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

دليل وصف البرنامج الأكاديمي والمقرر الدراسي

قسم هندسة تقنيات الميكانيك التطبيقي

الجامعة التقنية الشمالية - الكلية التقنية الهندسية / الموصل

٢٠٢٥-٢٠٢٦

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 م/2906/3 في 2023/5/3 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

اسم الجامعة : الجامعة التقنية الشمالية

الكلية/ المعهد : الكلية التقنية الهندسية / الموصل

القسم العلمي : قسم هندسة تقنيات الميكانيك التطبيقي

اسم البرنامج الأكاديمي او المهني : بكالوريوس هندسة تقنيات الميكانيك التطبيقي

اسم الشهادة النهائية : بكالوريوس في هندسة تقنيات الميكانيك التطبيقي

النظام الدراسي : مسار بولونيا

تاريخ اعداد الوصف : ٢٠٢٥/٩/٢

تاريخ ملء الملف : ٢٠٢٥/٩/٢

التوقيع: م.د. اياد سليمان عبدالله

اسم رئيس القسم: [illegible]

التاريخ: ٢٠٢٥/١٠/٠٦

التوقيع:

اسم المعاون العلمي: ا.م.د. محمد صباح جرجيس

التاريخ: / /٢٠٢٥

دقق الملف من قبل شعبة ضمان الجودة والأداء الجامعي

التوقيع :

اسم مدير شعبة ضمان الجودة والأداء الجامعي : م. م. ورقاء هاشم محمود

التاريخ: ٢٠٢٥/١٠/٩

مصادقة السيد العميد

1. رؤية البرنامج

أن يكون قسم هندسة تقنيات الميكانيك التطبيقي مركزاً رائداً في التعليم الهندسي والبحث التطبيقي، يخرّج كوادر تقنية مؤهلة ومبتكرة، قادرة على قيادة التحول في القطاع الصناعي والميكانيكي بما يواكب التطورات العالمية ويخدم أهداف التنمية المستدامة.

2. رسالة البرنامج

يلتزم القسم بتقديم تعليم تقني عالي الجودة يجمع بين المعرفة النظرية والتطبيق العملي، ويُعزز البحث العلمي والابتكار في تقنيات الميكانيك التطبيقي الحديثة. كما يسعى إلى إعداد خريجين يمتلكون الكفاءة والاحترافية لتلبية احتياجات السوق المحلي والإقليمي، والمساهمة بفاعلية في تطوير البنية الصناعية وخدمة المجتمع.

3. أهداف البرنامج

1. تقديم برامج أكاديمية متكاملة لمنح درجات البكالوريوس والماجستير والدكتوراه في هندسة تقنيات الميكانيك التطبيقي، مع التركيز على تطوير المهارات الهندسية والتقنية لتلبية متطلبات سوق العمل.
2. تأهيل خريجين بمهارات عالية في تصميم وتنفيذ وصيانة الأنظمة والمشاريع الميكانيكية بمختلف أنواعها، مع القدرة على توظيف التقنيات الحديثة والحلول المبتكرة في مجالات التصميم والتصنيع والإنتاج والصيانة.
3. تطوير البحث العلمي في هندسة تقنيات الميكانيك التطبيقي والمواد الهندسية وطرق التصنيع، مع التركيز على الأبحاث التطبيقية التي تعالج التحديات الهندسية وتسهم في التطور التكنولوجي.
4. تقديم الاستشارات الهندسية والخدمات الفنية لمختلف المشاريع، وتعزيز التعاون مع القطاعات الحكومية والخاصة لدعم التنمية المستدامة في القطاع الصناعي.
5. تعزيز التواصل مع الخريجين لمتابعة تطورهم المهني والاستفادة من خبراتهم في تحديث المناهج الدراسية وضمان مواءمتها مع التطورات الحديثة في القطاع الصناعي والميكانيكي.
6. المساهمة في تنمية المجتمع من خلال تقديم الدورات التدريبية والبرامج التطويرية للعاملين في القطاع الصناعي والميكانيكي، بهدف رفع كفاءة الموارد البشرية وتحسين جودة المشاريع الهندسية.

4. الاعتماد البرامجي

برنامج وزارة التعليم العالي والبحث العلمي / جهاز الاشراف والتقويم العلمي

5. المؤثرات الخارجية الأخرى

يحظى البرنامج بدعم جهات خارجية ومحلية متعددة. وقد تعاونت الإدارة بشكل وثيق مع منظمات دولية مثل اليونسكو، التي كان لها دور بارز في دعم جهود تطوير المناهج الدراسية بما يتماشى مع احتياجات سوق العمل. إضافةً إلى ذلك، ساهم الشركاء المحليون بتوفير فرص عمل للخريجين، فضلاً عن برامج تدريبية لما بعد التخرج مصممة لإعداد الطلاب للاندماج بنجاح في سوق العمل.

6. هيكلية البرنامج

هيكل البرنامج	عدد المقررات	وحدة اوربية	النسبة المئوية	ملاحظات *
متطلبات المؤسسة	8	32	13.3	مقرر ثانوي
متطلبات الكلية	4	14	5.8	مقرر اساسي
متطلبات القسم	30	194	80.8	مقرر اساسي
المجموع	**42**	**240**		

* ممكن ان تتضمن الملاحظات فيما اذا كان المقرر أساسي او اختياري .

- تشمل متطلبات الجامعة (NTU) مواد: الديمقراطية وحقوق الإنسان، اللغة الإنكليزية، الحاسوب، اللغة العربية، جرائم نظام البعث، منهجية البحث العلمي.
- تشمل متطلبات الكلية (TEMO) مشروعي التخرج (1 و2).
- تشمل متطلبات القسم (AM) جميع المواد التخصصية والهندسية.
- يُلزم الطالب بإكمال 4 أسابيع من التدريب الصيفي لاستيفاء متطلبات درجة البكالوريوس.

7. وصف البرنامج

المستوى / الفصل	رمز المقرر أو المساق	اسم المقرر أو المساق	نظري / عملي	الوحدات المعتمدة
الأول \ الأول	NTU 100	الديمقراطية وحقوق الإنسان	نظري	2
الأول \ الأول	NTU 101	اللغة الإنكليزية	نظري	2
الأول \ الأول	AM 104	مبادئ الرياضيات	نظري	7
الأول \ الأول	AM 105	تكنولوجيا كهرباء	نظري وعملي	6
الأول \ الأول	AM 106	المعامل	عملي	6
الأول \ الأول	AM 100	الميكانيك الهندسي / السكوني 1	نظري	7
الأول \ الثاني	NTU 102	الحاسوب	نظري وعملي	3
الأول \ الثاني	NTU 103	اللغة العربية	نظري	2
الأول \ الثاني	AM 107	الرسم الهندسي	عملي	7
الأول \ الثاني	AM 101	الميكانيك الهندسي / السكوني 2	نظري	7
الأول \ الثاني	AM 102	الديناميك الحراري	نظري وعملي	7
الأول \ الثاني	AM 103	السلامة المهنية	نظري	4
الثاني \ الأول	NTU 200	جرائم نظام البعث في العراق	نظري	2
الثاني \ الأول	AM 205	الرياضيات 2	نظري	7
الثاني \ الأول	AM 200	المواد الهندسية	نظري وعملي	7
الثاني \ الأول	AM 201	ميكانيك الموائع	نظري وعملي	7
الثاني \ الأول	AM 202	الرسم الميكانيكي	عملي	7
الثاني \ الثاني	AM 206	هندسة كهربائية وإلكترونية	نظري وعملي	7
الثاني \ الثاني	AM 203	مقاومة المواد	نظري وعملي	9
الثاني \ الثاني	AM 204	الميكانيك الهندسي / الحركي	نظري	9
الثاني \ الثاني	NTU 203	اللغة العربية	نظري	2
الثاني \ الثاني	NTU 202	الحاسوب	نظري وعملي	3

الثالث \ الأول	AM 300	التحليلات العددية والهندسية	نظري	5
الثالث \ الأول	NTU 201	اللغة الإنكليزية	نظري	2
الثالث \ الأول	AM 301	تطبيقات الحاسوب 2	عملي	5
الثالث \ الأول	AM 305	تصميم المكائن	نظري	6
الثالث \ الأول	AM 306	طرق التصنيع	نظري وعملي	6
الثالث \ الأول	AM 304	تكنولوجيا المواد	نظري وعملي	6
الثالث \ الثاني	AM 303	تشكيل معادن	نظري وعملي	6
الثالث \ الثاني	AM 302	اهتزازات 2	نظري	6
الثالث \ الثاني	AM 307	أنظمة القياس	نظري وعملي	6
الثالث \ الثاني	AM 308	نظرية المكائن	نظري	6
الثالث \ الثاني	AM 309	تطبيقات الحاسوب 3	عملي	6
الرابع \ الأول	NTU 400	منهجية البحث العلمي	نظري	1.96
الرابع \ الأول	TEMO 400	مشروع 1	عملي	4.08
الرابع \ الأول	AM 400	أنظمة التحكم	نظري وعملي	6
الرابع \ الأول	AM 401	لغة برمجة	نظري وعملي	6
الرابع \ الأول	AM 402	الأتمتة الصناعية	نظري وعملي	6
الرابع \ الأول	AM 403	منظومات هيدروليكية وهوائية	نظري وعملي	6
الرابع \ الثاني	TEMO 401	مشروع 2	عملي	4.28
الرابع \ الثاني	AM 407	إدارة هندسية وصناعية	نظري	6.92
الرابع \ الثاني	AM 404	تصميم أذرع آلية	نظري وعملي	5.92
الرابع \ الثاني	AM 405	التصميم والتصنيع بالحاسوب CAD/CAM	نظري وعملي	5.92
الرابع \ الثاني	AM 406	نمذجة الأنظمة والمحاكاة	نظري وعملي	7

8. مخرجات التعلم المتوقعة للبرنامج

المعرفة

يكون خريجو برنامج هندسة تقنيات الميكانيك التطبيقي قادرين على:

أ١: إجراء الحسابات الرياضية وتصميم الأجزاء الميكانيكية باستخدام الحواسيب، ودراسة الجدوى الاقتصادية لمشاريع مختلفة في مجال التخصص.

أ٢: تشخيص الأعطال وإجراء أعمال الصيانة والإصلاح للأنظمة الميكانيكية في الأغراض الصناعية والخدمية.

أ٣: إجراء البحوث والدراسات والبحث عن بدائل في ميدان التخصص.

أ٤: تصميم خطوط الإنتاج باستخدام طرق التصنيع المتنوعة لتحقيق أقصى كفاءة.

أ٥: تحسين عمليات الإنتاج والتحكم في الأجهزة والآلات.

أ٦: إدارة عمل الآلات باستخدام أحدث التقنيات.

المهارات

ب١: إجراء الحسابات الرياضية وتصميم الأجزاء الميكانيكية.

ب٢: إجراء التحاليل غير الاتلافية والفحوصات للأجزاء الميكانيكية.

ب٣: إجراء التجارب واختبار الفشل للأجزاء.

القيم
ج١: تنمية قدرات الطلبة على مشاركة الأفكار وتطبيقها في الواقع.

الاسم	الشهادة	اللقب العلمي اللقب / الوظيفي	الاختصاص العام	الاختصاص الدقيق	المنصب/المسؤولية	ملاك / عقد
اياد سليمان عبدالله علي	دكتوراه	استاذ مساعد	الهندسة الميكانيكية	ميكانيك حراريات	رئيس القسم	ملاك
بهجت حسن الياس خضير	ماجستير	استاذ مساعد	الهندسة الميكانيكية	ميكانيك حراريات	مقرر القسم	ملاك
هيثم محمد وعدالله يحيى المختار	دكتوراه	استاذ	هندسة الانتاج والمعادن	معادن	تدريسي	ملاك
حسين محمد علي ابراهيم محمد	دكتوراه	استاذ مساعد	الهندسة الميكانيكية	ميكانيك تطبيقي	تدريسي	ملاك
ثامر عون الدين محمد شيت المولى	دكتوراه	مدرس	الهندسة الميكانيكية	ميكانيك تطبيقي	تدريسي	ملاك
طارق خالد عبد الرزاق محمود العبيدي	ماجستير	استاذ مساعد	الهندسة الميكانيكية	ميكانيك تطبيقي	تدريسي	ملاك
لؤلؤة عبد الوهاب ياسين محمد الحبيطي	ماجستير	مدرس مساعد	تقنيات الحاسبات	تقنيات الحاسبات	تدريسي	ملاك
عبد الرحمن سامي عقيل احمد	ماجستير	مدرس مساعد	الهندسة الميكانيكية	ميكانيك تطبيقي	تدريسي	ملاك
شيماء سالم حميد	ماجستير	مدرس مساعد	لغة عربية	لغة	تدريسية	ملاك
عمر عبد الجبار محمد	ماجستير	مدرس مساعد	كهرباء	كهرباء	تدريسية	ملاك
محمد رعد عبد الوهاب فرحان	ماجستير	مدرس مساعد	ميكانيك	حراريات	تدريسي	ملاك
حسن عبد الاله عبد الله محمد الصراف	ماجستير	مدرس مساعد	تقنيات الحاسبات	تقنيات الحاسبات	مسؤول وحدة الاحصاء	ملاك
زينة سعد عبد الجبار	ماجستير	مدرس مساعد	ميكانيك	انتاج ومعادن	مسؤول وحدة الارشاد	ملاك
سامي عبد المجيد محمد	ماجستير	مدرس مساعد	ادراة واقتصاد	نظم المعلومات الادارية	شعبة الدراسات والتخطيط	ملاك
عبد الرحمن ناطق عبد الغني	بكالوريوس	معاون مهندس تقني	هندسة تقنيات تبريد وتكييف	تبريد وتكييف	م.مهندس تقني	ملاك
عبدالرحمن ذكوان محمد	بكالوريوس	مهندس اقدم	ميكانيك	ميكانيك	شؤون الطلبة	ملاك
وائل رياض داؤود	دبلوم فني	فني	التقنيات الميكانيكية	انتاج ومعادن	سكرتارية القسم	ملاك
محمد طه ياسين	دبلوم فني	فني	تقنيات ميكانيك	انتاج ومعادن	فني	ملاك
ياسر محمد شهاب	دبلوم فني	فني	ميكانيك	انتاج	فني	ملاك
عبد الستار خلف حمد	دبلوم فني	فني	ميكانيك	لحام معدات نفطية	فني	ملاك
عامر يونس معيوف	دبلوم فني	فني/عقد وزاري	ميكانيك	انتاج ومعادن	فني	عقد وزاري
علي حسين عبد الكريم	دبلوم فني	معاون مدير فني	مكائن ومعدات	تبريد وتكييف	مسول الورش والمعامل ومخازن القسم	ملاك

10. طرائق التقييم
- الاختبارات اليومية ، الامتحانات النصف فصلية ـ الامتحانات النهائية ، تقارير اسبوعية ضمن المادة ، واجبات بيتية وصفية، وعروض توضيحية، ومشاريع صغيرة، وغيرها

11- الهئية التدريسية

التطوير المهني - توجيه أعضاء هيئة التدريس الجدد

تمكين التدريسيين الملتحقين حديثاً بالقسم وتزويدهم بالمهارات الجوهرية اللازمة للعملية التعليمية، وتشمل:

- **مهارات العمل الجماعي :** تعزيز ثقافة التنسيق المشترك ضمن اللجان الأكاديمية والفرق البحثية.
- **المهارات الرقمية والتقنية :** إتقان استخدام الحاسوب والإنترنت والمنصات التعليمية الرقمية لإدارة المحاضرات بفعالية.
- **مهارات الاتصال والعرض الفني :** التمكن من لغة التواصل الأكاديمي (كاللغة الإنجليزية) وآليات التقديم والعرض الجاذبة للطلبة.
- **المهارات القيادية وإدارة المسؤولية :** بناء القدرة على إدارة القاعات الدراسية، والتوجيه الإيجابي، وتحمل المسؤوليات الإدارية والأكاديمية.
- **مهارات التعلم الذاتي والتعليم مدى الحياة :** غرس نهج البحث المستمر والتطوير المعرفي الذاتي لمواكبة مستجدات الاختصاص.

التطوير المهني لأعضاء هيئة التدريس

يخضع كادر الهيئة التدريسية الحالي لبرامج تطويرية دورية مستدامة عبر قنوات متعددة:

- **البرامج التدريبية الداخلية :** المشاركة في الدورات والورش التخصصية وطرق التدريس المقامة داخل أروقة المؤسسة التعليمية.
- **البرامج التدريبية الخارجية :** الانخراط في الدورات المتقدمة، والزمالات، والورش التي تنظمها مؤسسات وجامعات خارجية (محلية ودولية).
- **النشاط البحثي والعلمي :** تفعيل حركة البحث العلمي التطبيقي، والمشاركة الفاعلة في الحلقات النقاشية والدراسية، والندوات، والمؤتمرات العلمية التخصصية.
- **التطوير والتعليم الذاتي :** دعم المبادرات الشخصية للتدريسيين في تتبع المجلات العلمية الرصينة وتحديث حقائبهم التعليمية بآخر ما توصل إليه العلم التكنولوجي الهندسي.

12. معيار القبول

<u>قنوات القبول ومدخلات القسم:</u> يستقطب قسم هندسة تقنيات الميكانيك التطبيقي الكفاءات الطلابية عبر قنوات قبول محددة تشمل:

1 . خريجي الدراسة الإعدادية / الفرع العلمي (التطبيقي) عبر منظومة القبول المركزي.

2 . الطلبة الأوائل من خريجي المعاهد التقنية (حملة شهادة الدبلوم) في الاختصاصات المناظرة والقريبة، كالاختصاصات الميكانيكية والهندسية ذات الصلة.

<u>تخطيط واعتماد الطاقة الاستيعابية:</u> تخضع عملية تحديد الطاقة الاستيعابية السنوية لـ قسم هندسة تقنيات الميكانيك التطبيقي لمنظومة حوكمة متكاملة؛ حيث يقوم القسم بإعداد خطة القبول السنوية بناءً على دراسة دقيقة للموارد المتاحة (كفاءة الهيئة التدريسية، السعة المكانية للقاعات الدراسية، وتجهيزات المختبرات والورش الهندسية). تُرفع هذه الخطة تسلسلياً إلى عمادة الكلية ثم إلى رئاسة الجامعة، لترسل ختاماً إلى وزارة التعليم العالي والبحث العلمي لتدقيقها والمصادقة عليها رسمياً.

<u>ترشيح الطلبة والتوزيع الأكاديمي:</u> تبدأ مرحلة إتمام إجراءات التسجيل في الكلية عبر شعبة التسجيل وشؤون الطلبة لاستلام الوثائق والمستمسكات الرسمية فور صدور قوائم القبول. ويتم توزيع الطلبة على الأقسام العلمية وفقاً للمحددات التالية:

- الطاقة الاستيعابية المصادق عليها لكل قسم.
- الرغبة الشخصية للطالب والمعدل التنافسي.
- معالجة طلبات الانتقال بين الأقسام وفقاً للضوابط والتعليمات الوزارية النافذة.

المباشرة والانخراط الدراسي: فور صدور قوائم التوزيع النهائي واعتماد قبول الطالب رسمياً في قسم هندسة تقنيات الميكانيك التطبيقي، تُستكمل الإجراءات الإدارية لإصدار أمر المباشرة بالدوام، ليبدأ الطالب مسيرته الأكاديمية والفنية داخل القسم.

13. أهم المعلومات عن البرنامج

- الكتب منهجية.
- مصادر مساعدة (الأنترنت).
- البحوث العلمية واخر مستجداتها. (دور النشر Elsevier , Taylor & Francis)
- الموقع الالكتروني للكلية
- الموقع الالكتروني للجامعة

14. خطة تطوير البرنامج

أولاً: الروابط والتعاون المؤسسي المستدام

يتبنى قسم هندسة تقنيات الميكانيك التطبيقي رؤية منفتحة قائمة على بناء روابط تضامنية وشراكات متينة مع وزارة التعليم العالي والبحث العلمي، والوزارات الخدمية والقطاعية ذات العلاقة، بالإضافة إلى مؤسسات القطاع الخاص الصناعي. تُثمر هذه الروابط عن تنظيم ورش عمل دورية، وندوات تخصصية، ومؤتمرات علمية تهدف إلى نقل الخبرات الميدانية المباشرة وتطوير القدرات الفنية والتطبيقية لأعضاء الهيئة التدريسية.

ثانياً: التدويل والتوأمة مع الجامعات العالمية الرصينة

انطلاقاً من السعي نحو ترصين المخرجات الأكاديمية ومواكبة الثورة التقنية في القطاع الصناعي، يركز القسم على تفعيل اتفاقيات التوأمة والتعاون المشترك مع كبرى المؤسسات الأكاديمية العالمية. وتأتي هذه الخطوات لتعزيز حركة البحث العلمي المشترك، وتشجيع النشر في المستوعبات الدولية الرصينة، والمشاركة الفاعلة في المؤتمرات الهندسية التخصصية في الخارج.

ثالثاً: الشراكة الاستراتيجية مع جامعة فلورنس الإيطالية (University of Florence)

يتوج القسم جهوده الدولية بـ شراكة استراتيجية واتفاقية تعاون مبرمة لمدة (5) سنوات مع جامعة فلورنس الإيطالية، والتي تعد واحدة من أعرق الجامعات الأوروبية في مجالات الهندسة والعمارة. وقد تمخضت هذه الاتفاقية عن ركائز تطويرية جوهرية تشمل:

- **تحديث وتطوير المناهج الدراسية:** إعادة هيكلة وتطوير المناهج التعليمية للقسم وفقاً لمعايير مسار بولونيا والأنظمة الأوروبية، مع التركيز على إدخال مفاهيم الاستدامة، والتصنيع الذكي، والتحليل الهندسي المتقدم.
- **بناء وتطوير قدرات الكوادر التدريسية:** إقامة برامج زمالة بحثية، ودورات تدريبية متقدمة، وورش عمل تخصصية مشتركة (عبر الإنترنت وحضورياً) بإشراف خبراء من الجامعة الإيطالية، لرفع كفاءة التدريسيين في طرائق التدريس الحديثة والتكنولوجيا الهندسية الناشئة.
- **الإشراف العلمي والبحث المشترك:** فتح آفاق الإشراف المشترك على مشاريع التخرج المتميزة والبحوث التطبيقية، مما يضمن بيئة أكاديمية متكاملة ترفد سوق العمل بمهندسين تقنيين بمواصفات عالمية.

