10% (25)	7	LO #1 - #5
	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 static , vectors
Week 2	Forces
Week 3	3D forces
Week 4	Moments
Week 5	Couples
Week 6	Resultant
Week 7	Resultant
Week 8	Equilibrium
Week 9	Trusses, planes, joint method
Week 10	Frame and Machines
Week 11	Friction
Week 12	Application of friction on bearings
Week 13	Centered of line, area and volume
Week 14	Moment of inertia
Week 15	**Theory of parallel axes**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	ENGINEERING MECHANICS, statics by R. C. HIBBELER	Yes
Recommended Texts	ENGINEERING MECHANICS, statics by J. L. MERIAM	No
Websites	https://www.mathsisfun.com/	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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**	1	
Administering Department	3		**College**	1	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Mohammed Al-fahham		**e-mail**	E-mail: coj.moh@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	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 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** 2.1 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. 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)	**150**		

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% (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	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 الاسبوعي للمختبر	
	Material Covered
Week 1	Sound: speed of sound, production of sound, intensity, pitch and quality, Doppler effect.
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	Physics for Scientists & Engineers & Modern Physics, 9th Ed by Serway, Jewett	Yes
Recommended Texts	Fundamentals of Physics Textbook David Halliday	yes
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group	**A -** Excellent	امتياز	90 - 100	Outstanding Performance

(50 - 100)	**B -** Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Description Form

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**CAD Drawing**			**Module Delivery**	
Module Type	**Basic B**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**ATU13016**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department			**College**		
Module Leader	Mohammed Abdulridha Abbas		**e-mail**	mohd.a.abbas@atu.edu.iq	
Module Leader's Acad. Title	Senior lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	ATU13042, ATU13062, ATU13076, ATU13081, ATU13086	**Semester**	1, 6, 7, 8, 8

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To present a brief vision of Computer-Aided Design (CAD) and the tools of this term. 2. Highlighting the mathematical modeling principles of line, arc, spline, and other segments. 3. Covering the significant programs utilized in the modeling and comparing these programs. 4. Defining the SOLIDWORK program's tools and modeling outcomes. 5. Explaining global and local coordinate systems in modeling. 6. Explain the objectives of drawing views. 7. Enabling the students to have skills in modeling 2D and 3D. 8. Enabling the students to assemble the parts drawn. 9. Presenting theories of fit and tolerances in a drawing. 10. Presenting theories of bearings, gears, belts-pulleys, and cams.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Control of CAD principles as background programming of each segment, such as line or arc. 2. Controlling the main and sub-tools of the SOLIDWORKS program as a professional designer. 3. Contributing to knowing the methodology of drawing accuracy and technology terms. 4. Presenting the best factual knowledge for using the views and assembly techniques. 5. Create a valid basis for modeling cams, gears, ... etc. 6. Showing the right path to control in putting the dimensions. 7. Training the students to construct sub and major-projects of the designated modeling system.
Indicative Contents المحتويات الإرشادية	The indicative contents of this subject are: Part (A) CAD theories: DDA algorithm for line, Bresenham's algorithm, Spline theories, Matrices of drawing views, and Overlapping and topology problems. (8 hrs) Part (B) Introduction to modeling system in SOLIDWORKS: Drawing planes, Preparing sheet drawings, Line commands, circle commands, Arc commands, Rectangle commands, straight slot commands, Ellipse commands, Spline commands, and 3D sketch planes. (12 hrs) Part (C) Modifies commands in SOLIDWORKS: Trim commands, Convert entities commands, Offsite entities, Mirror, Pattern commands, and Miscellaneous commands. (6 hrs) Part (D) Main-Features commands: References Geometry commands, Curves, Extruded, Revolved, Swept, loft, Cut extruded, Hole wizard commands, Cut revolved, Cut loft, and Cut swept. (13 hrs) Part (E) Modify-Features commands: Fillet, Pattern, Rib, Draft, Shell, Wrap, Intersection, and Mirror. (5 hrs)