مخطط مهارات البرنامج																
			مخرجات التعلم المطلوبة من البرنامج													
المستوى / الفصل	رمز المقرر	اسم المقرر	أساسي أم اختياري	المعرفة								المهارات				القيم
				أ١	أ٢	أ٣	أ٤	أ٥	أ٦	ب١	ب٢	ب٣	ج١
الأول \ الأول	NTU 100	الديمقراطية وحقوق الإنسان	أساسي										√
الأول \ الأول	NTU 101	اللغة الإنكليزية	أساسي			√							√
الأول \ الأول	AM 104	مبادئ الرياضيات	رئيسي	√						√			
الأول \ الأول	AM 105	تكنولوجيا كهرباء	رئيسي		√			√					
الأول \ الأول	AM 106	المعامل	رئيسي		√							√	
الأول \ الأول	AM 100	الميكانيك الهندسي / السكوني 1	رئيسي	√						√			
الأول \ الثاني	NTU 102	الحاسوب	أساسي	√					√				
الأول \ الثاني	NTU 103	اللغة العربية	أساسي										√
الأول \ الثاني	AM 107	الرسم الهندسي	رئيسي	√						√			
الأول \ الثاني	AM 101	الميكانيك الهندسي / السكوني 2	رئيسي	√						√			
الأول \ الثاني	AM 102	الديناميك الحراري	رئيسي	√				√					
الأول \ الثاني	AM 103	السلامة المهنية	رئيسي		√								√
الثاني \ الأول	NTU 200	جرائم نظام البعث في العراق	أساسي										√
الثاني \ الأول	AM 205	الرياضيات 2	رئيسي	√						√			
الثاني \ الأول	AM 200	المواد الهندسية	رئيسي			√					√	√	
الثاني \ الأول	AM 201	ميكانيك الموائع	رئيسي	√				√		√			
الثاني \ الأول	AM 202	الرسم الميكانيكي	رئيسي	√						√			
الثاني \ الثاني	AM 206	هندسة كهربائية وإلكترونية	رئيسي		√			√	√				
الثاني \ الثاني	AM 203	مقاومة المواد	رئيسي	√						√		√	
الثاني \ الثاني	AM 204	الميكانيك الهندسي / الحركي	رئيسي	√						√			
الثاني \ الثاني	NTU 203	اللغة العربية	أساسي										√
الثاني \ الثاني	NTU 202	الحاسوب	أساسي	√					√				
الثالث \ الأول	AM 300	التحليلات العددية والهندسية	رئيسي	√		√				√			
الثالث \ الأول	NTU 201	اللغة الإنكليزية	أساسي			√							√
الثالث \ الأول	AM 301	تطبيقات الحاسوب 2	رئيسي	√					√	√			

الثالث \ الأول	AM 305	تصميم المكائن	رئيسي	√					√		√			
الثالث \ الأول	AM 306	طرق التصنيع	رئيسي				√	√						
الثالث \ الأول	AM 304	تكنولوجيا المواد	رئيسي			√					√	√		
الثالث \ الثاني	AM 303	تشكيل معادن	رئيسي				√	√						
الثالث \ الثاني	AM 302	اهتزازات 2	رئيسي		√				√					
الثالث \ الثاني	AM 307	أنظمة القياس	رئيسي		√						√	√		
الثالث \ الثاني	AM 308	نظرية المكائن	رئيسي	√	√				√					
الثالث \ الثاني	AM 309	تطبيقات الحاسوب 3	رئيسي	√					√	√				
الرابع \ الأول	NTU 400	منهجية البحث العلمي	أساسي			√								√
الرابع \ الأول	TEMO 400	مشروع 1	رئيسي	√	√	√	√	√	√	√	√	√	√	√
الرابع \ الأول	AM 400	أنظمة التحكم	رئيسي					√	√					
الرابع \ الأول	AM 401	لغة برمجة	رئيسي	√				√						
الرابع \ الأول	AM 402	الأتمتة الصناعية	رئيسي				√	√	√					
الرابع \ الأول	AM 403	منظومات هيدروليكية وهوائية	رئيسي		√			√						
الرابع \ الثاني	TEMO 401	مشروع 2	رئيسي	√	√	√	√	√	√	√	√	√	√	√
الرابع \ الثاني	AM 407	إدارة هندسية وصناعية	رئيسي	√			√							√
الرابع \ الثاني	AM 404	تصميم أذرع آلية	رئيسي	√					√	√				
الرابع \ الثاني	AM 405	التصميم والتصنيع بالحاسوب CAD/CAM	رئيسي	√			√			√				
الرابع \ الثاني	AM 406	نمذجة الأنظمة والمحاكاة	رئيسي	√		√				√				

- يرجى وضع اشارة في المربعات المقابلة لمخرجات التعلم الفردية من البرنامج الخاضعة للتقييم

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mechanics Engineering / Statics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**AM 100**				
ECTS Credits	**7**				
SWL (hr/sem)	**200**				
Module Level	**1**		**Semester of Delivery**	**1**	
Administering Department	**AM**		**College**	**TEMO**	
Module Leader	**Tariq Khalid**		**e-mail**	**tariqaikhalidi@ntu.edu.iq**	
Module Leader's Acad. Title	**Assist. Professor**		**Module Leader's Qualification**	**MASTER**	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	June /01/2023		**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 Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** Apply fundamental concepts of engineering mechanics/statics to analyze and solve problems related to the equilibrium of rigid bodies. **2.** Demonstrate a deep understanding of vector mathematics and its application in statics, including vector addition, subtraction, dot product, and cross product. **3.** Apply the principles of static equilibrium to solve problems involving forces and moments acting on rigid bodies in two and three dimensions. **4.** Analyze and calculate the internal forces, such as axial forces, shear forces, and bending moments, in statically determinate structures using methods such as the method of sections and the method of joints. **5.** Utilize free-body diagrams to model and analyze the forces acting on a structure or a rigid body, and determine the resultant forces and moments at specific points. **6.** Analyze and calculate the centroid and moment of inertia of various two-dimensional shapes, including rectangles, triangles, and circles, and apply these concepts to determine the stability and strength of structures. **7.** Apply the concepts of friction and its effects on the equilibrium of bodies in statics, including calculating static and kinetic friction forces and determining the angle of friction. **8.** Analyze and calculate the forces in trusses and frames, including the method of joints and the method of sections, and determine the stability and structural integrity of these systems. **9.** Apply the principles of equilibrium to solve real-world engineering problems, such as determining the stability of structures, calculating the forces on supports and connections, and analyzing the behavior of mechanical systems. **10.** Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of engineering mechanics/statics problems. By achieving these module learning outcomes, students will develop a strong foundation in engineering mechanics/statics and be equipped with the necessary knowledge and skills to analyze and solve a wide range of engineering problems involving static equilibrium and structural stability.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **1.** Introduction to Statics • Definition and scope of statics • Fundamental concepts and principles • Importance of statics in engineering **2.** Vectors and Vector Analysis • Vector representation and operations • Vector components and coordinate systems

- Vector addition, subtraction, and scalar multiplication

3. Forces and Moments
- Forces and their characteristics
- Resultant and equilibrium of forces
- Moment of a force and its properties
- Couples and their effects

4. Equilibrium of Rigid Bodies
- Free body diagrams and force analysis
- Equations of equilibrium in two and three dimensions
- Solving equilibrium problems using scalar and vector approaches
- Applications to simple systems and structures

5. Truss Structures
- Introduction to truss analysis
- Method of joints and method of sections
- Determination of member forces and support reactions

6. Friction
- Laws of friction and frictional forces
- Types of friction and their characteristics
- Calculation of frictional forces and moments
- Applications to inclined planes, wedges, and screws

7. Center of Gravity and Centroids
- Definitions and properties of center of gravity and centroids
- Determination of center of gravity and centroids of simple shapes
- Composite bodies and distributed loads

8. Moments of Inertia
- Moment of inertia and its physical significance
- Calculating moments of inertia for simple shapes
- Parallel-axis and perpendicular-axis theorems
- Application of moments of inertia in engineering analysis

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	**5**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**112**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation
تقييم المادة الدراسية

As		**Time/Number**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**4**	**25% (25)**	**5,7,9 and 13**	**LO #2 , #3 , #5 and #8**
	Assignments	**2**	**5% (5)**	**2, 10**	**LO #1 ,#4 ,#6 ,#7 and #9**
	Projects / Lab.				
	Report	**1**	**5% (5)**	**13**	**LO #5, #8 and #10**
Summative assessment	**Midterm Exam**	**2hr**	**15% (15)**	**7**	**LO #1 - #5**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Course 1 Material Covered

Week 1	**Introduction, Fundamental Concepts,**
Week 2	**Units of Measurement , SI Units, U.S. Customary , Prefixes , Units Conversion**
Week 3	**Force Vectors : Scalar and Vector Quantities**
Week 4	**Resultant force: Resolution & Composition of Forces**
Week 5	**Resultant force: Triangle & parallelogram law,**
Week 6	**Resultant force: Graphical Method**
Week 7-8	**Addition of a System of Coplanar Forces: Scalar Notation, Cartesian Vector Notation**
Week 9-10	**Equilibrium of a Particle: Condition for the Equilibrium of a Particle, The Free-Body Diagram, Coplanar Force Systems**
Week 11-13	**Moment of a Force, Varignon Theorem.**
Week 14	**Moment of a Couple**
Week 15	**Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Engineering Mechanics/ Statics, Fourteen Edition, R.C. Hibbeler**	**yes**
Recommended Texts	**1- Engineering Mechanics , Ferdinand L. Singer** **2- Engineering Mechanics, Meriam** **3- Engineering Mechanics/ Statics, Arthur P. Boresi & Richard J. Schmidt**	**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	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded

(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required

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

Code	Course/Module Title	ECTS	Semester
AM 100	Mechanics Engineering / Static	8	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	3	93	107
Description			

Statics, is a fundamental branch of Engineering Mechanics that deals with the analysis and prediction of the behavior of objects at rest or in equilibrium. It provides the foundation for understanding the principles of forces, moments, and their effects on structures and systems. This branch of engineering mechanics is primarily concerned with the study of particles and rigid bodies under the action of forces and moments.

One of the main objectives of Engineering Mechanics/Statics is to enable engineers to calculate and predict the behavior of structures and systems under different loading conditions. This includes understanding the concepts of force vectors, moments, and couples, as well as the methods for resolving and combining these forces to determine their resultant effects.

Through theoretical study, problem-solving, and practical applications, students of Engineering Mechanics/Statics develop critical skills in analyzing and solving engineering problems. They learn to apply mathematical principles, physics, and engineering concepts to determine the forces and moments in structures and systems, and to ensure their stability and safety.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	Mechanics Engineering / Statics2	**Module Delivery**
Module Type	Core	☒ **Theory**
Module Code	AM 101	

ECTS Credits	**7**			☒ **Lecture**
SWL (hr/sem)	**175**			☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**
Module Level	**1**	**Semester of Delivery**	**2**	
Administering Department	**AM**	**College**	**TEMO**	
Module Leader	**Tariq Khalid**	**e-mail**	**tariqaikhalidi@ntu.edu.iq**	
Module Leader's Acad. Title	**Assist. Professor**	**Module Leader's Qualification**	**MASTER**	
Module Tutor		**e-mail**		
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	June /01/2023	**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 Learning Outcomes مخرجات التعلم للمادة الدراسية	**11.** Apply fundamental concepts of engineering mechanics/statics to analyze and solve problems related to the equilibrium of rigid bodies. **12.** Demonstrate a deep understanding of vector mathematics and its application in statics, including vector addition, subtraction, dot product, and cross product. **13.** Apply the principles of static equilibrium to solve problems involving forces and moments acting on rigid bodies in two and three dimensions. **14.** Analyze and calculate the internal forces, such as axial forces, shear forces, and bending moments, in statically determinate structures using methods such as the method of sections and the method of joints. **15.** Utilize free-body diagrams to model and analyze the forces acting on a structure or a rigid body, and determine the resultant forces and moments at specific points. **16.** Analyze and calculate the centroid and moment of inertia of various two-dimensional shapes, including rectangles, triangles, and circles, and apply these concepts to determine the stability and strength of structures. **17.** Apply the concepts of friction and its effects on the equilibrium of bodies in statics, including calculating static and kinetic friction forces and determining the angle of friction. **18.** Analyze and calculate the forces in trusses and frames, including the method of joints and the method of sections, and determine the stability and structural integrity of these systems. **19.** Apply the principles of equilibrium to solve real-world engineering problems, such as determining the stability of structures, calculating the forces on supports and connections, and analyzing the behavior of mechanical systems. **20.** Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of engineering mechanics/statics problems. By achieving these module learning outcomes, students will develop a strong foundation in engineering mechanics/statics and be equipped with the necessary knowledge and skills to analyze and solve a wide range of engineering problems involving static equilibrium and structural stability.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **9.** Equilibrium of Rigid Bodies

- Free body diagrams and force analysis
- Equations of equilibrium in two and three dimensions
- Solving equilibrium problems using scalar and vector approaches
- Applications to simple systems and structures

10. Truss Structures

- Introduction to truss analysis
- Method of joints and method of sections
- Determination of member forces and support reactions

11. Friction

- Laws of friction and frictional forces
- Types of friction and their characteristics
- Calculation of frictional forces and moments
- Applications to inclined planes, wedges, and screws

12. Center of Gravity and Centroids

- Definitions and properties of center of gravity and centroids
- Determination of center of gravity and centroids of simple shapes
- Composite bodies and distributed loads

13. Moments of Inertia

- Moment of inertia and its physical significance
- Calculating moments of inertia for simple shapes
- Parallel-axis and perpendicular-axis theorems
- Application of moments of inertia in engineering analysis

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	**6**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**112**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**7**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative	**Quizzes**	**4**	**25% (25)**	**5,7,9 and 13**	**LO #2 , #3 , #5 and #8**

assessment	**Assignments**	**2**	**5% (5)**	**2, 10**	**LO #1 ,#4 ,#6 ,#7 and #9**
	Projects / Lab.				
	Report	**1**	**5% (5)**	**13**	**LO #5, #8 and #10**
Summative assessment	**Midterm Exam**	**2hr**	**15% (15)**	**7**	**LO #1 - #5**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Course 2 Material Covered
Week 1	**Equilibrium of a Rigid Body: Equilibrium in Two Dimensions,**
Week 2-3	**Free-Body Diagrams, *Support Reactions, Equations of Equilibrium***
Week 4	**Distributed loads.**
Week 5-6	**Friction**
Week 7	**Mid-Term Exam**
Week 9-10	**Trusses**
Week 11-12	**Centroid: Centroid of area, First moment of area.**
Week 13	**Area moment of inertia, Second moment of area. Parallel-Axis Theorem for an Area,**
Week 14	**Moments of Inertia for Composite Area**
Week 15	**Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Engineering Mechanics/ Statics, Fourteen Edition, R.C. Hibbeler**	**yes**
Recommended Texts	**1- Engineering Mechanics , Ferdinand L. Singer** **2- Engineering Mechanics, Meriam** **3- Engineering Mechanics/ Statics, Arthur P. Boresi & Richard J. Schmidt**	**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.

Code	Course/Module Title	ECTS	Semester
AM 100	Mechanics Engineering / Static	7	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	2	63	112

Description

Statics, is a fundamental branch of Engineering Mechanics that deals with the analysis and prediction of the behavior of objects at rest or in equilibrium. It provides the foundation for understanding the principles of forces, moments, and their effects on structures and systems. This branch of engineering mechanics is primarily concerned with the study of particles and rigid bodies under the action of forces and moments.

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**Principles of Thermodynamics**	**Module Delivery**
Module Type	**Core**	☒ **Theory**

Module Code	**AM 102**			☐ **Lecture**	
ECTS Credits	**7**			☒ **Lab**	
SWL (hr/sem)	**175**			☒ **Tutorial**	
				☐ **Practical**	
				☒ **Seminar**	
Module Level	**1**	**Semester of Deliver**	**2**		
Administering Department	**PM**	**College**	**TEMO**		
Module Leader	**Ahmad hani**	**e-mail**	**ahmed.hanigh@ntu.edu.iq**		
Module Leader's Acad. Title	Assist.lecturer	**Module Leader's Qualification**	**M.Tech.**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**23/9/2024**	**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 thermodynamics theory through the application of techniques. **2.** To understand thermodynamics and energy law. **3.** This course deals with the basic concept of heat, work and energy. **4.** This is the basic subject for all cases of systems used in thermodynamics. **5.** To understand the laws of energy conversion between thermodynamics systems. **6.** Introducing students to thermodynamics by studying thermal systems in terms of energy interactions with its immediate surroundings.
Module Learning	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study

Outcomes مخرجات التعلم للمادة الدراسية	weeks. 1. Recognize how temperature gauges work in laboratory equipment. 2. List the different thermodynamics terms. 3. Summarize what is meant by thermodynamics. 4. Discuss the reaction and participation of atoms in chemical reactions. 5. Describe thermal energy, work and energy. 6. Define Boyle's law. 7. Identify open and closed systems and their applications. 8. Discuss the heat transfer processes between thermal systems. 9. Discuss the different characteristics of the measuring devices used in the laboratory. 10. Explanation of Joule's law. 11. Identify the mathematical relationships in solving problems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A** • Introduction - Textbooks - Units. Important definitions - force - pressure - system. Pressure and its types [15 hrs] • Vapor - Forms of matter when changing its phase - Drawing the phase change of matter on the pressure-volume chart. [15 hrs] • Specific heat at constant pressure - specific heat at constant volume. Closed system procedures - constant volume - constant pressure. [10 hrs] • Energy Equation for Systems: Open and Closed - Applications [15 hrs] • Revision problem classes [6 hrs] **Part B** • Fundamentals • Temperature: Units - Conversions - Measuring Methods - Zero Law. Definition of energy - forms of energy: potential, kinetic, thermal - work - capacity - flow work - pressure diagram. internal energy - enthalpy [15 hrs] • Steam procedures and their projection on the pressure-volume chart [7 hrs] • Identify the types of pressure gauges used in refrigeration - types of air velocity gauges and their uses. [15 hrs]

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	**97**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**6**	**10% (10)**	**3,5,7,9,11 and 15**	**LO #2, #3,#5,#7,#9 and #11**
	Assignments	**4**	**10% (10)**	**2,6,8 and 12**	**LO #1, #4, #6and #10**
	Projects / Lab.	**4**	**20% (20)**	**Continuous**	**All**
	Report				
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**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	Introductions, references, units , General notations , about pressure, force, work etc.
Week 2	Temperature, unit of temperature and conversion, temperature measurements. Zeroth law of Thermodynamics. Energy, types of energy, positional, kinetic, internal and flow energy energies. Heat and work, power, enthalpy.
Week 3	First law of thermodynamics
Week 4	Steady flow energy equation for open system, non-flow energy equation for closed system, Ideal gas and equation of state
Week 5	Ideal gas, Boyle's law and Charles law and equation of state
Week 6	Specific heat at constant pressure and constant volume, closed system Processes using ideal gas. Isometric and isobaric processes.
Week 7	Isothermal and adiabatic processes
Week 8	Polytropic processes

Week 9	open system processes
Week 10	Vapor, phase of substance, Phase change curve on P-V diagram.
Week 11	Dryness fraction, liquid and vapor lines, wet vapor
Week 12	Steam tables and Examples on steam tables
Week 13	Superheated vapor, tables of superheated tables.
Week 14	Processes using two phase system, processes on P-V diagram, Irreversible processes Closed system
Week 15	Second law of thermodynamics, heat engine, heat pump
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Identify the types of pressure gauges used in refrigeration and their uses.
Week 2	Lab 2: Identify the types of air velocity gauges and their uses.
Week 3	Lab 3: Identify the types of temperature measurements used in refrigeration and their uses.
Week 4	Lab 4: Types of heat pumps with a study of the efficiency of the heat pump.
Week 5	Lab 5: compression cycle performance
Week 6	Lab 6: The real refrigeration cycle
Week 7	Lab 7: Filters

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Thermal engineering (eighth edition) R. K. RAJPUT	No
Recommended Texts	Fundamentals of heat and mass transfer (M. Thirumaleshwar)	No

Recommended Texts	Heat and mass transfer (SI UNITS) (Er. R. K. RAJPUT) (S. CHAND)	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.

Code	**Course/Module Title**	**ECTS**	**Semester**
AM 102	**Thermodynamics principles**	**7**	**2**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**(SSWL (hr/sem**	**(USWL (hr/sem**

2	**3**	**78**	**97**

Description

In this thermodynamics module, students will explore the foundational concepts that form the basis of this field of study. They will examine energy interactions in thermal systems and measure relevant properties. Key concepts covered include force, energy, work, thermal equilibrium, and temperature. The workshop aims to develop a clear understanding of thermodynamics and its application in engineering. Students will also learn about the practical implications of thermodynamics, such as the laws of heat transfer and their applications in engine cycles. Additionally, they will explore the functioning of refrigerators and heat pumps based on the reversed Carnot cycle, which requires external work to transfer heat from a lower temperature body to a higher temperature body.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information					
Module Title	**Occupational safety**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 103**			☐ **Lecture**	
ECTS Credits	**4**			☐ **Laboratory**	
SWL (hr/sem)	**100**			☐ **Tutorial**	
				☐ **Practical**	
				☐ **Seminar**	
Module Level	**1**	**Semester of Deliver**	**2**		
Administering Department	**AM**	**College**	**TEMO**		
Module Leader	**Haitham M. Wadullah**	**e-mail**	**Dr.haitham@ntu.edu.iq**		
Module Leader's Acad. Title	**Prof. Dr.**	**Module Leader's Qualification**	**PhD**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**23/9/2023**	**Version Number**	**1.0**		

Relation with other Modules			
Prerequisite module	**None**	**Semester**	
Co-requisites module	**None**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	**1.** Understand the importance of occupational safety: The module aims to provide students with a comprehensive understanding of the significance of occupational safety in the workplace. Students will learn about the potential hazards and risks associated with different industries and the impact they can have on the well-being of employees. **2.** Identify common workplace hazards: Students will learn how to identify and assess various workplace hazards, including physical, chemical, biological, and ergonomic hazards. They will gain knowledge about different types of safety hazards that exist in different work environments and how to recognize them to prevent accidents and injuries. **3.** Implement safety protocols and practices: The module will equip students with the knowledge and skills to implement effective safety protocols and practices in the workplace. They will learn about safety regulations, standards, and best practices, and understand the importance of following safety guidelines to create a safe working environment. **4.** Develop risk assessment and management skills: Students will be trained in conducting risk assessments and developing risk management strategies. They will learn how to identify potential risks, evaluate their severity and likelihood, and develop appropriate control measures to mitigate or eliminate those risks.
Module Learning Outcomes	**1.** Identify and assess workplace hazards: Engineering students will be able to identify and assess potential workplace hazards specific to their field of engineering. They will understand the importance of hazard identification and risk assessment in order to prevent accidents, injuries, and occupational illnesses. **2.** Apply engineering principles to develop safety solutions: Students will be able to apply their engineering knowledge and skills to develop innovative and effective safety solutions. They will understand how engineering principles can be utilized to design and implement engineering controls, safety devices, and protective measures to minimize or eliminate workplace hazards. **3.** Implement safety standards and regulations: Engineering students will be knowledgeable about relevant safety standards and regulations applicable to their specific engineering discipline. They will understand the importance of compliance with safety standards and be able to apply them in the design, construction, operation, and maintenance of engineering systems and processes.

	They will also be aware of the legal and ethical responsibilities associated with ensuring occupational safety in their professional practice.
Indicative Contents	Indicative content includes the following. **Part A - Theory** Introduction to Occupational Safety, Identifying and Assessing Risks, Engineering Controls and Safety Systems, Personal Protective Equipment and Safety, Equipment Occupational Health and Industrial Health [10 hrs] Fire Safety and Emergency Preparedness, Electrical Safety in Engineering Machine and Equipment, Safety Construction, Safety in Engineering Projects, Hazardous Materials Management [10 hrs] Revision problem classes [2 hrs] **Part B – Practice** Training and Communication in Engineering Safety Incident Investigation and Reporting in Engineering Safety Management Systems in Engineering Application in Occupational Safety 1 Application in Occupational Safety 2. [10 hrs]

Learning and Teaching Strategies	
Strategies	1. Familiarize yourself with the subject: Start by understanding the key concepts, principles, and regulations related to Occupational Safety in the engineering field. This will provide a foundation for further exploration and learning. 2. Actively engage in practical applications: Apply the theoretical knowledge to real-world scenarios by analyzing case studies, conducting risk assessments, and identifying safety measures in engineering projects. This hands-on approach will help reinforce understanding and develop problem-solving skills. 3. Collaborate and discuss: Engage in discussions and group activities with fellow engineering students. Share experiences, exchange ideas, and learn from each other's perspectives. This collaborative learning environment can broaden your understanding and provide different insights into safety practices. 4. Stay updated with industry standards: Keep yourself informed about the latest safety regulations, codes, and standards relevant to the engineering field. Regularly refer to authoritative sources such as government agencies, professional organizations, and reputable publications to stay up-to-date with best practices.

Student Workload (SWL)			
Structured SWL (h/sem)	**33**	**Structured SWL (h/w)**	**(32/15) = 2**

الحمل الدراسي المنتظم للطالب خلال الفصل		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	**(18/15) = 4**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	**1**	**10% (10)**	**5 and 10**	**LO #2**
	Assignments	**2**	**5% (10)**	**2 and 12**	**LO #3**
	Onsite assignments	**1**	**10%(10)**	**3**	**1**
	Report	**2**	**5% (10)**	**8 and 13**	**LO #1 and LO #2**
Summative assessment	**Midterm Exam**	**1hr.**	**10% (10)**	**7**	**LO #1 - #2**
	Final Exam	**2hr.**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	مقدمة في السلامة المهنية
Week 2	تحديد المخاطر وتقييم المخاطر
Week 3	وسائل السيطرة الهندسية وأنظمة السلامة
Week 4	معدات الحماية الشخصية ومعدات السلامة
Week 5	الصحة المهنية والصحة الصناعية
Week 6	سلامة الحرائق والاستعداد للطوارئ
Week 7	سلامة الكهرباء في الهندسة

Week 8	سلامة الآلات والمعدات
Week 9	سلامة البناء في مشاريع الهندسة
Week 10	إدارة المواد الخطرة
Week 11	التدريب والتواصل في سلامة الهندسة
Week 12	تحقيق الحوادث وتقاريرها في الهندسة
Week 13	أنظمة إدارة السلامة في الهندسة
Week 14	تطبيق في السلامة المهنية ١
Week 15	تطبيق في السلامة المهنية٢
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	**No**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	١. "السلامة والصحة المهنية" بواسطة علي عبد العزيز المرزوقي. ٢. "السلامة والصحة المهنية في البناء والتشييد" بواسطة فوزي عطا الله. ٣. "السلامة والصحة المهنية والبيئية" بواسطة مجدي الغول. ٤. "السلامة المهنية وإدارة المخاطر" بواسطة سلطان القحطاني. ٥. "السلامة المهنية والوقاية من المخاطر" بواسطة نزار السعودي. ٦. "السلامة المهنية والحريق" بواسطة حسن السناني. ٧. "السلامة والصحة المهنية في المعامل" بواسطة عمرو حسين.	**Yes**
Recommended Texts	1. "Occupational Safety and Health for Technologists, Engineers, and Managers" بواسطة David L. Goetsch و Eugene R. Pierce. 2. "Introduction to Occupational Health in Public Health Practice" بواسطة Bernard D. Goldstein و Mary Sue Henifin. 3. "Safety and Health for Engineers" بواسطة Roger L. Brauer. 4. "Occupational Safety and Health for Technologists, Engineers, and Managers" بواسطة David L. Goetsch و Eugene R. Pierce.	**No**

Websites	1. No Occupational Safety and Health Administration (OSHA): The official website of OSHA, a government agency responsible for enforcing workplace safety regulations in the United States. It offers a wealth of resources, guidelines, and educational materials on various safety topics. 2. National Institute for Occupational Safety and Health (NIOSH): NIOSH is a U.S. federal agency focused on conducting research and providing guidance on occupational safety and health. Their website offers publications, databases, training materials, and tools related to workplace safety. 3. Health and Safety Executive (HSE): HSE is the national independent regulator for workplace health and safety in the United Kingdom. Their website provides guidance, publications, and tools to help businesses and individuals understand and comply with health and safety regulations. 4. Centers for Disease Control and Prevention (CDC): While primarily focused on public health, the CDC also offers resources and information on occupational safety and health. Their website provides research, guidelines, and educational materials on various workplace safety topics. 5. Canadian Centre for Occupational Health and Safety (CCOHS): CCOHS is a Canadian organization dedicated to promoting occupational health and safety. Their website offers a wide range of resources, including fact sheets, guidelines, courses, and databases related to workplace safety. 6. European Agency for Safety and Health at Work (EU-OSHA): EU-OSHA is an agency of the European Union focused on promoting safety and health in the workplace. Their website provides information, publications, and tools to help improve workplace safety across Europe	

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	**FX – Fail**	راسب (قيد المعالجة)	**(45-49)**	**More work required but credit**

(0 – 49)				**awarded**
	F – Fail	راسب	**(0-44)**	**Considerable amount of work required**

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

Code	Course/Module Title	ECTS	Semester
NTU 204	Professional Ethics and Occupational Safety	4	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	0	33	67

Description

السلامة المهنية هي مجال دراسة يركز على تحقيق بيئة عمل آمنة وصحية للعاملين في جميع الصناعات والقطاعات. يهدف العلماء والباحثون في هذا المجال إلى تحليل وتقييم المخاطر المحتملة في مكان العمل وتطوير وتنفيذ استراتيجيات وأنظمة للوقاية والتحكم في هذه المخاطر. تشمل مجالات الدراسة في السلامة المهنية تحديد المخاطر، وتقييم المخاطر، وتصميم وتنفيذ إجراءات السلامة والوقاية، والتدريب والتثقيف، وإدارة الحوادث والطوارئ، والتشريعات والمعايير الخاصة بالسلامة. يهدف العلماء والمهنيين في هذا المجال إلى تعزيز ثقافة السلامة ورفع الوعي بأهمية السلامة المهنية بين العاملين وصناعة الأعمال بشكل عام. تعد السلامة المهنية جزءًا أساسيًا من الإدارة الفعالة للمخاطر وتساهم في تحسين الأداء العام والجودة ورفاهية العاملين في بيئة العمل.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Fluid Mechanics**	**Module Delivery**
Module Type	**Core**	☒ **Theory**
Module Code	**AM 201**	☐ **Lecture**
ECTS Credits	**7**	

SWL (hr/sem)	**175**	☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**

Module Level	**2**	**Semester of Deliver**	**3**
Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Mohammed Raad Abdulwahab**	**e-mail**	**Mohammed.raad@ntu.edu.iq**
Module Leader's Acad. Title	**Lecturer**	**Module Leader's Qualification**	**M.Eng.**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23/9/2023**	**Version Number**	**1.0**

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. To understand the properties of fluids, dimensions and units. 2. To derive the equation of conservation of mass, momentum, energy and its application. 3. To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems. 4. To understand the various flow measuring devices. 5. To understand the classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent.
Module Learning Outcomes	1. Understand how to convert the unit system from British to SI. unit or vice versa. 2. Training the students how to solve the problems associated with fluid mechanics.

مخرجات التعلم للمادة الدراسية	3. Measure the fluid flow of liquids by different types of flow meters. 4. Analyze the magnitude of the horizontal and vertical components of the force of the water on the gate. 5. Determine the reading on the pressure gauge by the different types of manometers. 6. Draw simple hydraulic and energy gradient lines. 7. Solve the formulas of open channel flow.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A- Introduction**: Basic concepts of fluid mechanics. Fundamental terms. Physical values. Fluids and their properties. Forces inside fluid. Measurement of pressure. Relative statistics of fluid – constant acceleration, rotation. Forces of hydrostatic pressure. Buoyancy. Streamlines. Stream surface. Stream tube. Mass/volume flow. Control volume. **Fluid Dynamics**: Continuity equation. Basic laws of fluid dynamics – conservation of mass, conservation of linear momentum, conservation of energy. Ideal fluid flow. Application of Bernoulli's equation. Real fluid flow. Viscosity. Determination of losses. Reynolds experiment. Laminar and turbulent flow. Boundary layer. Velocity profile. Losses in pipes. Frictional losses. Moody's diagram. Local losses. Pumps, types. Turbines and the working principle of the turbine. **Part B- Analyze characteristics of a particular flow.** Formulate the governing equations and boundary conditions. Solve these equations analytically in simple cases. Revision problem classes and quiz [6 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	**108**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**7**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**67**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**4**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	9	3, 5, and 10	LO #1, #2 and #5
	Assignments	5	15	2, 4, 6, 9, and 12	LO #3, #4, #6 and #7
	Projects / Lab.	6	12	Continuous	All
	Seminar	1	4		
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 - Units system
Week 2	Physical properties of fluids.
Week 3	Physical properties of fluids.
Week 4	Fluid pressure at static.
Week 5	Fluid pressure instruments.

Week 6	Hydrostatic force on a plane surface.
Week 7	Hydrostatic force on an inclined surface
Week 8	Hydrostatic force on a curved surface.
Week 9	Fluid dynamics / classifications of fluids.
Week 10	Conservation of mass.
Week 11	Conservation of momentum and its application.
Week 12	Conservation of energy- Bernoulli equation.
Week 13	Bernoulli equation applications.
Week 14	Viscous flow in pipes.
Week 15	Pumps or turbines.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Density and Specific Gravity.
Week 2	Lab 2: DETERMINATION OF LIQUID VISCOSITY USING STOCK`S METHOD.
Week 3	Lab 3: Determination of Centre of Pressure and Hydro-static Force on Plane surface (Part One).
Week 4	Lab 4: Determination of Centre of Pressure and Hydro-static Force on Plane surface (Part Two).
Week 5	Lab 5: Reynolds Number Investigation.
Week 6	Lab 6: Estimation of the Volume Flow Rate Using Orifice Meter Apparatus.
Week 7	Lab 7: IMPACT OF WATER JET ON VANES.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	FLUID MECHANICS	Yes
Recommended Texts	1- A TEXTBOOK OF FLUID MECHANICS AND HYDRAULIC MACHINES BY RAJPUT. 2- Fluid Mechanics by Yunus A. Cengel, John M. Cimbala.	No

	3- fluid_mechanics_frank_m._white_4th_ed.	
Websites	https://www.youtube.com/watch?v=jjqGoWfPKUY&t=43s	

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

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

Code	**Course/Module Title**	**ECTS**	**Semester**
AM 204	**Fluid Mechanics**	**7**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	**3**	**108**	**67**

Description
Fluid Mechanics, the branch of science that deals with the study of fluids (liquids and gasses) in a state of rest or motion, is an important subject of Civil, Mechanical and Chemical Engineering. Its various branches are fluid statics, fluid kinematics and fluid dynamics. A substance that flows is called a fluid. All liquid and gaseous substances are considered to be fluids. Water, oil, and others are very important in our day-to-day life as they are used for various applications. For instance, water is used for generation of electricity in hydroelectric power plants and thermal power plants, water is also used as the coolant in nuclear power plants, oil is used for the lubrication of automobiles etc. Fluid Mechanics is the branch of science that studies the behavior of fluids when they are in state of motion or rest. Whether the fluid is at rest or motion, it is subjected to different forces and different climatic conditions and it behaves in these conditions as per its physical properties. Fluid mechanics deals with three aspects of the fluid: static, kinematics, and dynamics aspects.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

HUMAN RIGHTS and DEMOCRACY

حقوق الانسان والديمقراطية

Module Title	**Democracy and Human Rights**	**Module Delivery**	
Module Type	**Basic**	☒ **Theory**	
Module Code	**NTU 100**	☐ **Lecture**	
ECTS Credits	**2**	☐ **Lab**	
SWL (hr/sem)	**50**	☐ **Tutorial**	
		☐ **Practical**	
		☒ **Seminar**	
Module Level	**1**	**Semester of Deliver**	**1**
Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Shaima'a Salim Hameed**	**e-mail**	**Shamaaalobaidy@ntu.edu.iq**
Module Leader's Acad. Title	**Assist lecturer.**	**Module Leader's Qualification**	**Ph.D.**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval	23/9/2023	**Version Number**	**1.0**

Date			

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	- زيادة معرفة الطالب بالجانب المفاهيمي النظري والتطور التاريخي لمادة حقوق الانسان والديمقراطية - تنمية مهارات الطالب التحليلية والنقدية فيما يتعلق بواقع ومستقبل حقوق الإنسان والديمقراطية - تدريب الطالب على أهمية المشاركة الفاعلة في جوانب الحياة العامة كتعزيز احترام مبادئ حقوق الإنسان العامة والمشاركة الفاعلة في الحياة السياسية والثقافية. - تمكين الطلاب من فهم أهمية التعليم ودوره في نشر ثقافة حقوق الإنسان والديمقراطية في بناء مجتمع حضاري يقوم على أساس الحكم الصالح الذي من أهم مقوماته الإيمان بحقوق الإنسان والتربية عليها والمشاركة الفاعلة في الحكم عبر الانتخابات الحرة والعادلة
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	١. حقوق الإنسان ، تعريفها ، أهدافها ٢. حقوق الإنسان في التاريخ المعاصر والحديث ٣. الاعتراف الإقليمي بحقوق الإنسان ٤. حقوق الإنسان الحديثة ٥. ضمانات احترام وحماية حقوق الإنسان على الصعيد الوطني ٦. مصطلح الديمقراطية.
Indicative Contents المحتويات الإرشادية	١. حقوق الانسان ، تعريفها ، أهدافها حقوق الإنسان في الحضارات القديمة وخصوصا حضارة وادي الرافدين ضمانات واحترام وحماية حقوق الإنسان على الصعيد الدولي : - دور الأمم المتحدة ووكالاتها المتخصصة في توفير الضمانات - دور المنظمات الإقليمية (الجامعة العربية ، الاتحاد الأوروبي ، الاتحاد الافريقي ، منظمة الدول الأمريكية ، منظمة آسيان) . [15 hrs] دور المنظمات الدولية الاقليمية غير الحكومية والرأي العام في احترام وحماية حقوق الانسان

	٢. مصطلح الديمقراطية ، نشأته، دلالته، تاريخ الديمقراطية. الأنظمة الديمقراطية في العالم/الديمقراطية في العالم الثالث/ المشاكل التي تواجه البلدان العربية في التحول الديمقراطي [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 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	٢
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**20**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	١
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	٥٠		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**3**	**٥% (15)**	**5 and ١٣**	**LO #٥, and #١٤**
	Assignments	**2**	**٥% (10)**	**6 and 12**	**LO#3 and #13**

	Projects / Lab.	**0**	**0% (0)**		
	Report	**2**	**5% (10)**	**4 and 11**	**Continues**
	SEMINAR	**1**	**٥% (5)**	**11**	**All**
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1 - #3**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

elivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**حقوق الإنسان ، تعريفها ، أهدافها** **حقوق الإنسان في الحضارات القديمة وخصوصا حضارة وادي الرافدين**
Week 2	**حقوق الانسان في الشرائع السماوية مع التركيز على حقوق الانسان في الاسلام**
Week 3	**حقوق الإنسان في التاريخ المعاصر والحديث : الاعتراف الدولي بحقوق الإنسان منذ الحرب العالمية الأولى وعصبة الامم المتحدة**
Week 4	**الاعتراف الإقليمي بحقوق الإنسان : الاتفاقية الاوربية لحقوق الانسان ١٩٥٠ ، الاتفاقية الامريكية لحقوق الانسان ١٩٦٩ ، الميثاق الافريقي لحقوق الانسان ١٩٨١ ، الميثاق العربي لحقوق الانسان ١٩٩٤**
Week 5	**حقوق الإنسان الحديثة : الحقائق في التنمية ، الحق في البيئة النظيفة ، الحق في التضامن ، الحق في الدين حقوق الانسان ، المنظمات الوطنية لحقوق الانسان)**
Week 6	**حقوق الإنسان في الدساتير العراقية بين النظرية والواقع**
Week 7	**Mid-term Exam+ حقوق الإنسان الاقتصادية والاجتماعية والثقافية وحقوق الانسان المدنية والسياسية**
Week 8	**حقوق الإنسان الحديثة : الحقائق في التنمية ، الحق في البيئة النظيفة ، الحق في التضامن ، الحق في الدين**
Week 9	**ضمانات احترام وحماية حقوق الإنسان على الصعيد الوطني ، الضمانات في الدستور والقوانين** **الضمانات في الرقابة الدستورية ، الضمانات في حرية الصحافة والرأي العام ، دور المنظمات غير الحكومية في احترام وحماية حقوق الإنسان**
Week 10	**ضمانات واحترام وحماية حقوق الإنسان على الصعيد الدولي :** **- دور الأمم المتحدة ووكالاتها المتخصصة في توفير الضمانات**

	– دور المنظمات الإقليمية (الجامعة العربية ، الاتحاد الأوروبي ، الاتحاد الافريقي ، منظمة الدول الأمريكية ، منظمة آسيان) دور المنظمات الدولية الإقليمية غير الحكومية والرأي العام في احترام وحماية حقوق الإنسان
Week 11	مصطلح الديمقراطية ، نشأته، دلالته، تاريخ الديمقراطية.
Week 12	الإسلام والديمقراطية ومساوئ الحكم الاستبدادي .
Week 13	الانتقادات الموجهة للديمقراطية، ومحاسن النظام الديمقراطي .
Week 14	الأنظمة الديمقراطية في العالم/الديمقراطية في العالم الثالث/ المشاكل التي تواجه البلدان العربية في التحول الديمقراطي
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	حقوق الإنسان والديمقراطية للدكتور محمد عابدالجابري ٢٠٠٦	Yes
Recommended Texts	حقوق الإنسان والديمقراطية اعداد أ.م.د. غسان كريم مجذاب و أ.م. امجد زين العابدين طعمة للعام ٢٠١٨	No
Websites	" طرق وتعليم وثقافة حقوق الانسان" ، منشور على شبكة المعلومات الدولية (الانترنت) على الموقع الالكتروني **http://ghrorg-learning.blogspot.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.