	Part (F) Surfaces commands: Extruded surface, Revolved surface, Swept surface, Loft surface, Boundary surface, Filled surface, Planar surface, Offset surface, Ruled surface, Flatten surface, and Fillet commands. (9 hrs) Part (G) Modify-Surfaces commands: Extend surfaces, Trim and Un-trim commands, knit surface, and Thicken commands. (5 hrs) Part (H) Assembly commands: Edit component, Insert components, Mate, Pattern, Smart features, Miscellaneous commands, Show and hidden components, Assembly features, Bill of Materials, and Exploded. (8 hrs) Part (I) Drawing sheet commands: Sheet size, 3D standard view, Model view, Projected view, Auxiliary, Section view, Detail view, Break commands, and Annotations commands. (6 hrs) Part (J) Tolerance Conceptual: Tolerance Methods, Tolerance expression, Plus and minus concept, Limit concept, Chain and baseline, Cases studies. (3 hrs) Part (K) Fit conceptual: Transition, Clearance, and Interference. (3 hrs) Part (L) Bearing, Cams, Gears, and Belts, bolts, Welding conceptual (12 hrs)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The strategy of this subject is to study the principles of computer-aided design (CAD) by employing one of the popular programs. The tools of SOLIDWORKS program contribute to developing the users' skills in 2D and 3D drawing. Besides, this program utilizes the assembly and sheet representation for sketched parts with annotation technologies. Furthermore, this program boosts the modeling of belts, coupling, gears, and cams. Consequently, prepare the students in the aeronautical field in the advanced modeling of airplanes.

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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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)	4 and 12	
	Assignments	2	10% (10)	3 to 12	
	Projects / Lab.	2	10% (10)	6 and 11	
	Report	1	10% (10)	0	
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	
	Final Exam	3hr	25% (25)	15	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	CAD theories.
Week 2	CAD theories, Introduction to modeling system in SOLIDWORKS.
Week 3	Introduction to modeling system in SOLIDWORKS
Week 4	Introduction to modeling system in SOLIDWORKS, 2D Modifies commands in SOLIDWORKS.
Week 5	2D Modifies commands in SOLIDWORKS, Main-Features commands.
Week 6	Main-Features commands.
Week 7	Main-Features commands, Mid-Term Exam.
Week 8	Modify-Features commands, Surfaces commands.
Week 9	Surfaces commands.
Week 10	Surfaces commands, Modify-Surfaces commands.
Week 11	Assembly commands.
Week 12	Assembly commands, Drawing sheet commands.

Week 13	Feet and clearance commands
Week 14	Modeling of Bearing, Cams, and Gears.
Week 15	Modeling of Belts, Bolts, and Welding.
Week 16	Final Exam.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	DDA Algorithm for line, Bresenham Algorithm for arc, HC-Spline.
Week 2	Bezier spline, Preparing sheet and plane for drawing by SOLIDWORK program.
Week 3	2D drawing tools.
Week 4	2D drawing tools, 2D modify tools.
Week 5	3D drawing tools.
Week 6	3D drawing tools.
Week 7	3D drawing tools, Mid-Test.
Week 8	3D Modify-Features tools.
Week 9	Surfaces tools.
Week 10	Surfaces tools, Modify-Surfaces tools.
Week 11	Modify-Surfaces tools, Assembly tools.
Week 12	Assembly tools, Drawing Sheet tools.
Week 13	Feet and clearance tools.
Week 14	Bearing, Cams, and Gears tools
Week 15	Belts, Bolts, and Welding tools
Week 16	Final test.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Radhakrishnan, P., Subramanyan, S. and Raju, V., 2008. CAD/CAM/CIM. New Age International. Bethune, James D. Engineering Design and Graphics with SolidWorks 2016. United States: Pearson, 2016.	Yes
Recommended Texts	Purdue Univ, Prof Sham Tickoo. Solidworks 2016: A Tutorial Approach. United States: CADCIM Technologies, 2016.	Yes
Websites	-	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Principals**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13012**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ATU13		**College**	PMTE	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1-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 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	3
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	**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 **Week 4** **Week 5**	**Variables** - Variable Names - Examples on variable names - 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** - polyarea (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 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	Headway book for learning English	Yes
Recommended Texts	Skills in writing and Learning English	Yes
Websites	https://www.bbc.co.uk/learningenglish/	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Fundamentals of Electricity**			**Module Delivery**	
Module Type	**Basic learning activities**			☒ **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**	C	
Module Leader	**Name : Mohammed Omar Ali**		**e-mail**	**E-mail:** mohammad.ali@atu.edu.iq	
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		**01/02/2024**	**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	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 الدراسية	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 Kirchhoff'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.] 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.]