Code	Course/Module Title	ECTS	Semester
NTU 100	Human Rights & Democracy	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	30	20
Description			
مادة حقوق الإنسان والديمقراطية تقدم فهمًا شاملاً للمفاهيم والمبادئ الأساسية لحقوق الإنسان والنظم الديمقراطية. تركز المادة على دراسة القيم والمبادئ التي تحكم حقوق الإنسان وحمايتها، بالإضافة إلى فهم أهمية الديمقراطية في تنظيم الحكم وضمان مشاركة المواطنين في صنع القرارات. يتناول المقرر مواضيع مثل المساواة، وحرية التعبير، وحقوق المرأة والطفل، وحقوق الأقليات، وحقوق العمال واللاجئين، وأسس			

ومؤسسات الديمقراطية. تهدف المادة إلى تعزيز الوعي القانوني والأخلاقي بين الطلاب، وتمكينهم من فهم أهمية حقوق الإنسان والمشاركة الديمقراطية في بناء مجتمع عادل ومتقدم.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**English Language**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**NTU 101**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	**1**		**Semester of Deliver**	**1**	
Administering Department	**AM**		**College**	**TEMO**	
Module Leader	**Shaima'a Salim Hameed**		**e-mail**	**Shamaaalobaidy@ntu.edu.iq**	
Module Leader's Acad. Title	**Assist. Lecturer**		**Module Leader's Qualification**	**M. Linguistics and English Language Teaching**	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	**٢٣/٩/2023**		**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	**1.** To develop problem solving skills mainly speaking, reading, writing and listening skills and to understand the English language as a foreign language through the

أهداف المادة الدراسية	application of many techniques. 2. To understand the general principles of the English language. 3. This course deals with the basic concepts of learning the main rules of English grammar and English vocabularies. 4. This is the basic subject for writing and speaking English well. 5. To understand how to build a correct English sentence.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To recognize how to use the main and auxiliary verbs in addition to the possessive pronouns. 2. To list the various words associated with questions and many subject pronouns. 3. To talk about social expressions and personal information mainly about jobs by using affirmative, negative and interrogative sentences. 4. To discuss how to use adjectives and their positions in the sentence. 5. To construct the simple present sentence by using I/ we/ you and they and to define the articles. 6. To describe the present simple tense with using he/ she and to discuss adverbs of frequency. 7. To identify the basic question words and demonstrative pronouns and their applications. 8. To discuss the use of there is/ are and many prepositions. 9. To discuss the structure of simple past sentences and various irregular verbs. 10. To explain the negative and interrogative structure of the simple past tense sentence in addition to the adverbs of the past tense. 11. To identify the use of many adverbs and the use of can/ can't in the sentence and to explain requests and offers. 12. To elaborate the use of like and would you like and the use of some and any in many expressions. 13. To discuss the use of the present continuous and the difference between present simple and present continuous sentences. 14. To explain the structures that are used to refer to future plants.
Indicative Contents المحتويات الإرشادية	1. An introduction to the importance of English language learning and the role it plays in social communication. 2. An application of various tenses like present and past tenses. 3. Demonstrating many main concepts including (offers, requests, future plants, personal expressions and tenses). 4. Using many skills to learn English like listening, reading, writing and speaking skills, moreover; presenting different examples to elaborate any concept or structure.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in this module is associated with the communicative approach which will be applied to develop students' skills to learn English and to enable students to use English in communication, therefore, using authentic materials in the class is so necessary. This approach is important to encourage students' participation in the class and to highlight their motivation in learning English, while at the same time refining and expanding their interactions and skills to achieve at least more success.

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	**(30/15)=2**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**20**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**(20/15)=1**
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**	**٣**	**٥% (15)**	**4 , 11 and 13**	**LO #3, #10 and #12**
	Assignments	**2**	**٥% (١٠)**	**6 and 12**	**LO #5, and #11**
	Projects / Lab.				
	Report	**2**	**5% (10)**	**13**	**LO #5, #8 and #9 #10**
	Seminar	**1**	**٥% (5)**	**Continuous**	**All**
Summative	**Midterm Exam**	**1hr**	**10% (10)**	**7**	**LO #1 - #7**

assessment	**Final Exam**	**2hr**	**50% (50)**	**16**	**All**
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Unit one: Hello Am/are/is. May/your This is with practice in work
Week 2	Unit two: Your world He/she/they, his/her Questions
Week 3	Unit three: All about you Personal information/ social expressions
Week 4	Unit four: Family and friends Possessive adjectives/ possessive 's Have/has , adjective + noun
Week 5	Unit five: The way I live Present simple l/we/you/they An/a , adjective + noun
Week 6	Unit six: Every day Present simple he/she Negatives and questions, adverbs of frequency
Week 7	Unit seven: My favorites Question words, pronouns, this/that
Week 8	Unit eight: Where l live

	There is/ are, prepositions
Week 9	Unit nine: Times past Was/ were born, past simple and irregular verbs
Week 10	Unit ten: We had a great time Past simple, regular and irregular Questions, negatives, ago
Week 11	Unit eleven: l can do that! Can/can't, adverbs, requests
Week 12	Unit twelve: Please and thank you I'd like, some and any Like and would like
Week 13	Unit thirteen: Here and now Present continuous Present simple and present continuous
Week 14	Unit fourteen: It's time to go! Future plans, writing email and information letter
Week 15	**Revision**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**John and liz Soar. (New Headway Beginner) 4th edition. Oxford: Oxford University Press.**	**Yes**
Recommended Texts	**"The Elements of Style" by William Strunk Jr. and E.B. White:** **This classic guide offers valuable advice on writing**	**No**

	style and grammar, essential for clear and effective communication. **"On Writing Well" by William Zinsser:** **Zinsser's book is a practical guide that covers different types of writing, including technical writing, and provides insights on improving clarity and precision.** **"Technical Communication: A Reader-Centered Approach" by Paul V. Anderson:** **This book focuses specifically on technical communication, which is crucial for engineering students. It covers writing reports, manuals, and other technical documents.**	
Websites	Purdue OWL (Online Writing Lab): Purdue OWL is a fantastic resource for writing and citation guidelines. It covers a wide range of topics, from general writing principles to specific guidelines for different citation styles. Grammarly: Grammarly is an online writing assistant that can help you improve your grammar, spelling, and overall writing style. It's a useful tool for both native and non-native English speakers. IEEE Author Center: If you're required to follow IEEE citation and writing style, the IEEE Author Center provides guidelines and resources for writing technical papers and articles.	

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

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

Code	Course/Module Title	ECTS	Semester
NTU 101	**English Language**	**2**	**1**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**0**	٣٠	٢٠
Description			
This module will be used to develop problem solving skills mainly speaking, reading, writing and			

listening skills and to understand English language as a foreign language through the application of many techniques. It is also important to understand the general principles of English language. This course deals with the basic concepts of learning the main rules of English grammar and English vocabularies. It is mainly the basic subject for writing and speaking English well. The module is to understand how to build a correct English sentence. It contains various grammatical rules and different vocabularies with using typical examples to explain the structure and the meaning of any word or expression. The module is valid and reliable to deal with many recognizable situations and how to use English in different contexts associating with life experiences.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer**			**Module Delivery**	
Module Type	**support**			☒ **Theory**	
Module Code	**NTU 102**			☐ **Lecture**	
ECTS Credits	**3**			☒ **Lab**	
SWL (hr/sem)	**75**			☒ **Tutorial**	
				☐ **Practical**	
				☒ **Seminar**	
Module Level	**1**		**Semester of Deliver**		**2**
Administering Department	**AM**		**College**		**TEMO**
Module Leader	**Luluwah abdulwahaab Yaseen**		**e-mail**		**luluwah.alhubaity@ntu.edu.iq**
Module Leader's Acad. Title	**Asst. Lecturer**		**Module Leader's Qualification**		**M.S.C.**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	**٢٣/٩/2023**		**Version Number**		**1.0**

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To learn about computers and their characteristics and features, compare different types of computers. 2. To learn about the computer's Hardware, Identify the factors that affect the computer's performance, Learn about the numerical systems and data representation. 3. Learn about the computer's Hardware(2), CPU, Memory 4. Learn about operating system software 5. Learn about the utility software programming languages, application software. 6. Learn the Microsoft office2020(Word, Excel, PowerPoint)
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrates knowledge of the Introduction to computer, computer component (hardware, software) 2. Demonstrates knowledge of the Operating system (windows), 3. Able to install windows (formatting) 4. Able to use the following items: Start menu, desktop, taskbar, mouse applications, My computer, My documents, drivers, folders, files, cut, copy, paste, shortcut, right click menu, Setting menu, control panel 5. Able to use Microsoft word 2020, Microsoft excel 2020, Microsoft powerpoint 2020 6. Able to use Internet , Internet explorer, starting, menus of internet explorer, E-Mail: Yahoo, Hotmail, google, yahoo, search information
Indicative Contents المحتويات الإرشادية	After studying this chapter, the student is expected to master the following knowledge and skills: 1. To know what is the computer, distinguish different computer properties, list the computers features and capabilities, compare between the different types of computers [11 hrs] 2. Classifies the computer's hardware components to internal and external [11 hrs] 3. To knows the CPU, types of memory modules, learn about input and output units, Learn about storage media, learn the components of the motherboard [11 hrs]

	4. Distinguish between different types of software, differentiate between types of system software, distinguish between types of operating systems, count the basic functions of the operating system.[12 hrs] 5. Learn about different types of utility software, learn about the most important utility software and its functions, distinguish between different types of programming languages, differentiate between the types of different programming languages Compilers, classifies different programming languages, classifies application software, learn about the most important application software [12 hrs] 6. Learn to use the Microsoft office2020 [15hrs] • Word [5 hrs] • Excel [5 hrs] • Powerpoint [5 hrs] • Revision and quiz [8hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**3**	**10% (10)**	**3,8 and 12**	**LO #1, #2,#4,#5 and #6**
	Assignments	**4**	**10% (10)**	**2,5,10 and 14**	**LO #1, #4,#5 and #6**
	Projects / Lab.	**3**	**20% (20)**	**Continuous**	**All**
	Report				
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1 - #3**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Demonstrates knowledge of the Introduction to computer, computer component (hardware, software)
Week 2	• Demonstrates knowledge of the Operating system (windows), • Able to install windows (formatting)
Week 3 &4	Able to use the following items: Start menu, desktop, taskbar, mouse applications, My computer, My documents, drivers, folders, files, cut, copy, paste, shortcut, right click menu, Setting menu, control panel
Week 5&6	Able to use Microsoft word 2020
Week 7& 8& 9	Able to use Microsoft excel 2020
Week 10&11	Able to use Microsoft power point 2020
Week 12	Able to use Internet , Internet explorer, starting, menus of internet explorer
Week 13	Able to create and use E-Mail: Yahoo, Hotmail
Week 14	• Able to utilize Search engines • Able to use google, yahoo, search information
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1- 6	Able to use Microsoft word 2020
Week 7 – 9	Able to use Microsoft excel 2020
Week 10 -11	Able to use Microsoft PowerPoint 2020

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Introduction to Computer Skills **For first year students, Bisha University** Computer Science Principles: The Foundational Concepts of Computer Science - For AP® Computer Science Principles 2020th Edition , Mr. Kevin P Hare (Author), Pindar Van Arman (Foreword)	Yes
Recommended Texts	MICROSOFT ACCESS, EXCEL & POWER BI FOR BEGINNERS & POWER USERS, Tech Demystified (Author)	No
Websites	https://www.just.edu.jo/~mqais/CIS99/PDF/Ch.01_Introduction_%20to_computers.pdf	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks**	**Definition**

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

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

Code	Course/Module Title	ECTS	Semester
NTU 102	COMPUTER PRINCIPLES	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	4	78	72
Description			

Computer Principles is an introductory course that provides a comprehensive understanding of the fundamental concepts and principles of computer science. The course covers topics such as computer architecture, data representation, algorithms, programming languages, operating systems, and computer networks. Students will learn about the basic components of a computer system, how data is stored and processed, and the principles behind efficient and reliable computer operations. The course also explores the role of computers in society, ethical considerations in computing, and emerging trends in the field. Through this course, students will develop a solid foundation in computer principles and gain the necessary skills to pursue further studies or careers in computer science

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information					
Module Title	**Arabic Language**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory**	
Module Code	**NTU 103**			☐ **Lecture**	
ECTS Credits	**2**			☐ **Tutorial**	
SWL (hr/sem)	**50**			☐ **Practical**	
				☐ **Seminar**	
Module Level	**1**	**Semester of Deliver**		**2**	
Administering Department	**AM**	**College**		**TEMO**	
Module Leader	**Shaimaa Salem Hameed**	**e-mail**		**Shaima.salem@ntu.edu.iq**	
Module Leader's Acad. Title	**Assist Lect.**	**Module Leader's Qualification**		**M.Sc.**	
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**23/9/2023**	**Version Number**		**1.0**	

Relation with other Modules			
Prerequisite module	**None**	**Semester**	
Co-requisites module	**None**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	**١. تعزيز التواصل الفعال: يهدف تعلم اللغة العربية إلى تمكين الطلاب من التواصل بشكل فعال في البيئة العربية، سواء كان ذلك في الحياة اليومية أو في السياق الأكاديمي والعملي.** **٢. فهم الثقافة العربية: يعتبر تعلم اللغة العربية مفتاحًا لفهم الثقافة العربية وقيمها، ويساعد الطلاب على التعرف على التراث العربي الغني وفهم تعدد الثقافات في العالم العربي.** **٣. تعزيز القدرات البحثية والأكاديمية: تعلم اللغة العربية يساهم في تطوير مهارات البحث والكتابة الأكاديمية للطلاب، مما يمكنهم من المشاركة بفاعلية في النقاشات الأكاديمية وإنتاج المعرفة.** **٤. توفير فرص وظيفية: يعتبر إتقان اللغة العربية مهارة قيمة في سوق العمل، حيث يمكن للطلاب العربية العمل في مجالات متعددة مثل الترجمة، الإعلام، العلاقات العامة، والتعليم.** 1. Enhancing effective communication: Teaching Arabic aims to enable students to communicate effectively in the Arab environment, both in daily life and in academic and professional contexts. 2. Understanding Arab culture: Learning Arabic is a key to understanding Arab culture and its values, helping students to explore the rich Arab heritage and comprehend the cultural diversity within the Arab world. 3. Enhancing research and academic skills: Learning Arabic contributes to developing research and academic writing skills for students, enabling them to actively participate in academic discussions and contribute to knowledge production. 4. Providing job opportunities: Proficiency in Arabic is a valuable skill in the job market, allowing students to .
Module Learning Outcomes	١. القدرة على التواصل الفعال: يكتسب الطلاب مهارات الاستماع والتحدث والقراءة والكتابة في اللغة العربية، مما يمكنهم من التواصل بطلاقة وفهم المحتوى بشكل صحيح. ٢. القدرة على فهم النصوص والثقافة: يتعلم الطلاب قراءة وفهم النصوص الأدبية والثقافية باللغة العربية، مما يساهم في تطوير فهمهم للتراث العربي والتحليل النقدي للأعمال الأدبية. ٣. القدرة على البحث والكتابة الأكاديمية: يتعلم الطلاب كيفية إجراء البحوث والكتابة الأكاديمية باللغة العربية، ويتمكنون من تقديم أوراق بحثية وتقارير أكاديمية بشكل متميز. ٤. التفاعل الثقافي والاجتماعي: يتمكن الطلاب من المشاركة في المجتمع العربي بشكل أعمق وفهم التقاليد والقيم والعادات المحلية، مما يعزز التفاهم الثقافي والتعايش السلمي. 1. Effective communication skills: Students acquire listening, speaking, reading, and writing skills in Arabic, enabling them to communicate fluently and understand content accurately.

	2. Understanding texts and culture: Students learn to read and comprehend literary and cultural texts in Arabic, enhancing their understanding of Arab heritage and developing critical analysis of literary works. 3. Research and academic writing abilities: Students learn how to conduct research and engage in academic writing in Arabic, enabling them to present research papers and academic reports effectively. 4. Cultural and social interaction: Students are able to actively participate in the Arab community, gaining a deeper understanding of local traditions, values, and customs, fostering cultural understanding and peaceful coexistence.
Indicative Contents	١. مقدمة في المحتويات الإشارية: تعريف المحتويات الإشارية وأهميتها، ودورها في مجالات وتخصصات متنوعة. ٢. أنواع وصيغ المحتويات الإشارية: استكشاف مختلف أنواع وصيغ المحتويات الإشارية، مثل الجداول والرسوم البيانية والنقاط البارزة والملخصات. ٣. إنشاء المحتويات الإشارية: تقنيات واستراتيجيات إنشاء المحتويات الإشارية الفعالة، بما في ذلك اختيار المعلومات الرئيسية، وتبسيط المفاهيم المعقدة، وتنظيم المحتوى لسهولة الفهم. ٤. التمثيل البصري للمحتويات الإشارية: استخدام الوسائط البصرية، مثل الرسوم البيانية والمخططات والرسومات، لتقديم المحتويات الإشارية بشكل جذاب ومفيد بصريًا. ٥. أمثلة ودراسات الحالة: تحليل أمثلة ودراسات حالة حقيقية لفهم كيفية استخدام المحتويات الإشارية في سياقات مختلفة، مثل التقارير البحثية ومواد التسويق والموارد التعليمية. 1. Introduction to Indicative Contents: Defining indicative contents and understanding their significance in various fields and disciplines. 2. Types and Formats of Indicative Contents: Exploring different types and formats of indicative contents, such as tables, charts, bullet points, and summaries. 3. Creating Indicative Contents: Techniques and strategies for effectively creating indicative contents, including selecting key information, simplifying complex concepts, and organizing content for easy comprehension. 4. Visual Representation of Indicative Contents: Utilizing visual aids, such as infographics, diagrams, and illustrations, to present indicative contents in an engaging and informative manner. 5. Examples and Case Studies: Analyzing real-life examples and case studies to

	understand how indicative contents are used in various contexts, such as research reports, marketing materials, and educational resources.

Learning and Teaching Strategies	
Strategies	1. Interactive Language Activities: Engaging students in interactive activities such as role-plays, group discussions, and language games to practice and reinforce language skills. 2. Communicative Approach: Emphasizing real-life communication and providing opportunities for students to actively engage in speaking, listening, reading, and writing tasks to develop their language proficiency. 3. Authentic Materials: Incorporating authentic materials such as newspaper articles, songs, videos, and literature to expose students to real-world language usage and cultural contexts

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**32**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**(32/15)=2**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**18**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**(18/15)=1**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**4**	**30% (30)**	**3,6,10 and 14**	**LO #1, #2 , #3, and #4**
	Assignments	**2**	**10% (10)**	**4 and 12**	**LO #1and #4**
	Projects / Lab.		**0% (0)**	**0**	**0**

	Report		**0% (0)**	**0**	**0**
Summative assessment	**Midterm Exam**	**1hr.**	**10% (10)**	**7**	**LO #1 - #2**
	Final Exam	**2hr.**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)		
	Material Covered	
Week 1	مقدمة عن الأخطاء اللغوية	Introduction to Language Errors:
Week 2	التاء المربوطة والتاء المفتوحة	Taa Marbuta and Taa Marbuta (Bound and Open Taa): Understanding the rules and usage of the Taa Marbuta and Open Taa in Arabic language.
Week 3	همزة الوصل والقطع	Hamzat Al-Wasl and Al-Qat' (Hamza of Connection and Hamza of Disconnection): Differentiating between Hamzat Al-Wasl and Al-Qat' and their respective roles in pronunciation.
Week 4	الهمزة المتوسطة والمتطرفة	Alif Al-Maddooda and Alif Al-Muqassara Writing Rules: Exploring the rules for writing Alif Al-Maddooda (elongated Alif) and Alif Al-Muqassara (shortened Alif).
Week 5	قواعد كتابة الالف الممدودة والمقصورة –	Solar and Lunar Letters: Identifying the distinction between solar and lunar letters in Arabic pronunciation.
Week 6	الحروف الشمسية والقمرية	Adad (Numbers): Learning about the numerical system in Arabic and its usage.
Week 7	الضاد والظاء	Verbs: Understanding verb conjugation and the different verb forms in Arabic.
Week 8	العـــدد	Parts of Speech: Exploring the different parts of speech, including nouns, verbs, adjectives, adverbs, etc.
Week 9	المفاعيل	Meanings of Prepositions: Examining the meanings and usage of prepositions in Arabic.
Week 10	أقسام الكلام	Common Language Errors: Analyzing common language errors and their applications in practical contexts.
Week 11	معاني حروف الجر	Noon and Tanween: Understanding the usage and pronunciation of Noon and Tanween in Arabic.

Week 12	تطبيقات الأخطاء اللغوية الشائعة	Taa Marbuta and Taa Marbuta (Bound and Open Taa): Understanding the rules and usage of the Taa Marbuta and Open Taa in Arabic language.
Week 13	النون والتنوين -	Hamzat Al-Wasl and Al-Qat' (Hamza of Connection and Hamza of Disconnection): Differentiating between Hamzat Al-Wasl and Al-Qat' and their respective roles in pronunciation.
Week 14	مقدمة عن الأخطاء اللغوية	Alif Al-Maddooda and Alif Al-Muqassara Writing Rules: Exploring the rules for writing Alif Al-Maddooda (elongated Alif) and Alif Al-Muqassara (shortened Alif).
Week 15	الأخطاء اللغوية	Solar and Lunar Letters: Identifying the distinction between solar and lunar letters in Arabic pronunciation.
Week 16	Preparatory week before the final Exam	

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	**No**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	١. "الكافية" للكندي: يعتبر من أهم الكتب في علم النحو، حيث يشرح القواعد والتراكيب النحوية بأسلوب مبسط وشامل. ٢. "الصرف" لابن مالك: كتاب مشهور يتناول قواعد تصريف الأفعال والأسماء في اللغة العربية، ويعد من أعمال النحو الكلاسيكية. ٣. "المفصل في علم العربية" لابن جني: كتاب شامل يغطي مجموعة واسعة من موضوعات النحو والصرف والبلاغة والأدب	**Yes**
Recommended Texts	١. "الألفية" لابن مالك: كتاب مشهور في علم النحو والصرف، يعتبر من أهم المراجع الكلاسيكية في دراسة اللغة العربية. ٢. "المستطرف في كل فن مستظرف" لابن الأنباري: كتاب يشمل العديد من الألفاظ والتعابير العربية المستخدمة في الأدب والشعر. ٣. "البيان والتبيين" لابن حجر العسقلاني: كتاب يتناول موضوعات النحو والصرف والبلاغة، ويعتبر مرجعًا قيمًا في دراسة اللغة العربية.	**No**
Websites	**No**	

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

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

Code	Course/Module Title	ECTS	Semester
NTU 103	Arabic language	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	0	32	18
Description			
The description for the Arabic language is: Arabic is a rich and diverse language spoken by millions of people around the world. It is the official			

language of over 20 countries and holds great cultural and historical significance. With its unique alphabet, intricate grammar, and beautiful calligraphy, Arabic offers a fascinating linguistic journey. Whether you are interested in exploring the language for academic, professional, or personal reasons, learning Arabic opens doors to understanding Arab culture, literature, and society. From basic greetings to advanced conversational skills, mastering Arabic provides opportunities for communication, travel, and career prospects. Embrace the beauty of Arabic as you embark on a journey of language discovery and cultural immersion.

الوصف الاكاديمي لمادة اللغة العربية

اللغة العربية هي لغة غنية ومتنوعة يتحدثها الملايين من الأشخاص حول العالم. إنها اللغة الرسمية في أكثر من ٢٠ دولة وتحمل أهمية ثقافية وتاريخية كبيرة. بفضل أبجديتها الفريدة، وقواعدها المعقدة، والخط الجميل، تقدم اللغة العربية رحلة لغوية مثيرة. سواء كنت مهتمًا باستكشاف اللغة لأسباب أكاديمية، مهنية أو شخصية، فإن تعلم العربية يفتح أبوابا لفهم الثقافة العربية والأدب والمجتمع. من التحية الأساسية إلى مهارات المحادثة المتقدمة، يوفر اتقان العربية فرصًا للتواصل والسفر وفرص العمل

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Principles of Mathematics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**TEMO 100**			☐ **Lecture**	
ECTS Credits	**7**			☐ **Lab**	
SWL (hr/sem)	**175**			☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Level	1		**Semester of Delivery**	**1**	
Administering Department	AM		**College**	**TEMO**	
Module Leader	RAID ABDULHADI ABDULQUADER		**e-mail**	**raid.alabdullah@ntu.edu.iq**	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**	**M. Sc.**	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		

Scientific Committee Approval Date	**22/10/2023**	**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	To let students be able to identify the advanced basic fundamentals in mathematics (differentiation and integration and their different applications) to develop their mentally capability by exercising solutions. Also can be able to correlate the information data in order to solve the scientific problem and how to make use of it in other scientific subjects.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students are able to relate the significance of comprehending algebra's structure to a higher-level subject. 2. Within the parameters of the theory of modules, students have the ability to generate consciousness, particularly symbolic thinking. 3. Students are capable of using their understanding and analyzing models of mathematics, science, and technology, as well as other fields that are relevant to those disciplines. 4. Students are able to convey the outcomes of the growth of oral and writing comprehension as well as construct a framework for knowledge that supports mathematics, science, and technology.
Indicative Contents المحتويات الإرشادية	Subject-specific Knowledge: • knowledge of key ideas related to mathematics in the university • knowledge of the National Curriculum for mathematics and the way in which it facilitates the development of mathematical understanding • an understanding of the way in which theory informs practice and vice versa **Subject-specific Skills:** • an informed and critical awareness of research in mathematics education which

	can enhance the effectiveness of the university mathematics teacher • observe, record accurately and relate educational practice to theory in university and classrooms • critically analyzes literature on a variety of contemporary education issues relating to advanced mathematics **Key Skills:** • communicate ideas, principles and theories effectively in written form • manage time and work to deadlines • construct and sustain a reasoned argument • evaluate and make use of information from a variety of advance sources

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	To accommodate varied talents, skills, learning rates, and learning styles, teaching and learning strategies might involve a variety of whole class, group, and individual activities. This enables every student to engage and to some extent succeed.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٦٧	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**4**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	١٠٨	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**7**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**5**	**3% (15)**	**5 , 7 and 13**	**LO #4, #6 and #12**
	Assignments	**٥**	**2% (10)**	**4 , 6 and 12**	**LO #5, #7 and #13**

	Projects / Lab.				
	Report	**١**	**٥% (٥)**	**14**	**LO # All**
	Onside Assignments	**١**	**٥% (٥)**		
	Seminars	**0**	**0% (0)**	**14**	**LO # All**
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1 - #8**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	To let students be able to identify the advanced basic fundamentals in mathematics (differentiation and integration and their different applications) to develop their mentally capability by exercising solutions. Also, can be able to correlate the information data in order to solve the scientific problem and how to make use of it in other scientific subjects.
Week 2	Trigonometric functions, trigonometric relations, graphic drawing, applications
Week 3	Limits of algebraic and trigonometric functions, limit near, applications
Week 4	Theory of derivatives, derivative of algebraic and trigonometric and empirical functions
Week 5	Chain rules, applications
Week 6	Inverse functions and inverse of trigonometric functions, applications
Week7	Derivatives of logarithmic and exponential functions, hyperbolic and its derivatives, relation and drawing, applications
Week 8	Integration theory, indefinite and definite integration, trigonometric and its inverse
Week 9	Integration of logarithmic and exponential functions, integration of hyperbolic functions, other integrations
Week 10	Methods of integrations, integration by parts
Week 11	Integration by partial fractions
Week 12	Area under a curve, area between two curves
Week 13	Volumes by revolutions, length of a curve

Week 14	Simple differential equations
Week 15	Approximate area by trapezoidal and Simpson rule, numerical integration, applications
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	" Calculus " , Ford , S.R. and Ford , J.R. , (1963) McGraw-Hill	Yes
Recommended Texts	“Principles of Mathematics”, Katherine A. Loop., (2015)	No
Websites	https://web.math.ucsb.edu/~agboola/teaching/2021/winter/122A/rudin.pdf	

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

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

Code	Course/Module Title	ECTS	Semester
TEMO 100	**Mathematics Principles**	**7**	١
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	0	٦٧	١٠٨

Description

Mathematics offers a potent and common language. When presenting mathematical ideas, arguments, and conclusions both orally and in writing, students are expected to employ acceptable mathematical terminology and a variety of representational techniques.

Students should be able to:

1. employ proper mathematical language (notation, symbols, and terminology) in both spoken and written

explanations in order to achieve the goals of mathematics.

2. Present information using the proper mathematical representations.

3. choose between various mathematical representational styles.

4. Express thorough, clear, and simple mathematical arguments.

5. utilizes a logical structure to arrange information.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Electrical Technology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar** ☒ **lab**	
Module Code	**TEMO 101**				
ECTS Credits	٦				
SWL (hr/sem)	١٥٠				
Module Level	**1**		**Semester of Deliver**	**1**	
Administering Department	**AM**		**College**	**TEMO**	
Module Leader	**Safwan Assaf Hamoodi** **The file (module description form of electrical and electronic engineering) prepared by Prof. Dr. Haitham M. Wadullah**		**e-mail**	**Safwan79azb@ntu.edu.iq** **dr.haitham@ntu.edu.iq**	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	23/9/2023		**Version Number**	**1.0**	

Relation with other Modules			
Prerequisite module	**None**	**Semester**	
Co-requisites module	**None**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	Preparing the student to study the different calculations in alternating current and direct current circuits, and to get acquainted with the various theories to study these calculations. Understanding electrical principles and concepts: The module aims to provide students with a clear understanding of electrical principles and concepts, including voltage, current, resistance, and power. Students will learn how these concepts are applied in electrical circuits and systems. Developing practical skills in electrical measurements and testing: The module aims to equip students with practical skills in using electrical instruments and equipment for measurements and testing. Students will learn how to perform accurate measurements, interpret the results, and troubleshoot electrical systems. Applying knowledge to electrical machines and power systems: The module aims to enable students to apply their knowledge of electrical technology to the operation and maintenance of electrical machines, such as motors and generators. Students will also gain an understanding of power systems and their components, including power generation, transmission, and distribution.
Module Learning Outcomes	1. Understanding electrical circuit theory: Students will gain knowledge of fundamental electrical circuit theory, including concepts such as voltage, current, resistance, and power. They will be able to apply this understanding to analyze and solve basic electrical circuits. 2. Proficiency in electrical measurements and testing: Students will develop skills in using electrical instruments and equipment to measure and test electrical parameters. They will learn how to interpret measurement results and troubleshoot electrical systems to identify faults. 3. Application of electrical machines and power systems: Students will learn about electrical machines, such as motors and generators, and their operating principles. They will understand the characteristics and applications of these machines. Additionally, they will gain a basic understanding of power systems, including power generation, transmission, and distribution.
Indicative Contents	**Part A -** **1.** Basic Electrical Principles, Electrical Measurements and Instruments [20 hrs] **2.** Electrical Machines, Power Systems, Electrical Safety, Direct current circuit [20 hrs] **3.** Revision and quiz [1.5 hrs] Part B – **1.** Alternating current circuit, Circuit Theory, Analogue Electronics Control Systems [20 hrs] **2.** Renewable Energy, Troubleshooting and Maintenance [10 hrs] **3.** Revision and quiz [1.5 hrs]

Learning and Teaching Strategies	
Strategies	1. Active Engagement: Actively engage with the subject matter by participating in class discussions 2. Practice Problem Solving: Electrical Technology involves problem-solving skills. 3. Hands-on Experience: Gain practical experience by participating in laboratory sessions and hands-on projects. 4. Collaborative Learning: Engage in group discussions and study sessions with classmates. 5. Utilize Resources: Take advantage of resources such as textbooks, online tutorials, video lectures, and educational websites to supplement your learning. 6. Time Management: Create a study schedule and allocate dedicated time for studying Electrical Technology. 7. Review and Recap: Regularly review previously covered topics to reinforce your understanding and retain information.

Student Workload (SWL)			
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	**4**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**2**	**10% (10)**	**5 and 10**	**LO #1and #2**
	Assignments	**2**	**5% (5)**	**2 and 12**	**LO #2 and #3**
	Projects / Lab.	**9**	**15% (15)**	**Continuous**	**LO #1 and #3**
	Report	**1**	**10% (10)**	**13**	**LO #3**
Summative assessment	**Midterm Exam**	**2hr.**	**10% (10)**	**7**	**LO #1 - #2**
	Final Exam	**2hr.**	**50% (50)**	**16**	**All**

Total assessment	**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Symbols and abbreviations, electric circuit and its elements
Week 2	The direct-current network (kerchief's law & their use in network analysis
Week 3	Conversion of delta-connected resistance into an equivalent Wye connection & vice versa
Week 4	Power sources connected in parallel, node voltage method
Week 5	Loop current method.
Week 6	Super position method.
Week 7	Thevenin's theorem and Norton's theorem.
Week 8	Maximum power transfer.
Week 9	Reciprocity theorem
Week 10	Sinusoidal excitation, average, effective values and their steady- state analysis
Week 11	Generation of alternating current, sinusoidal current
Week 12	The mean values of current and voltage
Week 13	Complex Frequency, s-Plane, Poles and Zeros, Response Function, Bode Plots
Week 14	Frequency Response of Series/Parallel Resonances, High-Q Circuits
Week 15	Mutual Inductance, Linear and Ideal Transformers, Circuits with Mutual Inductance
Week 16	Final Examination

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: : Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: Kirchhoff's Laws
Week 3	Lab 3: series circuit
Week 4	Lab 4: Parallel circuit
Week 5	Lab 5: Thévenin's Theorem.
Week 6	Lab 6: Norton's Theorem.
Week 7	Lab 7: Y-connection delta-connection
Week 8	Lab 8: Second-Order Transient Responses
Week 9	Lab 9: Frequency Response of RC Circuits
Week 11	Lab 10: Frequency Response of RLC Circuits
Week 12	Lab 11: Filters
Week 13	Lab 12: AC circuit
Week 14	Lab 13: sine wave form
Week 15	Lab 14: Review

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. **"Electric Machinery and Power System Fundamentals" by Stephen J. Chapman** 2. **"Electricity and Electronics for HVAC" by Rex Miller and Mark R. Miller** 3. **"Principles of Electric Machines and Power Electronics" by P.C. Sen** 4. **"Electrical Power Systems: Design and Analysis" by Mohamed E. El-Hawary**	
Recommended Texts	1. **"Electrical Wiring Residential" by Ray C. Mullin and Phil Simmons** 2. **"Industrial Electrical Troubleshooting" by Lynn Lundquist** 3. **"Electrical Safety Handbook" by John Cadick, Mary Capelli - Schellpfeffer, and Dennis Neitzel** 4. **"Digital Control Systems" by Benjamin C. Kuo**	

	5. **"Electromechanical Energy Conversion" by David J. Braun**	
Websites	(www.allaboutcircuits.com) (www.electrical4u.com) (www.khanacademy.org)	

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

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

Code	Course/Module Title	ECTS	Semester

TEMO 101	Electrical technology	٦	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**3**	**93**	٥٧
Description			
Electrical technology encompasses the study of electrical systems, circuits, devices, and their applications. It focuses on understanding the principles and theories behind electricity, electrical power generation, transmission, and distribution. This field involves the design, installation, maintenance, and troubleshooting of electrical systems in various industries, such as power generation, manufacturing, telecommunications, and transportation. Electrical technology professionals work with electrical equipment, control systems, and renewable energy technologies. They are skilled in analyzing electrical circuits, performing measurements, and ensuring safety and compliance with electrical codes and standards. A strong foundation in electrical technology enables individuals to contribute to the development and advancement of electrical systems, energy efficiency, and the integration of new technologies in the field.			

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Workshop**			**Module Delivery**	
Module Type	**Core**			☐**Theory**	
Module Code	**TEMO 102**			☐**Lecture**	
ECTS Credits	**6**			☒ **Lab**	
SWL (hr/sem)	**150**			☐ **Tutorial**	
				☒ **Practical**	
				☐ **Seminar**	
Module Level	**1**		**Semester of Deliver**		**1**
Administering Department	**AM**		**College**	**TEMO**	
Module Leader	**Ali Hussien**		**e-mail**	**alimohallami@ntu.edu.iq**	
Module Leader's Acad. Title			**Module Leader's Qualification**		**M.Sc.**
Module Tutor			**e-mail**		

Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	23/9/2023	**Version Number**	**1.0**

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**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.** Teach students the basic principles of the workshop. **2.** Identify the tools used. **3.** Training students on the operations of a process. **4.** Teaching students about the electrical and mechanical parts of devices. **5.** Learn about the types of furnaces for melting metals, and how to pour molten metal into sand molds. **6.** Identify the types of filings and their shapes. **7.** Learn about all types of lathes and how to use them. **8.** Learn how to deal with sheet metal. **9.** Learn about the most important methods of welding and the machines and tools needed for that. **10.** Learn about the most important tools and machines for dealing with wood, in addition to identifying the most popular and common types of wood.
Module Learning Outcomes	توفر ورشة العمل في كلية الهندسة للطلاب فرصة قيمة لاكتساب المعرفة والمهارات العملية في مجالات هندسية محددة. وتهدف الورشة إلى تعزيز تطبيق المفاهيم النظرية المستفادة في الفصول الدراسية وتوفير بيئة تعليمية تفاعلية. ويشمل جلسات تعليمية وتمارين عملية وحل

مخرجات التعلم للمادة الدراسية	**المشكلات ومشاريع التطبيق العملي. يتعاون الطلاب في فرق لتحقيق أهداف محددة وتطوير مشاريع فعالة. تعزز ورشة العمل التواصل والتعاون بين الطلاب، وتشجع التفكير النقدي وحل المشكلات في بيئة محاكاة هندسية. وتعد ورشة العمل فرصة قيمة للطلاب لتطوير مهاراتهم الفنية والعملية وتعزيز قدراتهم الهندسية للمستقبل.**
Indicative Contents المحتويات الإرشادية	**يتم في كل ورشة من هذه الورش عمل تمرين او اكثر (بحسب ماهو متاح من اجهزة وعدد ومواد) ، حيث يتدرب الطالب على السباكة ولخراطة والباردة والنجارة واللحام عمليا من خلال التدريب ثم الممارسة لاكتساب الخبرة والمهارة**

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	**108**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**7**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**٤٢**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**٣**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**١٥٠**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative	**Quizzes**	**2**	**2.5(5)**	**3,5**	**all**

assessment	**Assignments**	**2**	**2.5(5)**	**6,9**	**all**
	Projects / Lab.	**4**	**5% (10)**	**Continuous**	**All**
	Report	**2**	**5% (30)**	**Continuous**	**All**
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1 - #6**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري والعملي	
	Material Covered
Week 1	١ .ورشة السباكة : يتم فيها التعرف على انواع الافران الخاصة بصهر المعادن وكيفية صب المعدن المصهور في قوالب الرمل والتعرف على نوع الرمل المستخدم في صب القوالب اضافة الى كيفية التعامل مع القالب وتثبيته بالرمل وكيفية اخراجه م الرمل
Week 2	
Week 3	٢ .ورشة البرادة : يتم فيها التعرف على انواع المبارد واشكالها وكيفية العمل بكل نوع من المبارد وكيف يتم اختياره وفقا لنوع المادة التي يتم العمل عليها
Week 4	
Week 5	٣ .ورشة الخراطة : يتم فيها التعرف على اهم اجهزة خراطة وكشط وتثقيب الاجزاء المراد تشكيلها بواسطة كل من المكائن التالية التورنة الفريزة القاشطة انواع المزارف ويتم التعرف على كل ماكنة من هولاء المكائن والاجزاء الرئيسية لكل ماكنة وكيفية عملها
Week 6	
Week 7	
Week 8	٤ .ورشة السمكرة : يتم فيها التعرف على كيفية التعامل مع صفائح المعادن من حيث القص والطرق والتثقيب والثني والتحديب واهم العدد اللازمة لذلك وكيفية العمل بها
Week 9	
Week 10	٥ .ورشة اللحام : التعرف على اهم طرق اللحام والمكائن والعدد اللازمة لذلك وكيف يتم اختيار المعدن الملائم لاجراء عملية اللحام وسمكه وكيفية العمل بكل طريقة من طرق اللحام والمتضمنة لحام القوس الكهربائي لحام النقطة
Week 11	
Week 12	

	اللحام بالاحتكاك اللحام الغازي
Week 13 Week 14	٦ .النجارة : يتم فيها التعرف على اهم العدد والمكائن الخاصة بالتعامل مع الخشب اضافة الى التعرف على اشهر انواع الاخشاب والاكثرها شيوعا وكيف يتم التعامل مع العروق التركيب النسيجي للوح الخشب عن طريق العدد
Week 15	عمل تجريبي على جميع الورش
Week 16	Preparatory week before the 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		**Yes**
Recommended Texts		**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.

Code	Course/Module Title	ECTS	Semester
TEMO 102	**WORKSHOP**	**6**	**1**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
0	**6**	**93**	**57**

The workshop in an engineering college provides students with a valuable opportunity to acquire knowledge and practical skills in specific engineering fields. The workshop aims to enhance the application of theoretical concepts learned in classrooms and provides an interactive learning environment. It includes instructional

sessions, hands-on exercises, problem-solving, and practical application projects. Students collaborate in teams to achieve specific goals and develop effective projects. The workshop promotes communication and collaboration among students, encourages critical thinking, and problem-solving in an engineering simulation environment. The workshop is a valuable chance for students to develop their technical and practical skills and enhance their engineering capabilities for the future.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Engineering Drawing**		**Module Delivery**	
Module Type	**Core**		☐ **Theory**	
Module Code	**TEMO 103**		☐ **Lecture**	
ECTS Credits	**7**		☒ **Lab**	
SWL (hr/sem)	**175**		☐ **Tutorial**	
			☐ **Practical**	
			☐ **Seminar**	
Module Level	**1**	**Semester of Deliver**	**2**	
Administering Department	**AM**	**College**	**TEMO**	
Module Leader	**Hasan abd alsarraf**	**e-mail**	**hasan.alsarraf@ntu.edu.iq**	
Module Leader's Acad. Title	**Asst. Lecturer**	**Module Leader's Qualification**	**M.Sc.**	
Module Tutor		**e-mail**		
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	**23/9/2024**	**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	The Objectives of this course are to enable students to: 1. Represent the various geometric shapes in drawing. 2. Represent of the connection of bolts and screws to the drawing and interpretation. 3. Engage the engineering parts by symbols welding on the drawing and interpreting these symbols 4. Determine the mechanisms of movement between the geometric parts and placing the appropriate symbols on them. 5. Draw the assembled mechanical parts and determine the mechanism or method
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Capability to use AutoCAD for 2-D representations. 2. To make the students understand all about the screw threads and their definitions also to teach the students all common types for screw threads and the common types for bolts and nuts with overview in details. 3. To make the students understand all about the Keys, types of keys, spline shaft and hub concept, and the basic definitions for Keys also the correct manner for Keys drawing. 4. Enables the students to learn the techniques and standard practices of technical graphics. 5. To make the students understand all about the riveting and types of rivets. 6. Read a working or assembly drawing (blueprint). 7. Represent mechanical components in multi view orthographic representation. 8. understanding all about the welding, types of weld joints and the basic definitions for welding also the correct manner for all types of welding symbol drawing.

	9. To help students understand all about the Gears classification, draw spur gear, definitions, formulas and calculations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Introduction to (CAD), components of computer aided drawing (CAD), Exercises. [8 hrs.] Introducing the most important geometric mechanical shapes and their components, and how to draw each shape using the program [4hrs.] Introducing the most important commands that contribute to making modifications to the geometric shapes drawn using the program [8 hrs.] Demonstrate the method of drawing advanced geometric shapes using the program. [4 hrs.] Training students to draw advanced geometric shapes using the program [8 hrs.] Revision and quiz [8hrs] Part B - Training students at this stage to draw triangular projections of geometric shapes for any geometric shape in general. [8 hrs.] Complex geometrical shape. [12 hrs.] Training the students at this stage to draw the triangular projections of the geometric shapes of the mechanical engineering shapes in particular. [15 hrs.] Training the students at this stage to draw the Perspective. [15 hrs.] Revision and quiz [8hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for 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	**112**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**7**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	2.5% (10)	2 , 7 and 13	LO #1, #5 and #6
	Assignments	5	2% (10)	3 , 5, 8,10 and 14	LO #2,#3, #4 and #7
	Projects / Lab.	14	1% (14)	Continuous	All
	seminar	1	6%(6)		
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #4
	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 (CAD) , Exercises
Week 2	Screw threads , Exercises
Week 3	Method of drawing (Hexagonal & Square headed bolts and nuts)
Week 4	Keys, types of keys.
Week 5	Pins and Cotters.
Week 6	Rivets and riveted joints.
Week 7	Types of riveted joints, Conventional rivet symbol, working drawing.
Week 8	Welding, type of weld joints
Week 9	Pulleys, types of pulleys.
Week 10	Gears, classification of gears, Gear tooth profile
Week 11	Assembly and details of common mechanical units
Week 12	Power screw (Assemble and details)
Week 13	Coupling, Types of coupling, Bearings, types of bearings.