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)	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 - 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 الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Electronic Workbench and Multisim
Week 2	Lab 2: Thevenin’s / Norton's Theorem and Kirchhoff's Laws

Week 3	Lab 3: Δ-Y and Y-Δ circuit conversions
Week 4	Lab 4: Superposition Theorem
Week 5	Lab 5: RLC series circuit
Week 6	Lab 6: RLC parallel circuit
Week 7	Lab 7: Resonance in parallel circuits

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	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Theory of Machines**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13057**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	3		**College**	1	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	**Dr. Essam Oun Ali Al-Zaini**		**e-mail**	**dr.essam.alzaini@atu.edu.iq**	
Peer Reviewer Name			**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	**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)	48	**Structured SWL (h/w)**	3

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
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	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Aerodynamics: Fundamentals**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13051**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	3		**College**	1	
Module Leader	Mohammed Al-fahham		**e-mail**	E-mail: coj.moh@atu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Mohammed Al-fahham		**e-mail**	E-mail: coj.moh@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	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. 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. 1. Recognize the main difference between fluids. 2. Ability to analyses the flow using continuity equation and vorticity equation. 3. Derive and use the stream function to describe the flow patterns. 4. Discuss the application of stream and potential flow. 5. Recognize the difference between basic and super impose flow patterns. 6. Derive and use Navier -stoke equation and it is application. 7. Recognize the flow properties between parallel plates. 8. Recognize the types of boundary layers. 9. Discuss the application of the boundary layer. 10. Calculate the drag and lift in laminar and turbulent boundary layer. 11. 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	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

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		

Grading Scheme
مخطط الدرجات

Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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** ☐ **Seminar**	
Module Code	**ATU13065**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	3		**College**	1	
Module Leader	Zaid Al-Dulaimi		**e-mail**	E-mail: DulaimiZM@atu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Zaid Al-Dulaimi		**e-mail**	E-mail: DulaimiZM@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	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. 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. 1. Recognize the main difference between fluids. 2. Ability to analyses the flow using continuity equation and vorticity equation. 3. Derive and use the stream function to describe the flow patterns. 4. Discuss the application of stream and potential flow. 5. Recognize the difference between basic and super impose flow patterns. 6. Derive and use Navier -stoke equation and it is application. 7. Recognize the flow properties between parallel plates. 8. Recognize the types of boundary layers. 9. Discuss the application of the boundary layer. 10. Calculate the drag and lift in laminar and turbulent boundary layer. 11. 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		

Grading Scheme مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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	3		**College**	1	
Module Leader	Prof. Dr. Ali Shakir		**e-mail**	E-mail: coj.alishl@atu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Adel A. Eidan		**e-mail**	E-mail: Inj.adel@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	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 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.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how the heat is transferred by three methods 2. Define the Fourier's law, Newton's law of cooling and Stefan–Boltzmann law. 3. Explain the general Heat Conduction Equation 4. Summarize what is meant by the Boundary and Initial Conditions 5. Discuss the type of heat exchangers. 6. Describe the convection heat transfer systems
Indicative Contents المحتويات الإرشادية	Indicative content includes the following.

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
Week 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		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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	3		**College**	1	
Module Leader	Adwaa Mohammed		**e-mail**	E-mail	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor	Adwaa Mohammed		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date			**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	1. Understanding the theoretical and practical aspects of the use of numerical methods 2. Implementing numerical methods for a variety of multidisciplinary applications 3. Establishing the limitations, advantages, and disadvantages of numerical methods. 4. Understand Fundamentals: Familiarize with basic concepts in numerical analysis, such as accuracy and errors.

	5. Solve Equations: Learn methods for numerically solving algebraic and differential equations. 6. Data Analysis: Use numerical techniques to analyze data and interpret results. 7. Evaluate Algorithms: Assess the effectiveness and accuracy of algorithms used in numerical solutions. 8. Critical Thinking: Enhance critical thinking skills by analyzing results and understanding limitations.
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. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems 2. perform curve fitting • explain the least square method • find the determined function using least square method 3. construct a function which closely fits given n- points in the plane by using interpolation method 4. integration by using Trapozoidal rule, Simpson's 1/3 – rule, and Simpson's 3/8 – rule. 5. Find the solution of ordinary differential equation of first order by Euler, and Runge-Kutta methods 6. Find the derivatives using Newton's forward difference formula, Newton's backward difference formula. 7. 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.** **Part A – Matrix**: Solution of equation by Gauss Sidle and Jacobian method Eigen Value & Eigen Vector **Solution of non-linear equations:** Simple iteration method + Bisection method, Newton Raphson Method **Part C: Curve fitting** - linear Regression - Applications of linear regression - Transformation of nonlinear regression to linear regression **Part D: Numerical interpolation** - Introduction - Linear interpolation - Quadratic interpolation **Part E: Numerical Integration** - 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/	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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

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	Type Dept. Code		**College**	Type College Code	
Module Leader	Noor H. Dhahir Al-Fatlawi		**e-mail**	Coj.nor@atu.edu.iq	
Module Leader's Acad. Title	Asst. 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	01/02/2024		**Version Number**	1.0	

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

Module Objectives أهداف المادة الدراسية	1. Gain knowledge about the most type of gas turbine engines for single and double spool. 2. This course deals with the gas turbine engine construction (Intake, Fan/ Propeller/ Rotor, Compressor, Combustion section, Turbine section, Afterburner, jet pipe, Nozzle) 3. To understand and knowledge of operation principle and thermodynamic cycle analysis of aircraft propeller engines. 4. To understand and knowledge of operation principle and thermodynamic cycle analysis of turbojet and turbofan engines. 5. To develop problem solving skills of shaft power for the (shaft based) gas turbine engines. 6. To develop deriving and problem solving skills of thrust power for the (reaction) gas turbine engines. 7. Understand and knowledge the function and operation of auxiliary power units (APUs) 8. To develop the skill of troubleshoot for a gas turbine engine mechanic.
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 the types of aircraft gas turbine engines. 2. Understand the engine power augmentation systems. 3. Understand and knowledge the function and operation of auxiliary power units (APUs) 4. Recognize the difference between single spool and double spool gas turbine engines. 5. Recognize the difference in thermodynamic analysis between the shaft base engines and the reaction engines. 6. Understand how thrust power is generated in the different types of aircraft gas turbine engines. 7. Ability to calculate the engine speed and thrust power in gas turbine engines (turboprop). 8. Ability to calculate the shaft power in gas turbine engines (turboshaft). 9. Ability to calculate the engine speed and thrust power in gas turbine engines (turbojet and turbofan). 10. 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

Module Evaluation تقييم المادة الدراسية	
	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**		

		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	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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)	100				
Module Level	3		**Semester of Delivery**	5	
Administering Department	3		**College**	1	
Module Leader	Asaad Zuhair		**e-mail**	E-mail: Asaad.zuhair@atu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Asaad Zuhair		**e-mail**	E-mail: Asaad.zuhair@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	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. 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 system
	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
	3. Safety & Emergency Procedures
	• **Objective:** Mitigate electrical hazards and respond to failures.
	  ○ 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 1.
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

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	**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**	Yes

	• **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	
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		

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

Module Aims, Learning Outcomes and Indicative Contents

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Aerodynamics: Application**			**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	3		**College**	1	
Module Leader	Mohammed Al-fahham		**e-mail**	E-mail: coj.moh@atu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Mohammed Al-fahham		**e-mail**	E-mail: coj.moh@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	None	**Semester**	
Co-requisites module	None	**Semester**	

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Understand the incompressible flow over airfoils and wings. 2. Understand main characteristics of airfoils . 3. Understanding the lift optimization methods. 4. To build basic understanding of lift control devices. 5. To build basic understanding of propellers. 6. 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. 1. Recognize the main characteristics of flow over airfoils and wings. 2. Understand different theories of airfoil design. 3. Discuss the main tests and parameters of airfoils. 4. Discuss the maximum lift parameters. 5. Understanding wing stall. 6. Discuss the lift control devices. 7. Recognize the propellers main parameters and theory. 8. Recognize the blade theory. 9. Discuss the propeller performance. 10. Understand the concepts of computational fluid dynamics. 11. 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		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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	Asaad Zuhair		**e-mail**	E-mail: Asaad.zuhair@atu.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Asaad Zuhair		**e-mail**	E-mail: Asaad.zuhair@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	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** o Explain binary, octal, decimal, and hexadecimal number systems and perform conversions. o Interpret and simplify Boolean expressions using algebraic methods and Karnaugh Maps. 2. **Design and Analyze Digital Logic Circuits** o Implement combinational circuits such as adders, multiplexers, and decoders. o Demonstrate understanding of sequential logic elements such as flip-flops, counters, and shift registers. 3. **Explain Data Conversion Techniques** o Describe the operation and characteristics of ADCs and DACs. o Interface ADC/DAC components with microcontrollers or systems. 4. **Utilize and Interface Sensors** o Identify and classify different types of sensors used in measurement systems. o Implement signal conditioning circuits for sensor integration. 5. **Understand Electronic Instrumentation Systems** Illustrate the block diagram of a typical instrumentation system. o Discuss the characteristics of measurement systems and sources