Week 14	**Pipes and pipe joints, piping fittings**
Week 15	**pipe symbols standard**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	No

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Fundamentals and principles of engineering drawing** **Fundamentals of AutoCAD 2010**	**Yes**
Recommended Texts	**Fundamentals of AutoCAD2020**	**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 -	متوسط	60 - 69	Fair but with major shortcomings

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

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

Code	**Course/Module Title**	**ECTS**	**Semester**
TEMO 103	**ENGINEERING DRAWING**	**7**	**2**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
0	**4**	**63**	**112**

DESCRIPTION

Definition of engineering drawing orders and its uses - the concept of engineering programs in engineering drawing and their fields - engineering drawing tools. Types of engineering lines and their uses, exercises + function. Drawing geometric shapes on computer) rectangular, parallelepiped, square, the circle (exercises + function. Dimensions and how to put them on the drawing. Principles of projection in engineering drawing (simple shapes). Cartesian projection on three levels. uncomplicated shapes, medium complexity, Complex geometric shapes

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Engineering Materials**	**Module Delivery**
Module Type	**Core**	☒ **Theory**

Module Code	**AM 200**		☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**
ECTS Credits	**7**		
SWL (hr/sem)	**175**		
Module Level	**2**	**Semester of Delivery**	**3**
Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Jamal N. Sultan**	**e-mail**	**Jamal.nayyef@ntu.edu.iq**
Module Leader's Acad. Title	**Professor**	**Module Leader's Qualification**	**Ph.D.**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23/9/2023**	**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. Understand the Structure of Materials: Learn about the atomic and molecular structure of materials, including the arrangement of atoms, crystal structures, and the relationship between structure and material properties. 2. Study Material Properties: Explore the various physical and mechanical properties of materials such as strength, hardness, elasticity, conductivity, thermal expansion, and corrosion resistance. Understand how these properties influence the behavior of materials in different applications. 3. Learn about Material Processing: Gain knowledge about different manufacturing and processing techniques used to modify the structure and properties of materials. This may include topics such as casting, forging, welding, heat treatment, and

	surface treatment. 4. Comprehend Material Selection: Understand the principles and criteria for selecting materials for specific engineering applications. Consider factors such as mechanical requirements, environmental conditions, cost, and sustainability in the material selection process. 5. Explore Material Failure and Fracture: Study the causes and mechanisms of material failure, including fracture, fatigue, creep, and wear. Learn how to analyze and prevent failures through the application of material science principles. 6. Examine Material Testing and Characterization: Familiarize yourself with different experimental techniques and methods used to evaluate material properties and performance. This may include tensile testing, hardness testing, microscopy, spectroscopy, and non-destructive testing. 7. Understand Material Behavior under Different Conditions: Learn how materials respond to external factors such as temperature, pressure, and loading conditions. Study the concepts of elasticity, plasticity, viscoelasticity, and the behavior of materials at extreme temperatures. 8. Gain Knowledge of Material Sustainability: Explore the concepts of sustainable materials, recycling, and environmental impact assessment. Understand the importance of considering the lifecycle of materials and their ecological footprint. 9. Develop Material Design Skills: Apply material selection principles and knowledge of material properties to design components and systems that meet specific engineering requirements. Understand the relationship between material properties, manufacturing processes, and design optimization. 10. Enhance Problem-Solving Abilities: Develop critical thinking and problem-solving skills related to material selection, material performance, and failure analysis. Apply theoretical knowledge to practical engineering challenges.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- **Knowledge of Material Properties, crystalline structure and Non-crystalline structure of metals:** Students gain a comprehensive understanding of the fundamental properties of different engineering materials such as metals, polymers, ceramics, and composites. This includes knowledge of mechanical properties (strength, stiffness, and toughness), thermal properties (conductivity, expansion), electrical properties, corrosion resistance, and other relevant characteristics. **Knowledge of atomic binding: Ionic bond, covalent bond, metallic bond, Van der Waals forces:** Students will recognize and understand the crystallography, atomic binding, bond formation, and defects. Learning the role of energy minimization in bond formation, and the physical properties of ionic compounds. Understanding the relationship between metallic bonding strength and properties like hardness and melting points. Students get knowledge about the different types of Van der Waals forces and their

impact on the behavior of molecules.

Knowledge of crystal defects, different crystals from an ingot, Crystal imperfections:

Students will explore the metal imperfections, such as vacancies, interstitials, and substitutional atoms, and their effects on hardness, ductility, and strength. Get knowledge about defects, such as point defects, which can affect electrical conductivity, carrier mobility, and the behavior of p-n junctions. Learning about defects formations during crystal growth, solidification, and plastic deformation, and how could be controlled or reduced through processes like annealing, quenching, or crystal purification.

2- **Knowledge of Solidification: different crystals form in an ingot:**

Students will understand solidification processes involve the formation of nucleated and crystallized materials, with the difference between homogeneous and heterogeneous nucleation. Get knowledge about cooling rates and its effects on grain size and structure. Learning how the solidification affects the microstructure and mechanical properties of the material. Recognize different types of crystal imperfections, such as point defects, line defects, and planar defects, and how can affect the properties of the ingot.

Knowledge of Mechanical properties, hardness, Brinell hardness, Vickers hardness, and Rockwell hardness:

Students will understand mechanical properties like strength, ductility, toughness, elasticity, and plasticity. They will learn metal hardness tests like Brinell, Vickers, and Rockwell, and develop skills for quality control, material selection, and failure analysis. They will recognize solidification processes and properties in engineering and manufacturing.

3- **Knowledge of Cooling curves for metals and alloys and the solubility of metals in each other's:**

Students will learn about the transition of metals and alloys from liquid to solid during cooling, distinguishing between pure and alloys. They will understand cooling curves, eutectic points, and their impact on microstructure. They will understand the application of cooling curves in heat treatment, industrial processes, and quality control. They will also understand the role of partially soluble metal systems in alloy development.

4- **Knowledge of Iron making and Steel making:**

Students will learn about raw materials used in iron making, their roles in the blast furnace process, chemical reactions, thermodynamics, and emissions. They will also understand cost factors, economic challenges, and conversion of pig iron and scrap into steel. They will learn about alloying elements, innovations, sustainable practices, and advancements in iron and steel production technologies. They will gain a strong foundation in metallurgical engineering and technical aspects.

5- **Knowledge of thermal equilibrium diagram for Iron-Iron carbide:**

Students will learn about iron transformation through phases like ferrite, austenite, cementite, and pearlite at different temperatures and carbon concentrations. They will understand equilibrium phases and critical points like the eutectoid and eutectic reactions. They will predict the microstructure of iron-carbon alloys at different cooling rates and carbon content. They will understand Pearlitic, Bainitic, and Martensitic structures based on cooling rates and temperatures. Mastering the Fe-Fe_3C diagram will help students make informed decisions in material selection, processing, and applications in fields like automotive, construction, and manufacturing.

Knowledge of steel types:

Students will learn about steel's chemical composition, properties like tensile strength, ductility, hardness, and corrosion resistance, and their applications. They will understand low, medium, and high-carbon steels, alloying elements, and high hardness steels. They also will explore steels used in construction, automotive, aerospace, and manufacturing industries.

6- **Knowledge of Impurities (alloying elements) in steel:**

Students will learn the impact of various elements on steel's mechanical and physical properties. They will get knowledge about how elements like carbon, manganese, and chromium enhance steel's strength, hardness, and wear resistance. They will be able to discuss how these elements improve ductility and toughness, enhance corrosion resistance, and affect the formation of martensite. In addition, they will be able to discuss how impurities like sulfur and phosphorus can lead to brittleness. They will recognize how alloying elements influence steel's phase transformations, heat treatment processes, thermal conductivity, electrical conductivity, and recycling processes. They will get a comprehensive understanding of alloyed and impure steels, enhancing engineering design and processing.

7- **Knowledge of Cast Iron, and types of cast Iron**:

Students should understand cast iron's chemical composition, including its high carbon content and alloying elements. They should also understand different types of cast iron, their properties, and their applications in industry. The students will also understand how cast iron behaves under different stresses and temperatures, and common failure modes. This knowledge helps in selecting the right material for engineering and industrial applications.

Knowledge of heat treatments and surface hardening of steel:

Students should understand heat treatments of steel, such as annealing, normalizing, and quenching, to enhance performance in various industries. They should also understand how these treatments alter steel's microstructure, critical transformation temperatures, and alloying elements' impact. They will get knowledge about how surface hardening increases steel resistance, wear, and abrasion resistance, offering

	economic benefits and optimizing processes.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** **1.** Metals: Ferrous Metals: Iron, Carbon, Manganese, Chromium, Nickel, Molybdenum, etc. Non-Ferrous Metals: Aluminum, Copper, Zinc, Lead, Tin, Titanium, etc. **2.** Polymers (Plastics): • Polyethylene: Ethylene monomer units • Polypropylene: Propylene monomer units • Polyvinyl Chloride (PVC): Vinyl Chloride monomer units • Polystyrene: Styrene monomer units • Polyethylene Terephthalate (PET): Ethylene Glycol, Terephthalic Acid **3.** Ceramics: • Traditional Ceramics: Clay, Feldspar, Silica, Alumina • Advanced Ceramics: Zirconia, Silicon Carbide, Aluminum Nitride, Boron Nitride **4.** Composites: • Fiber Reinforced Composites: Glass fibers, Carbon fibers, Aramid fibers • Matrix Materials: Epoxy resins, Polyester resins, Thermoplastics **5.** Semiconductors: Silicon: Pure silicon with small amounts of impurities (dopants) like Boron or Phosphorus **6.** Concrete: • Cement: Portland cement (mainly composed of Calcium, Silicon, Aluminum, Iron) • Aggregates: Crushed stone, Sand, Gravel **7.** Wood: • Cellulose: Main constituent of wood • Lignin: Provides rigidity and strength to wood **8.** Glass: • Silica: Main component of glass • Various additives: Sodium carbonate, Calcium oxide, Aluminum oxide, etc.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم	
Strategies	1. Active Learning: Engage students in hands-on activities, experiments, and projects that involve working with engineering materials. This could include laboratory sessions, case studies, or design projects that require students to apply their knowledge to real-world problems. 2. Visualization Tools: Utilize visualization tools such as diagrams, models, and simulations to help students understand the structure, properties, and behavior of different engineering materials. This can enhance their conceptual understanding and make complex concepts more accessible. 3. Practical Examples: Provide practical examples of engineering materials used in real-world applications. Showcase the materials' properties and performance in various industries, such as aerospace, automotive, or construction. This can help students connect theoretical knowledge with practical relevance. 4. Collaborative Learning: Encourage collaboration among students through group discussions, team projects, and peer learning. This fosters active engagement and allows students to learn from each other's perspectives and experiences. Assigning group projects that involve materials selection, analysis, or testing can enhance teamwork and problem-solving skills. 5. Problem-Based Learning: Present students with real or hypothetical engineering problems that require material selection or analysis. This approach promotes critical thinking, problem-solving skills, and the application of theoretical knowledge to practical scenarios. Encourage students to research, analyze, and propose solutions using appropriate materials. 6. Multimedia Resources: Utilize multimedia resources such as videos, interactive websites, and online simulations to supplement classroom lectures and textbooks. These resources can provide visual representations, demonstrations, and interactive experiences that enhance understanding and engagement. 7. Guest Speakers and Industrial Visits: Invite industry professionals, researchers, or experts in materials engineering to give guest lectures or organize industrial visits. This exposes students to real-world applications, current research trends, and industry practices, providing valuable insights and networking opportunities. 8. Formative Assessment: Incorporate formative assessment methods such as quizzes, concept maps, or short assignments to gauge students' understanding of engineering materials throughout the learning process. This helps identify areas of improvement and allows for timely feedback and clarification. 9. Scaffolded Learning: Break down complex concepts into smaller, more manageable units and provide scaffolding to support students' learning

	progression. Start with foundational knowledge and gradually build up to more advanced topics, ensuring students grasp fundamental principles before moving forward. **10.** Reflective Practices: Encourage students to reflect on their learning experiences, make connections between theory and practice, and identify areas of improvement. Incorporate reflective exercises, journals, or group discussions to promote metacognitive skills and enhance self-directed learning.

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	**82**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**5**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**3**	**5% (15)**	**4, 6, and 8**	**LO #3, #5 and #7**
	Assignments	**2**	**5% (10)**	**3, and 5**	**LO #2 and #4**
	Projects / Lab.	**10**	**1% (10)**	**Continuous**	**All**
	Report	**1**	**5% (5)**	**6**	**Lo #8**
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1, #2,#3,#4,#5, #6 and #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 engineering materials Types of engineering materials Properties of engineering materials Crystalline structure and non-crystalline structure
Week 2	Atom binding: Ionic bond, covalent bond, metallic bond, Van der Waals forces
Week 3	Crystal defects, different crystals from an ingot, crystal imperfections
Week 4	Solidification: different crystals form in an ingot
Week 5	Mechanical properties, hardness, Brinell hardness
Week 6	Vickers hardness, and Rockwell hardness
Week 7	Cooling curves for metals and alloys
Week 8	Solid solution, two metals completely soluble in each other in solid state,
Week 9	Two metals completely insoluble in each other in solid state, Two metals partially soluble in each other in solid state,
Week 10	Iron making. steel making
Week 11	Thermal equilibrium diagram for Iron-Iron carbide, types of steel
Week 12	Impurities in steel
Week 13	Cast Iron, types of cast Iron
Week 14	Heat treatments of steel
Week 15	Surface hardening of steel
Week 16	Preparatory week before the final Exam

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

Week 1	Lab 1: Introduction to Mechanical Tests.
Week 2	Lab 2: Specimen Preparation For Microscopic Examination.
Week 3	Lab 3: Microscopic Examination of Different Types of Steel.
Week 4	Lab 4: Heat Treatments of Steel.
Week 5	Lab 5 Surface Hardening of Steel.
Week 6	Lab 6: Microstructure Examination of Stainless Steel .
Week 7	Lab 7: Microstructure Examination of Cast Iron.
Week 8	Lab 8: Thermal Equilibrium Diagrams of Two Metals Completely Soluble in Each Other in Liquid States.
Week 9	Lab 9: Impact Test.
Week 10	Lab 10: Fatigue Test.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. "Materials Science and Engineering: An Introduction" by William D. Callister Jr. and David G. Rethwisch.	Yes
Recommended Texts	1. "Introduction to Materials Science for Engineers" by James F. Shackelford. 2. "Mechanical Metallurgy" by George E. Dieter. 3. "Fundamentals of Materials Science and Engineering" by William D. Callister Jr. and David G. Rethwisch. 4. "Engineering Materials 1: An Introduction to Properties, Applications, and Design" by Michael F. Ashby and David R. H. Jones.	No
Websites	1. Materials Research Society (MRS) - The MRS website (www.mrs.org) offers a wide range of materials science resources, including journals, publications, news, events, and educational materials. It is a leading organization dedicated to advancing the field of materials research. 2. American Ceramic Society (ACerS) - The ACerS website (www.ceramics.org) focuses specifically on ceramic materials. It provides access to journals, conferences,	

	educational resources, and news related to ceramics and other related materials. 3. Materials Today - Materials Today (www.materialstoday.com) is an online platform that covers various aspects of materials science, including news, articles, reviews, and interviews. It covers a broad range of material classes, such as metals, polymers, composites, and nanomaterials. 4. ASM International - ASM International (www.asminternational.org) is an organization that focuses on the science and engineering of materials. Their website provides access to technical publications, educational resources, events, and a knowledge base with information on various materials and their applications. 5. National Institute of Standards and Technology (NIST) - The NIST website (www.nist.gov/materials-science-and-engineering) offers resources related to materials science and engineering, including research papers, databases, measurement techniques, and standards. It is a valuable resource for those interested in materials characterization and properties. 6. Elsevier Materials Science - Elsevier's Materials Science website (www.elsevier.com/physical-sciences/materials-science) provides access to a wide range of scientific journals and publications in the field of materials science. It covers topics such as materials synthesis, characterization, properties, and applications.

Grading Scheme

مخطط الدرجات

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

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

Code	Course/Module Title	ECTS	Semester
AM 200	Engineering Materials	7	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	82

Description

Engineering materials are vital substances used in various engineering applications. They possess specific physical and chemical properties that make them suitable for specific purposes. These materials can be classified into metals, ceramics, polymers, composites, and specialized materials.

Metals are versatile with excellent strength, ductility, and conductivity. Steel, aluminum, copper, and titanium are commonly used metals in engineering. Ceramics are hard, brittle materials with high melting points. They exhibit resistance to heat, wear, and corrosion. Alumina, silicon carbide, and porcelain are examples of ceramics.

Polymers, also known as plastics, are lightweight materials with flexibility and corrosion resistance. They can be easily molded into various shapes. Polyethylene, polystyrene, and PVC are commonly used polymers. Composites are engineered materials made from different constituent materials, providing enhanced properties such as high strength and low weight. Fiberglass and carbon fiber reinforced polymers are examples of composites.

Specialized materials include semiconductors for electronic devices, superconductors for energy applications, and biomaterials for medical implants. Each material type has unique characteristics and is selected based on specific engineering requirements.

Overall, understanding engineering materials is essential for selecting the right materials for various applications and ensuring optimal performance in engineering projects.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Fluid Mechanics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 201**			☐ **Lecture**	
ECTS Credits	**7**			☒ **Lab**	
SWL (hr/sem)	**175**			☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Level	**2**	**Semester of Deliver**	**3**		
Administering Department	**AM**	**College**	**TEMO**		
Module Leader	**Mohammed Raad Abdulwahab**	**e-mail**	**Mohammed.raad@ntu.edu.iq**		
Module Leader's Acad. Title	**Lecturer**	**Module Leader's Qualification**	**M.Eng.**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**23/9/2023**	**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	**6.** To understand the properties of fluids, dimensions and units. **7.** To derive the equation of conservation of mass, momentum, energy and its application.

	8. To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems. 9. To understand the various flow measuring devices. 10. To understand the classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	8. Understand how to convert the unit system from British to SI. unit or vice versa. 9. Training the students how to solve the problems associated with fluid mechanics. 10. Measure the fluid flow of liquids by different types of flow meters. 11. Analyze the magnitude of the horizontal and vertical components of the force of the water on the gate. 12. Determine the reading on the pressure gauge by the different types of manometers. 13. Draw simple hydraulic and energy gradient lines. 14. Solve the formulas of open channel flow.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A- Introduction**: Basic concepts of fluid mechanics. Fundamental terms. Physical values. Fluids and their properties. Forces inside fluid. Measurement of pressure. Relative statistics of fluid – constant acceleration, rotation. Forces of hydrostatic pressure. Buoyancy. Streamlines. Stream surface. Stream tube. Mass/volume flow. Control volume. **Fluid Dynamics**: Continuity equation. Basic laws of fluid dynamics – conservation of mass, conservation of linear momentum, conservation of energy. Ideal fluid flow. Application of Bernoulli's equation. Real fluid flow. Viscosity. Determination of losses. Reynolds experiment. Laminar and turbulent flow. Boundary layer. Velocity profile. Losses in pipes. Frictional losses. Moody's diagram. Local losses. Pumps, types. Turbines and the working principle of the turbine. **Part B- Analyze characteristics of a particular flow.** Formulate the governing equations and boundary conditions. Solve these equations analytically in simple cases. Revision problem classes and quiz [6 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	**93**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**6**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**82**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**5**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	**3**	**9**	**3, 5, and 10**	**LO #1, #2 and #5**
	Assignments	**5**	**15**	**2, 4, 6, 9, and 12**	**LO #3, #4, #6 and #7**
	Projects / Lab.	**6**	**12**	**Continuous**	**All**
	Seminar	**1**	**4**		
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 - Units system
Week 2	Physical properties of fluids.
Week 3	Physical properties of fluids.
Week 4	Fluid pressure at static.
Week 5	Fluid pressure instruments.
Week 6	Hydrostatic force on a plane surface.
Week 7	Hydrostatic force on an inclined surface
Week 8	Hydrostatic force on a curved surface.
Week 9	Fluid dynamics / classifications of fluids.
Week 10	Conservation of mass.
Week 11	Conservation of momentum and its application.
Week 12	Conservation of energy- Bernoulli equation.
Week 13	Bernoulli equation applications.
Week 14	Viscous flow in pipes.
Week 15	Pumps or turbines.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Density and Specific Gravity.
Week 2	Lab 2: DETERMINATION OF LIQUID VISCOSITY USING STOCK`S METHOD.
Week 3	Lab 3: Determination of Centre of Pressure and Hydro-static Force on Plane surface (Part One).
Week 4	Lab 4: Determination of Centre of Pressure and Hydro-static Force on Plane surface (Part Two).
Week 5	Lab 5: Reynolds Number Investigation.
Week 6	Lab 6: Estimation of the Volume Flow Rate Using Orifice Meter Apparatus.
Week 7	Lab 7: IMPACT OF WATER JET ON VANES.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	FLUID MECHANICS	Yes
Recommended Texts	4- A TEXTBOOK OF FLUID MECHANICS AND HYDRAULIC MACHINES BY RAJPUT. 5- Fluid Mechanics by Yunus A. Cengel, John M. Cimbala. 6- fluid_mechanics_frank_m._white_4th_ed.	No
Websites	https://www.youtube.com/watch?v=jjqGoWfPKUY&t=43s	

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

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

Code	Course/Module Title	ECTS	Semester
AM 201	Fluid Mechanics	7	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	2	93	82

Description

Fluid Mechanics, the branch of science that deals with the study of fluids (liquids and gasses) in a state of rest or motion, is an important subject of Civil, Mechanical and Chemical Engineering. Its various branches are fluid statics, fluid kinematics and fluid dynamics.

A substance that flows is called a fluid. All liquid and gaseous substances are considered to be fluids. Water, oil, and others are very important in our day-to-day life as they are used for various applications. For instance, water is used for generation of electricity in hydroelectric power plants and thermal power plants, water is also used as the coolant in nuclear power plants, oil is used for the lubrication of automobiles etc.

Fluid Mechanics is the branch of science that studies the behavior of fluids when they are in state of motion or rest. Whether the fluid is at rest or motion, it is subjected to different forces and different climatic conditions and it behaves in these conditions as per its physical properties. Fluid mechanics deals with three aspects of the fluid: static, kinematics, and dynamics aspects.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Mechanical Drawing**	**Module Delivery**	
Module Type	**Core**	☐ **Theory**	
Module Code	**AM 202**	☐ **Lecture**	
ECTS Credits	**7**	☒ **Lab**	
SWL (hr/sem)	**175**	☐ **Tutorial**	
		☐ **Practical**	
		☐ **Seminar**	
Module Level	**2**	**Semester of Delivery**	**3**

Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Abd alrahman sami**	**e-mail**	**abd.s.akeel@ntu.edu.iq**
Module Leader's Acad. Title	**Asst. Lecturer**	**Module Leader's Qualification**	**M.Sc.**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23/9/2023**	**Version Number**	**1.0**

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**1.** to train students: to read the technical drawings through the application of techniques. **2.** Learn students to read symbols, technical terms, standard specifications. **3.** To understand the basic principle for descriptive geometry.. **4.** This course deals with the basic concept of the computer in mechanical drawing. **5.** To be able to communicate with manufacturers of mechanical systems. **6.** To understand standard specifications, draw simple and complex assembly drawings. **7.** To be able to communicate with other mechanical engineering professionals regardless of their spoken language.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** Capability to use AutoCAD for 3-D representations. **2.** the ability to make a 3D drawing from scratch, **3.** make manufacturing drawings with all annotations and **4.** create presentation-ready **5.** details using 3D models. **6.** Enables the students to learn the techniques and standard practices of technical

	graphics. **7.** renderings with custom materials **8.** Represent mechanical components in multi view orthographic representation
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** **Introduction To AutoCAD 3D** • Introduction • Understanding and navigation in 3d workspace • Using view control and view cube • Using visual styles • Working with model space viewports **3D SOLID MODELING** • Creating Solid primitives • Extrude command • Presspull command • Revolve command • Sweep command • Loft Command **SOLID EDITING** • Fillet and Chamfer edge • Shell Command • Slice Command • Interfere command • extract edges and Copy edges • Extrude, Taper and Move Face • Copy, Offset, Delete and color Face • 3D mirror command • 3D array command • Convert to surface, solid and thicken command **VISUALIZING SOLIDS** • Understanding User coordinate system (UCS) • Move, rotate and Scale object using gizmo • Align objects • Visualizing solid with sectional planes • Creating 2D/3D Blocks with generate section • Creating 2D layout views from 3D drawing • Creating detail and sectional view

	• Annotating layout views **SURFACE MODELING** • Making surface using Extrude, Revolve, Sweep and Loft • Planar and Network command • Surface trim, Untrim and Extend command **RENDERING AND PRESENTATION** • Applying materials to 3D solids • Customizing material properties • Placing Cameras and making views • Adding interior Lights and making quick Rendering • Creating and saving renderings as image file

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for 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	**4**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**112**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**7**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	3, 6 and 12	LO #1, #2, #4, #6
	Assignments	5	10% (10)	2, 5, 9, 11 and 14	LO #3, #5, #7,and #8
	Projects / Lab.	14	20% (20)	Continuous	All
	Report				
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to AutoCAD 3D
Week 2,3,4	3d Solid Modeling .
Week 5,6,7	Solid Editing
Week 8,9,10	Visualizing Solids
Week 11,12	Surface Modeling
Week 13,14,15	Rendering and Presentation
Week 16	Preparatory Week Before The Final Exam

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**

Required Texts	k. l. Narayana p. kannaiah k. venketa reddy mechanical engineering.	Yes
Recommended Texts	Up.and.Running.with.AutoCAD .2012.2D.and.3D.Drawing.and.Modeling	yes
Websites	https://learnengineering.in/mechanical-drawing-books/	

Grading Scheme

مخطط الدرجات

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

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

Code	Course/Module Title	ECTS	Semester
AM 202	**Mechanical Drawing**	**7**	**3**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

0	**4**	**63**	**112**

Description

The course on Mechanical Drafting provides comprehensive training on various aspects of drafting and design in mechanical engineering. It covers topics such as the use of AutoCAD 3D system for mechanical drafting. The course includes practical examples and exercises that allow students to gain hands-on experience in drawing each component. By completing this course, students can enhance their knowledge and skills in mechanical engineering drafting, enabling them to create accurate and detailed drawings for various mechanical components and systems.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Strength of Materials**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 203**			☐ **Lecture**	
ECTS Credits	**9**			☒ **Lab**	
SWL (hr/sem)	**225**			☒ **Tutorial**	
				☐ **Practical**	
				☐ **Seminar**	
Module Level	**2**	**Semester of Delivery**	**4**		
Administering Department	**AM**	**College**	**TEMO**		
Module Leader	**Hussein Mohammed Ali**	**e-mail**	**alabadi.hussein@ntu.edu.iq**		
Module Leader's Acad. Title	**Professor**	**Module Leader's Qualification**	**Ph.D.**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**23/9/2023**	**Version Number**	**1.0**		

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**1)** To know different types of the stresses which may subjected to the mechanical elements and their expected effects such as strain. **2)** To study the shear forces and bending moment diagrams with essential stresses
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Students who successfully complete this course will have demonstrated an ability to: **1.** Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials. **2.** Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings. **3.** Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels. **4.** Determine the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading. **5.** Determine and illustrate principal stresses, maximum shearing stress, and the stresses acting on a structural member. **6.** Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural. **7.** Analyze slender, long columns subjected to axial loads. **8.** Design simple bars, beams, and circular shafts for allowable stresses and loads.
Indicative Contents المحتويات الإرشادية	**1.** Introduction to Strength of Materials A. Definition and Importance of Strength of Materials B. Historical Background C. Applications of Strength of Materials **2.** Stress and Strain A. Basic Definitions B. Types of Stresses C. Types of Strains D. Hooke's Law

	3. Axial Loading A. Normal Stress and Strain B. Deformation of Axially Loaded Members C. Stress-Strain Diagrams D. Elastic and Plastic Deformation E. Factor of Safety **4.** Torsion A. Torque and Torsional Shear Stress B. Polar Moment of Inertia C. Torsional Deformation D. Power Transmission in Shafts **5.** Bending

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	**108**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**(108/15) = 7**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**67**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**(67/15) = 4**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**225**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative	**Quizzes**	**5**	**10% (10)**	**3,6,11,13 and 15**	**LO #1, #3, #5, #6and #7**

assessment	**Assignments**	**3**	**10% (10)**	**4,7 and 14**	**LO #2, #4 and #8**
	Projects / Lab.	**10**	**20% (20)**	**Continuous**	**All**
	Report	**1**	**5%(5)**		
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1 - #4**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus) **المنهاج الاسبوعي النظري**	
	Material Covered
Week 1	**Simple stress**
Week 2	**Shearing stress, Bearing stress**
Week 3	**Thin wall cylinders**
Week 4	**Simple strain, stress-strain diagram, Hook's law**
Week 5	**Thermal stress**
Week 6	**Welded connection**
Week 7	**Riveted joints**
Week 8	**Torsion**
Week 9	**Spring**
Week 10	**Shear and moment in Beam**
Week 11	**Beam deflection**
Week 12	**Deflection cantilever Beam**
Week 13	**Deflection of simply supported Beam**
Week 14	**Combined stresses**
Week 15	**Stress at a point /Mohr circle**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:Introduction to Strength of materials
Week 2	Lab 2: Brinell Hardness Test
Week 3	Lab 3: Rockwell Hardness Test
Week 4	Lab 4: Vickers Hardness Test
Week 5	Lab 5: Tensile Test
Week 6	Lab 6: Compression Test
Week 7	Lab 7: Torsion Test
Week 8	Lab 8: Creep Test
Week 9	Lab 9: Spring Stiffness
Week 10	Lab 10: Deflection in Cantilever Beam Test

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Strength of Materials, Ferdinand L. Singer and Andrew Pytel.	Yes
Recommended Texts	Schaum's Outline of Strength of Materials	No
Websites	https://www.coursera.org/learn/mechanics-1	

Grading Scheme

مخطط الدرجات

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

	Good			
	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	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required

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

Code	Course/Module Title	ECTS	Semester
AM 203	Strength of Materials	9	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	82

Description

The field of strength of materials, also known as mechanics of materials, focuses on analyzing the stresses and strains experienced by structural components like beams, columns, and shafts. Engineers use different techniques to determine how these structures will respond to loads and potential failure modes. This analysis takes into consideration material properties, including yield strength, ultimate strength, Young's modulus, and Poisson's ratio. By understanding these properties, engineers can predict the behavior of a structure and design it to withstand the expected forces and stresses. Strength of materials is essential in ensuring the structural integrity and safety of engineering projects.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Engineering Mechanics/ Dynamics**	**Module Delivery**	
Module Type	**Core**	☒ **Theory**	
Module Code	**AM 204**	☐ **Lecture**	
ECTS Credits	**9**	☐ **Lab**	
SWL (hr/sem)	**225**	☒ **Tutorial**	
		☐ **Practical**	
		☐ **Seminar**	
Module Level	**2**	**Semester of Delivery**	**4**
Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Abd alrahman sami**	**e-mail**	**abd.s.akeel@ntu.edu.iq**
Module Leader's Acad. Title	**Assist. lecturer**	**Module Leader's Qualification**	**MASTER**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23 /9/2023**	**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	Module Objectives for Engineering Mechanics/Dynamics: 1. Understand the fundamental concepts and principles of dynamics, including motion, forces, and acceleration. 2. Apply kinematic equations to analyze the motion of particles and rigid bodies in various scenarios. 3. Determine the relationship between forces, mass, and acceleration using Newton's laws of motion.

	4. Apply the principles of work and energy to analyze and solve dynamic problems. 5. Analyze and calculate linear and angular momentum, and apply the principle of impulse and momentum to dynamic systems. 6. Understand and apply the principles of vibrations and oscillations in mechanical systems. 7. Apply principles of balancing rotating masses and vibrations to ensure smooth operation of machinery. 8. Analyze multi-degree of freedom systems and determine their natural frequencies and mode shapes. 9. Apply dynamic principles to real-world engineering problems and systems. 10. Develop critical thinking and problem-solving skills in the context of engineering dynamics. 11. Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of dynamic problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Module Learning Outcomes for Engineering Mechanics/Dynamics: 1. Demonstrate a thorough understanding of the fundamental concepts and principles of dynamics, including motion, forces, and acceleration. 2. Apply kinematic equations to analyze the motion of particles and rigid bodies in different scenarios and determine their velocities and accelerations. 3. Analyze and calculate the forces and moments acting on particles and rigid bodies in dynamic situations, considering the principles of equilibrium. 4. Apply Newton's laws of motion to determine the relationship between forces, mass, and acceleration, and solve dynamic problems using these principles. 5. Utilize the principles of work and energy to analyze and solve dynamic problems, calculating mechanical work, kinetic energy, and potential energy. 6. Apply the principles of impulse and momentum to analyze the motion and collision of particles and rigid bodies, and solve related problems. 7. Understand the principles of vibrations and oscillations in mechanical systems, and analyze their behavior, natural frequencies, and damping effects. 8. Analyze three-dimensional motion of rigid bodies, applying Euler's equations of motion to determine their rotational and translational behavior. 9. Understand gyroscopic motion and its applications in stability and control systems, including precession and gyroscope stabilization. 10. Apply the principles of balancing rotating masses to minimize vibrations and ensure

	smooth operation of rotating machinery. **11.** Analyze multi-degree of freedom systems, determine their natural frequencies and mode shapes, and understand their response to dynamic loading. **12.** Apply the principles and techniques learned in dynamics to solve real-world engineering problems, such as analyzing the motion and forces in mechanical systems. **13.** Demonstrate critical thinking and problem-solving skills by effectively applying dynamic principles to analyze and solve complex engineering problems. **14.** Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of dynamics problems. By achieving these module learning outcomes, students will have a solid foundation in engineering dynamics, enabling them to analyze and solve problems related to motion, forces, vibrations, and stability in mechanical systems. They will develop critical thinking skills, problem-solving abilities, and effective communication skills, which are essential for success in the field of engineering dynamics.
Indicative Contents المحتويات الإرشادية	Indicative Contents for Engineering Mechanics/Dynamics: **1.** Kinematics of Particles • Position, velocity, and acceleration • Rectilinear and curvilinear motion • Projectile motion • Tangential and normal components of acceleration **2.** Kinetics of Particles • Newton's laws of motion • Force, mass, and acceleration • Application of Newton's laws to particles • Frictional forces • Applications of particle kinetics **3.** Kinematics of Rigid Bodies • Rotation and angular displacement • Angular velocity and acceleration • Fixed axis rotation • General plane motion **4.** Kinetics of Rigid Bodies • Moment of inertia • Parallel-axis theorem • Angular momentum and torque • Equations of motion for rigid bodies

	• Applications of rigid body kinetics **5.** Work and Energy • Work done by a force • Kinetic energy and potential energy • Principle of work and energy • Power and efficiency • Conservative and non-conservative forces **6.** Impulse and Momentum • Linear momentum and impulse • Conservation of linear momentum • Impulse-momentum principle • Impact and collision • Applications of momentum Note: The indicative contents provided above give an overview of the topics typically covered in an Engineering Mechanics/Dynamics course. The actual contents may vary depending on the specific curriculum and academic institution.

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	**112**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**7**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**225**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	**5**	**15% (15)**	**2,4,9,11 and 13**	**LO #1, #3 ,#8,#9 and #10,**
	Assignments	**6**	**15% (15)**	**3,5,7,8,10 and 15**	**LO #2, #4, #5, #7, #9 , and #11**
	Projects / Lab.				
	Report	**1**	**10% (10)**	**15**	**LO #6, #12,#13 and #14**
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) Course 1

المنهاج الاسبوعي النظري

	Material Covered
Week 1-2	Introduction to Engineering Mechanics/Dynamics • Overview of Engineering Mechanics/Dynamics • Fundamental concepts and principles • Unit conversions
Week 3-4	• Kinematics of Particles • Position, velocity, and acceleration
Week 5-6	Rectilinear motion
Week 7	Curvilinear motion

Week 8	Tangential and normal components of acceleration
Week 9-11	Projectile motion
Week 12-14	• Kinetics of Particles • Newton's laws of motion • Force, mass, and acceleration
Week 15	Application of Newton's laws to particles

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**ENGINEERING MECHANICS, STATICS AND DYNAMICS** **TWELFTH EDITION R. C. HIBBELER**	**yes**
Recommended Texts	**Theory and Problems of Engineering Mechanics** **Statics and Dynamics/ Fifth Edition, Shaum's Outline**	**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	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required

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

Code	Course/Module Title	ECTS	Semester
AM 201	**Eng. Mechanics/ Dynamics 1**	**7**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	**63**	**112**

Dynamics is a branch of Engineering Mechanics that focuses on the study of objects in motion and the forces that cause that motion. It builds upon the principles of statics and expands them to analyze the behavior of objects subjected to acceleration, velocity, and displacement. This field is concerned with

understanding and predicting the motion of particles and rigid bodies, as well as the forces and energy associated with their motion.

The primary goal of Engineering Mechanics/Dynamics is to provide engineers with a comprehensive understanding of how objects move and interact under the influence of forces and moments. By studying dynamics, engineers can design and analyze systems such as machines, vehicles, and structures to ensure their optimal performance, efficiency, and safety.

In this subject, students explore various topics, including the kinematics and kinetics of particles and rigid bodies. Kinematics deals with the description of motion, focusing on concepts such as displacement, velocity, and acceleration. Kinetics, on the other hand, focuses on the forces and torques acting on objects, leading to their motion.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Applications 1** (MATLAB)			**Module Delivery**	
Module Type	**core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**AM205**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	**2**		**Semester of Deliver**	**4**	
Administering Department	**AM**		**College**	**TEMO**	
Module Leader	**Ayman Sabah Rashad**		**e-mail**	**Aymansabah@ntu.edu.iq**	
Module Leader's Acad. Title	**Lecturer**		**Module Leader's Qualification**	**Ph.D**	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval	**23/9/2023**		**Version Number**	**1.0**	

Date			

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	**7.** Understanding the MATLAB environment **8.** Being able to do simple calculations using MATLAB **9.** Being able to carry out simple numerical computations and analyses using MATLAB
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After attending the module, the students **7.** are familiar with the MATLAB environment and can perform basic operations, such as simple programming, importing data and plotting graphics **8.** are able to create and combine variables (scalars, vectors, matrices) **9.** are familiar with basic numerical methods, such as numerical differentiation and integration integrals, approximate derivatives, and solving linear systems **10.** can use MATLAB solver(s) for solving differential equations **11.** Use the MATLAB GUI effectively **12.** Design simple algorithms to solve problems **13.** Know where to find help
Indicative Contents المحتويات الإرشادية	**7.** We will learn how to start MATLAB and will familiarize ourselves with its user interface. We will learn how to use MATLAB as a sophisticated calculator. We will learn about syntax and semantics. We will see ways in which MATLAB provides help. Finally, we will learn how to create plots in MATLAB. **8.** The basic unit with which we work in MATLAB is the matrix. We solve problems by manipulating matrices, and operators are the primary means by which we manipulate them. We will learn how to define matrices, extract parts of them and combine them to form new matrices. We will learn how to use operators to add, subtract, multiply, and

divide matrices, and we will learn that there are several different types of multiplication and division. Finally, we will learn MATLAB's rules for determining the order in which operators are carried out when more than one of them appear in the same expression.

9. Functions let us break up complex problems into smaller, more manageable parts. We will learn how functions let us create reusable software components that can be applied in many different programs. We will learn how the environment inside a function is separated from the outside via a well-defined interface through which it communicates with that outside world. We will learn how to define a function to allow input to it when it initiates its execution and output from it when it is done.
10. MATLAB has useful built-in functions and we will explore many of them in this section. We will learn about polymorphism and how MATLAB exploits it to change a function's behavior on the basis of the number and type of its inputs. Because random numbers play an important role in computer programming, we will learn how to use the MATLAB random number generator. We will learn how to get input from the keyboard, how to print to the Command Window, and how to plot graphs in a Figure window. Finally, we will learn how to find programming errors with the help of the debugger.
11. Selection is the means by which MATLAB makes decisions about the order in which it executes its statements. We will learn how to use the if-statement, which is the most important method of selection. We will learn how to use relational operators and logical operators. We will learn how to write polymorphic functions and how to make functions resistant to error.
12. Loops give computers their power. We will learn how to use both of MATLAB's loop constructs: the for-loop and the while-loop. We will learn how the break-statement works, and we will use nested loops. We will learn how to make loops more efficient. We will learn about logical indexing and will see how to use it to produce implicit loops that are efficient and easy for a user to understand.
13. Computers operate on bits, but humans think in terms of numbers, words, and other types of data. Like any good language, MATLAB organizes bits into convenient data types. We will study those types in this section. We will learn that there are ten types of numbers and that there are conversion functions to change one type into another. We will learn much more about strings and how the characters in them are encoded as numbers. We will learn how to produce heterogeneous collections of data via structures and cells, and we will learn how to store points in time and time durations.
14. Files are named areas in permanent memory for storing data that can be used as input or output to MATLAB and to other programs. We will be introduced to MATLAB's most important methods for reading and writing files. We will learn how to create, read from, and write into MAT-files, Excel files, text files, and binary files. We will learn how to navigate among folders with MATLAB commands.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for 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**	**5% (10)**	**3,8 and 12**	**LO #1, #2,#4,#5 and #6**
	Assignments	**2**	**5% (10)**	**2,5,10 and 14**	**LO #1, #3,#5 and #7**
	Projects / Lab.	**10**	**1.5% (15)**	**Continuous**	**All**
	Report	**1**	**5% (5)**		
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1 - #3**
	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 MATLAB
Week 2	The MATLAB environment
Week 3 &4	Matrices and operators
Week 5&6	Functions
Week 7& 8& 9	Programmer's toolbox
Week 10&11	If statement
Week 12	Loops
Week 13	Data type
Week 14	File input/output
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	MATLAB documentation https://www.mathworks.com/help/MATLAB/	No
Recommended Texts	Introduction to MATLAB for Engineering Students	No
Websites	https://www.mathworks.com/products/MATLAB.html	

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

	Good			
	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	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required

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

Code	Course/Module Title	ECTS	Semester
AM 205	COMPUTER PRINCIPLES	7	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

1	**3**	**63**	**112**

Description

This course teaches computer programming to those with little to no previous experience. It uses the programming system and language called MATLAB to do so because it is easy to learn, versatile and very useful for engineers and other professionals. MATLAB is a special-purpose language that is an excellent choice for writing moderate-size programs that solve problems involving the manipulation of numbers. The design of the language makes it possible to write a powerful program in a few lines. The problems may be relatively complex, while the MATLAB programs that solve them are relatively simple: relative, that is, to the equivalent program written in a general-purpose language, such as C++ or Java. As a result, MATLAB is being used in a wide variety of domains from the natural sciences, through all disciplines of engineering, to finance, and beyond, and it is heavily used in industry. Hence, a solid background in MATLAB is an indispensable skill in today's job market. Nevertheless, this course is not a MATLAB tutorial. It is an introductory programming course that uses MATLAB to illustrate general concepts in computer science and programming. Students who successfully complete this course will become familiar with general concepts in computer science, gain an understanding of the general concepts of programming, and obtain a solid foundation in the use of MATLAB.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information					
Module Title	**Professional ethics**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory**	
Module Code	**NTU 204**			☐ **Lecture**	
ECTS Credits	**2**			☐ **Laboratory**	
SWL (hr/sem)	**50**			☐ **Tutorial**	
				☐ **Practical**	
				☐ **Seminar**	
Module Level	**2**	**Semester of Deliver**	**4**		
Administering Department	**AM**	**College**	**TEMO**		
Module Leader	**Haitham M. Wadullah**	**e-mail**	**Dr.haitham@ntu.edu.iq**		
Module Leader's Acad. Title	**Prof. Dr.**	**Module Leader's Qualification**	**PhD**		
Module Tutor		**e-mail**			

Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23/9/2023**	**Version Number**	**1.0**