	of error. 6. **Operate Electronic Measuring Instruments** o Use digital multimeters, oscilloscopes (CRO, DSO), and function generators effectively. o Analyze waveforms and electrical parameters using electronic instruments. 7. **Apply Knowledge in Real-world Applications** o Integrate smart sensors in instrumentation applications (e.g., biomedical or industrial domains). o Demonstrate basic IoT-based measurement and monitoring systems.
Indicative Contents المحتويات الإرشادية	**1. Number Systems & Codes** o Binary, Octal, Decimal, Hexadecimal conversions o Signed numbers: 1's and 2's complement o Binary arithmetic and coding systems (BCD, Gray) **2. Boolean Algebra & Logic Gates** o Boolean postulates and theorems o Logic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR o Simplification using Karnaugh Maps (2 to 4 variables) **3. Combinational Circuits** o Half Adder, Full Adder, Subtractor o Multiplexers, Demultiplexers o Encoders, Decoders o Design of simple logic systems **4. Sequential Circuits** o Flip-Flops: SR, JK, D, T (characteristics, excitation tables) o Counters: Asynchronous and Synchronous o Shift Registers: Serial-in/serial-out and parallel configurations **5. Data Conversion Techniques** o Analog-to-Digital Converters (ADC): Flash, SAR o Digital-to-Analog Converters (DAC): R-2R Ladder, Weighted Resistor o Resolution, accuracy, and quantization error **6. Sensors & Transducers** o Classification: Active/Passive, Analog/Digital o Sensors: RTD, Thermocouple, LVDT, Strain gauge, Light sensors o Selection criteria and sensor characteristics **7. Signal Conditioning** o Amplification, Filtering, Isolation o Op-Amp configurations for sensor interfacing o Importance of noise reduction and impedance matching **8. Instrumentation Systems** o Block diagram and components of instrumentation systems o 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** • Muhammad Ali Mazidi – The 8051 Microcontroller and Embedded Systems, Pearson • Hughes & John Ridley – Programmable Logic Controllers, Pearson	Yes
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	

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:				

Module Description Form

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mechanical Engineering Design-Applied**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU13062**				
ECTS Credits	**6**				
SWL (hr/sem)	**78**				
Module Level	**3**	**Semester of Delivery**	**6**		
Administering Department		**College**			
Module Leader	**Mohammed Abdulridha Abbas**	**e-mail**	**mohd.a.abbas@atu.edu.iq**		
Module Leader's Acad. Title	**Senior lecturer**	**Module Leader's Qualification**	**Ph.D.**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**25/07/2025**	**Version Number**	**2.0**		

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. 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.
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)** **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)**

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	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	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**	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		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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	3		**College**	1	
Module Leader	Mohammed Abdulridha Abbas		**e-mail**	mohd.a.abbas@atu.edu.iq	
Module Leader's Acad. Title	Senior lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/07/2025		**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	**The indicative contents of this subject are:**

المحتويات الإرشادية	**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 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)**

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

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

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

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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		3	**College**	1	
Module Leader	Hayder Hashim Khaleel		**e-mail**	hayderhashim@atu.edu.iq	
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		01/02/2024	**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	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	1. Learn the different types of combined engineering stresses and strains 2. Learn to draw Mohr circle for stress and strain 3. Deal with various types of torsion stress 4. Learn how to analyze rosettes strain gauge 5. 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)	27	**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	**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		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Aircraft Engines**			**Module Delivery**	
Module Type	**Basic learning activities**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**ATU13055**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Noor H. Dhahir Al-Fatlawi		**e-mail**	Coj.nor@atu.edu.iq	
Module Leader's Acad. Title	Asst. 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	01/02/2024		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**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. Gain knowledge about the basic concepts of all aircraft engines types. 2. To understand and knowledge of the fundamentals and performance and

	construction of aircraft piston engines. 3. This course is introduction subject for piston engine fuel systems, starting and ignition systems, exhaust and cooling systems, lubrication systems. 4. To understand and knowledge of the fundamentals and performance and construction of aircraft propeller engines. 5. To develop deriving and problem solving skills of thrust force for the jet and propeller engines and knowledge the factors affecting on it. 6. To develop problem solving skills and understanding of aircraft engines performance parameters. 7. To develop the skill of troubleshoot for an aircraft engine mechanic.
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 the classifications of aircrafts and propulsion systems. 2. List the types of propulsion systems. 3. Recognize the difference between air breathing and non-air breathing engines. 4. Recognize the difference between the shaft base engines (piston or propeller) and the reaction engines. 5. Identify the type of jet engine: turbine-based or ram-based (Athodyd). 6. Identify the basic parts in construction of each type of aircraft engines. 7. Understand how thrust force is generated in the different types of aircraft engines and how it is calculated. 8. Describe the advantages and applications the type of bypass engines. 9. Summarize the factors affecting on the thrust force. 10. Describe and calculation the engine performance parameters. 11. Identify the function and component of engine systems: (fuel system, starting and ignition systems, exhaust and cooling systems, lubrication system)
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: **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 primary strategy adopted for delivering this module is to encourage students' participation in exercises, while 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	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks with Decimal places above or below 0.5 will be rounded to the nearest 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.