Relation with other Modules			
Prerequisite module	**None**	**Semester**	
Co-requisites module	**None**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	**5.** Understand the importance of occupational safety: The module aims to provide students with a comprehensive understanding of the significance of occupational safety in the workplace. Students will learn about the potential hazards and risks associated with different industries and the impact they can have on the well-being of employees. **6.** Identify common workplace hazards: Students will learn how to identify and assess various workplace hazards, including physical, chemical, biological, and ergonomic hazards. They will gain knowledge about different types of safety hazards that exist in different work environments and how to recognize them to prevent accidents and injuries. **7.** Implement safety protocols and practices: The module will equip students with the knowledge and skills to implement effective safety protocols and practices in the workplace. They will learn about safety regulations, standards, and best practices, and understand the importance of following safety guidelines to create a safe working environment. **8.** Develop risk assessment and management skills: Students will be trained in conducting risk assessments and developing risk management strategies. They will learn how to identify potential risks, evaluate their severity and likelihood, and develop appropriate control measures to mitigate or eliminate those risks.
Module Learning Outcomes	**4.** Identify and assess workplace hazards: Engineering students will be able to identify and assess potential workplace hazards specific to their field of engineering. They will understand the importance of hazard identification and risk assessment in order to prevent accidents, injuries, and occupational illnesses. **5.** Apply engineering principles to develop safety solutions: Students will be able to apply their engineering knowledge and skills to develop innovative and effective safety solutions. They will understand how engineering principles can be utilized to design and implement engineering controls, safety devices, and protective measures to minimize or eliminate workplace hazards. **6.** Implement safety standards and regulations: Engineering students will be

	knowledgeable about relevant safety standards and regulations applicable to their specific engineering discipline. They will understand the importance of compliance with safety standards and be able to apply them in the design, construction, operation, and maintenance of engineering systems and processes. They will also be aware of the legal and ethical responsibilities associated with ensuring occupational safety in their professional practice.
Indicative Contents	Indicative content includes the following. **Part A - Theory** Introduction to Occupational Safety, Identifying and Assessing Risks, Engineering Controls and Safety Systems, Personal Protective Equipment and Safety, Equipment Occupational Health and Industrial Health [10 hrs] Fire Safety and Emergency Preparedness, Electrical Safety in Engineering Machine and Equipment, Safety Construction, Safety in Engineering Projects, Hazardous Materials Management [10 hrs] Revision problem classes [2 hrs] **Part B – Practice** Training and Communication in Engineering Safety Incident Investigation and Reporting in Engineering Safety Management Systems in Engineering Application in Occupational Safety 1 Application in Occupational Safety 2. [10 hrs]

Learning and Teaching Strategies	
Strategies	5. Familiarize yourself with the subject: Start by understanding the key concepts, principles, and regulations related to Occupational Safety in the engineering field. This will provide a foundation for further exploration and learning. 6. Actively engage in practical applications: Apply the theoretical knowledge to real-world scenarios by analyzing case studies, conducting risk assessments, and identifying safety measures in engineering projects. This hands-on approach will help reinforce understanding and develop problem-solving skills. 7. Collaborate and discuss: Engage in discussions and group activities with fellow engineering students. Share experiences, exchange ideas, and learn from each other's perspectives. This collaborative learning environment can broaden your understanding and provide different insights into safety practices. 8. Stay updated with industry standards: Keep yourself informed about the latest safety regulations, codes, and standards relevant to the engineering field. Regularly refer to authoritative sources such as government agencies, professional organizations, and reputable publications to stay up-to-date with best practices.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**32**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**(32/15) = 2**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**18**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**(18/15) = 1**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**1**	**10% (10)**	**5 and 10**	**LO #2**
	Assignments	**1**	**10% (10)**	**2 and 12**	**LO #3**
	Projects / Lab.				
	Report	**2**	**20% (20)**	**8 and 13**	**LO #1 and LO #2**
Summative assessment	**Midterm Exam**	**1hr.**	**10% (10)**	**7**	**LO #1 - #2**
	Final Exam	**2hr.**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	مقدمة في السلامة المهنية
Week 2	تحديد المخاطر وتقييم المخاطر
Week 3	وسائل السيطرة الهندسية وأنظمة السلامة
Week 4	معدات الحماية الشخصية ومعدات السلامة
Week 5	الصحة المهنية والصحة الصناعية

Week 6	سلامة الحرائق والاستعداد للطوارئ
Week 7	سلامة الكهرباء في الهندسة
Week 8	سلامة الآلات والمعدات
Week 9	سلامة البناء في مشاريع الهندسة
Week 10	إدارة المواد الخطرة
Week 11	التدريب والتواصل في سلامة الهندسة
Week 12	تحقيق الحوادث وتقاريرها في الهندسة
Week 13	أنظمة إدارة السلامة في الهندسة
Week 14	تطبيق في السلامة المهنية ١
Week 15	تطبيق في السلامة المهنية٢
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	**No**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	٨. "السلامة والصحة المهنية" بواسطة علي عبد العزيز المرزوقي. ٩. "السلامة والصحة المهنية في البناء والتشييد" بواسطة فوزي عطا الله. ١٠. "السلامة والصحة المهنية والبيئية" بواسطة مجدي الغول. ١١. "السلامة المهنية وإدارة المخاطر" بواسطة سلطان القحطاني. ١٢. "السلامة المهنية والوقاية من المخاطر" بواسطة نزار السعودي. ١٣. "السلامة المهنية والحريق" بواسطة حسن السناني. ١٤. "السلامة والصحة المهنية في المعامل" بواسطة عمرو حسين.	**Yes**
Recommended Texts	5. "Occupational Safety and Health for Technologists, Engineers, and Managers" بواسطة David L. Goetsch و Eugene R. Pierce. 6. "Introduction to Occupational Health in Public Health Practice" بواسطة Bernard D. Goldstein و Mary Sue Henifin. 7. "Safety and Health for Engineers" بواسطة Roger L. Brauer.	**No**

	8. "Occupational Safety and Health for Technologists, Engineers, and Managers" بواسطة David L. Goetsch و Eugene R. Pierce.	
Websites	7. No Occupational Safety and Health Administration (OSHA): The official website of OSHA, a government agency responsible for enforcing workplace safety regulations in the United States. It offers a wealth of resources, guidelines, and educational materials on various safety topics. 8. National Institute for Occupational Safety and Health (NIOSH): NIOSH is a U.S. federal agency focused on conducting research and providing guidance on occupational safety and health. Their website offers publications, databases, training materials, and tools related to workplace safety. 9. Health and Safety Executive (HSE): HSE is the national independent regulator for workplace health and safety in the United Kingdom. Their website provides guidance, publications, and tools to help businesses and individuals understand and comply with health and safety regulations. 10. Centers for Disease Control and Prevention (CDC): While primarily focused on public health, the CDC also offers resources and information on occupational safety and health. Their website provides research, guidelines, and educational materials on various workplace safety topics. 11. Canadian Centre for Occupational Health and Safety (CCOHS): CCOHS is a Canadian organization dedicated to promoting occupational health and safety. Their website offers a wide range of resources, including fact sheets, guidelines, courses, and databases related to workplace safety. 12. European Agency for Safety and Health at Work (EU-OSHA): EU-OSHA is an agency of the European Union focused on promoting safety and health in the workplace. Their website provides information, publications, and tools to help improve workplace safety across Europe	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A - Excellent**	امتياز	**90 - 100**	**Outstanding Performance**
	B - Very Good	جيد جدا	**80 - 89**	**Above average with some errors**
	C - Good	جيد	**70 - 79**	**Sound work with notable errors**
	D - Satisfactory	متوسط	**60 - 69**	**Fair but with major shortcomings**

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

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

Code	Course/Module Title	ECTS	Semester
NTU 204	**Professional Ethics**	**2**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**0**	**32**	**18**

Description

السلامة المهنية هي مجال دراسة يركز على تحقيق بيئة عمل آمنة وصحية للعاملين في جميع الصناعات والقطاعات. يهدف العلماء والباحثون في هذا المجال إلى تحليل وتقييم المخاطر المحتملة في مكان العمل وتطوير وتنفيذ استراتيجيات وأنظمة للوقاية والتحكم في هذه المخاطر. تشمل مجالات الدراسة في السلامة المهنية تحديد المخاطر، وتقييم المخاطر، وتصميم وتنفيذ إجراءات السلامة والوقاية، والتدريب والتثقيف، وإدارة الحوادث والطوارئ، والتشريعات والمعايير الخاصة بالسلامة. يهدف العلماء والمهنيين في هذا المجال إلى تعزيز ثقافة السلامة ورفع الوعي بأهمية السلامة المهنية بين العاملين وصناعة الأعمال بشكل عام. تعد السلامة المهنية جزءًا أساسيًا من الإدارة الفعالة للمخاطر وتساهم في تحسين الأداء العام والجودة ورفاهية العاملين في بيئة العمل.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

المادة بموجب كتاب الوارة ذي العدد (ت م ٣ / ٧٥٨٨ في ٢٠٢٣/١٠/١٩)

Module Title	Crimes of the Former Ba'ath Party	Module Delivery

Module Type	منهاج دراسي ٧٥٨٨ نظام البعث في العراق منهاج دراسي ٧٥٨٨ نظام البعث في العراق ٢ S	☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**
Module Code	**NTU 200**	
ECTS Credits	2	
SWL (hr/sem)	**50**	

Module Level	**2**	**Semester of Deliver**	**3**
Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Shaima'a Salim Hameed**	**e-mail**	**Shamaaalobaidy@ntu.edu.iq**
Module Leader's Acad. Title	lecturer	**Module Leader's Qualification**	**M.Tech.**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23/9/2024**	**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	٧. تمكين الطلاب من فهم أعمق لتاريخ المنطقة وتأثير الاحزاب السياسية في تشكيل مصير الشعوب ٨. تنمية قدرات التحليل لدى الطلاب في مجال حقوق الانسان والقانون الدولي ٩. تشجيع التفكير في الحلول الممكنة لتحقيق العدالة والمصالحة في المجتمعات المتضررة
Module Learning Outcomes	١٢. فهم السياق التاريخي والسياسي لحزب البعث ١٣. تحليل الجرائم والانتهاكات التي قام بها حزب البعث

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.

مخرجات التعلم للمادة الدراسية	١٤.فهم الاطار القانوني الدولي ضد مرتكبي الجرائم في حزب البعث
Indicative Contents المحتويات الإرشادية	١. ادلة القراءة من كتب سياسية ٢. موارد الوسائط المتعددة من صور وخرائط ٣. ادلة التحليل القانوني من جرائم دولية وتقديم محاكمات للنظام السابق

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**32**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**2**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**18**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**1**
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**	5% (10)	**4,10**	**LO #1, #2 ,**
	Assignments	1	**10% (10)**	**4 and 12**	**LO #3**
	Seminar	**1**	**10% (١٠)**	**12**	**LO #4**

	Report	**1**	**10% (١0)**	**14**	**LO #4**
Summative assessment	**Midterm Exam**	**1hr.**	**10% (10)**	**7**	**LO #1 - #2**
	Final Exam	**2hr.**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	مقدمة في جرائم النظام وفق قانون المحكمة الجنائية العراقية العليا سنة ٢٠٠٥ مفهوم الجرائم تعريف الجرائم لغة واصطلاحا اقسام الجرائم
Week 2	جرائم نظام البعث وفق توثيق قانون المحكمة الجنائية العراقية العليا سنة ٢٠٠٥ انواع الجرائم الدولية القرارات الصادرة من المحكمة الجنائية العليا
Week 3	الجرائم النفسية والاجتماعية واثارها وابرز انتهاكات النظام البعثي في العراق الجرائم النفسية اليات الجرائم النفسية اثار الجرائم النفسية
Week 4	الجرائم الاجتماعية
Week 5	عسكرة المجتمع
Week 6	موقف النظام البعثي من الدين
Week 7	انتهاكات القوانين العراقية صور من انتهاكات حقوق الانسان وجرائم السلطة
Week 8	بعض قرارات الانتهاكات السياسية والعسكرية لنظام البعث اماكن السجون والاحتجاز لنظام البعث
Week 9	الجرائم البيئية لنظام البعث في العراق
Week 10	التلوث الحربي والاشعاعي وانفجار الالغام
Week 11	تدمير المدن والقرى (سياسة الارض المحروقة)
Week 12	تجفيف الاهوار

	تجريف بساتين النخيل والاشجار والمزروعات
Week 13	جرائم المقابر الجماعية
Week 14	احداث مقابر الابادة الجماعية المرتكبة من قبل النظام البعثي في العراق
Week 15	التصنيف الزمني لمقابر الابادة الجماعية في العراق للمدة ١٩٦٣_٢٠٠٣م
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	القران الكريم	**yes**
Recommended Texts	ارشيف مؤسسة السجناء السياسيين وارشيف مؤسسة الشهداء	No
Recommended Texts	ارشيف المركز العراقي لتوثيق جرائم التطرف في العتبة العباسية المقدسة	No
Websites	الموقع الرسمي للأمم المتحدة	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**

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

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

Code	Course/Module Title	ECTS	Semester
NTU 203	**Crimes of the Former Ba'ath Party**	**2**	**2**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**(SSWL (hr/sem**	**(USWL (hr/sem**
2	**0**	**32**	**18**
Description			

مادة حزب البعث عادة ما تركز على دراسة تاريخ الحزب وأثره السياسي والاجتماعي في العراق. في الجامعات العراقية، تُدرَّس هذه المادة من منظور نقدي بعد سقوط النظام في ٢٠٠٣ لفهم ماضي العراق وتأثيرات حكم حزب البعث على المجتمع. وكذلك فهم اهم الحقائق التي كانت طي الكتمان أبان النظام السابق من جرائم وتهجير وأباده جماعية ومقابر جماعية وتجريف للأراضي ونظام الاراضي المحروقة

يوفر وصف المقرر هذا إيجازاً مقتضياً لأهم خصائص المقرر ومخرجات التعلم المتوقعة من الطالب تحقيقها مبرهناً عما إذا كان قد حقق الاستفادة القصوى من فرص التعلم المتاحة. ولابد من الربط بينها وبين وصف البرنامج

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics**		**Module Delivery**		
Module Type	**Basic**		☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**		
Module Code	**TEMO 200**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	**2**		**Semester of Delivery**	**3**	
Administering Department	**AM**		**College**	**TEMO**	
Module Leader	**Raid Abdulhadi Abdulqader**		**e-mail**	**raid.alabdullah@ntu.edu.iq**	
Module Leader's Acad. Title	**Assistant Lecher**		**Module Leader's Qualification**	**M. Sc.**	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	**18\9\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	Mathematics provides a powerful and universal language. Students are expected to use appropriate mathematical language and different forms of representation when communicating mathematical ideas, reasoning and findings, both orally and in writing. In order to reach the aims of mathematics, students should be able to:

	1. use appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations. **2.** use appropriate forms of mathematical representation to present information. **3.** move between different forms of mathematical representation. **4.** communicate complete, coherent and concise mathematical lines of reasoning. **5.** organizes information using a logical structure.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** Students are able to appreciate the importance of understanding the structure of algebra to a higher-level concept. **2.** Students can create awareness, especially symbolic thinking within the framework of the theory of modules. **3.** Students have the capability to use its understanding and analyzing models of mathematics, science and technology and other disciplines related fields. **4.** Students are able to develop an understanding framework that supports science and technology, and mathematics as well as communicate the results of the development of oral and written comprehension.
Indicative Contents المحتويات الإرشادية	• Demonstrate an understanding of basic concepts in each of the module core topics (complex numbers, matrices, limits, differential equations, integration, hyperbolic functions, vectors, series, proof) • Demonstrate an understanding of basic skills and techniques in dealing with concrete examples in each of the core topics • Apply these skills and techniques to solve a wide range of familiar and unfamiliar problems in the core topics • Demonstrate an understanding of how to communicate mathematical ideas clearly and coherently

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching and learning strategies can include a range of whole class, group and individual activities to accommodate different abilities, skills, learning rates and styles that allow every student to participate and to achieve some degree of success.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	**63**	**Structured SWL (h/w)**	**4**

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**112**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**7**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	**4**	**5% (20)**	**5,8,10 and 14**	**LO #1,#2,#3 and #4**
	Assignments	**5**	**2% (10)**	**2,4,8 and 12**	**LO #1,#2,#3and#4**
	Seminar	**1**	**5%(5)**	**Continuous**	**All**
	Report	**1**	**5%(5)**	**15**	**3**
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1 - #2**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Review in differential and integration
Week 2	Vectors: general introduction to vectors in space – equation of straight line and an equation for a plane in space – plane, tangent and perpendicular line – vector function
Week 3	Complex numbers – polar form – Euler equation – exponential and roots of complex numbers –

	composite functions – Cauchy-Riemann equation
Week 4	Tow and more variable equations – partial derivative
Week 5	Chain rule for partial derivative – gradient and directional derivative – maximum and minimum values for tow variable functions
Week 6	Double integral, areas and volumes – physical applications
Week7	Triple integral
Week 8	Polar coordinates – cylindrical and spherical coordinates – curve drawing in polar coordinates
Week 9	Green's theorem - divergence theorem
Week 10	The linear integration
Week 11	The Series: sequences of numbers – limits – infinite series – limit by definition - alternating series test - power series - converges interval
Week 12	Taylor/Maclaurin series for a function – general applications
Week 13	Matrices: introduction and Basic Operations
Week 14	Inverse of a Matrix (system of linear equations) – solution of equations by matrices
Week 15	Solution of Differential Equations
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**No**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**" Calculus " , Ford , S.R. and Ford , J.R. , (1963) McGraw-Hill**	**Yes**
Recommended Texts	**“Advanced Engineering Mathematics”, Erwin Kreyszig et al., (2006)**	**No**
Websites	**https://library.oapen.org/bitstream/handle/20.500.12657/31235/633792.pdf?sequence=1&isAllowed=y**	

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

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

Code	Course/Module Title	ECTS	Semester
TEMO 200	Mathematics	7	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	0	63	112
Description			

The proficiencies of Understanding, Fluency, Problem Solving and Reasoning are fundamental to learning mathematics and working mathematically and are applied across all three strands Number and Algebra, Measurement and Geometry, and Statistics and Probability.

Understanding refers to students building a robust knowledge of adaptable and transferable mathematical concepts and structures. Students make connections between related concepts and progressively apply the familiar to develop new ideas. They develop an understanding of the relationship between the 'why' and the 'how' of mathematics. Students build understanding when they:

- connect related ideas
- represent concepts in different ways
- identify commonalities and differences between aspects of content
- describe their thinking mathematically
- interpret mathematical information

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information			
Module Title	**Electrical and Electronic Engineering**	**Module Delivery**	
Module Type	**Basic**	☒ **Theory**	
Module Code	**TEMO 201**	☐ **Lecture**	
ECTS Credits	**7**	☒ **Tutorial**	
SWL (hr/sem)	**175**	☒ **Lab**	
		☐ **Seminar**	
Module Level	**2**	**Semester of Deliver**	**4**
Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Safwan Assaf Hamoodi** The file (module description form of electrical and electronic engineering) prepared by Prof. Dr. Haitham M. Wadullah	**e-mail**	**Safwan79azb@ntu.edu.iq**
Module Leader's Acad. Title	**Assist. Prof.**	**Module Leader's Qualification**	**M.Sc.**
Module Tutor	**Haitham M. Wadullah**	**e-mail**	**Dr.haitham@ntu.edu.iq**

Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23/9/2023**	**Version Number**	**1.0**

Relation with other Modules			
Prerequisite module	**None**	**Semester**	
Co-requisites module	**None**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	**1.** Building a foundation for studying electrical calculations in both AC and DC circuits, and familiarizing students with the various theories used in these calculations. **2.** Gaining a comprehensive understanding of electrical principles and concepts, such as voltage, current, resistance, and power. This knowledge will be applied to the analysis of electrical circuits and systems. **3.** Developing practical skills in electrical measurements and testing by using various instruments and equipment. Students will learn how to accurately measure electrical parameters, interpret the results, and troubleshoot electrical systems. **4.** Applying the acquired knowledge to the operation and maintenance of electrical machines, including motors and generators. Students will also explore the fundamentals of power systems, including power generation, transmission, and distribution.
Module Learning Outcomes	**1.** Mastery of electrical circuit theory: Students will acquire a comprehensive understanding of the fundamental principles of electrical circuit theory, encompassing key concepts such as voltage, current, resistance, and power. They will be proficient in applying this knowledge to analyze and solve basic electrical circuits. **2.** Proficiency in electrical measurements and testing: Students will develop expertise in utilizing electrical instruments and equipment for precise measurements and thorough testing of electrical parameters. They will learn to interpret measurement outcomes accurately and effectively troubleshoot electrical systems to identify and rectify faults. **3.** Application of electrical machines and power systems: Students will explore the principles and workings of electrical machines, including motors and generators, gaining insight into their applications and performance characteristics. Additionally, they will develop a foundational understanding of power systems, encompassing power generation, transmission, and distribution aspects, enabling them to comprehend the broader context of electrical engineering.

Indicative Contents	**Part A:** Fundamentals of Electrical Principles, Measurements, and Instruments [20 hours] Introduction to Electrical Machines, Power Systems, Safety, and Direct Current Circuits [20 hours] Revision Session and Quiz [1.5 hours] **Part B:** Alternating Current Circuits, Circuit Theory, and Analogue Electronics [20 hours] Control Systems, Renewable Energy, Troubleshooting, and Maintenance [10 hours] Revision Session and Quiz [1.5 hours] Revised Description: Part A of the course focuses on building a strong foundation in electrical engineering. Students will start by understanding the basic principles of electricity, along with electrical measurements and the use of instruments. They will then explore electrical machines, power systems, and safety considerations in the context of direct current circuits. A revision session and quiz will help reinforce the learned concepts.
Learning and Teaching Strategies	
Strategies	1. Active Participation: Actively participate in class discussions to engage with the subject matter and deepen your understanding. 2. Problem-Solving Skills: Develop and enhance your problem-solving skills, as they are essential in Electrical and Electronic Engineering. 3. Practical Application: Gain hands-on experience through laboratory sessions and projects, allowing you to apply theoretical concepts to real-world scenarios. 4. Collaborative Learning: Foster collaborative learning by actively engaging in group discussions and study sessions with your peers. 5. Utilize Learning Resources: Make effective use of various resources such as textbooks, online tutorials, video lectures, and educational websites to supplement your learning and broaden your knowledge. 6. Time Management: Manage your time effectively by creating a study schedule and dedicating specific time slots for studying Electrical and Electronic Engineering. 7. Regular Review and Recap: Continuously review previously covered topics to reinforce your understanding and ensure long-term retention of the learned material.

Student Workload (SWL)

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)	**97**	**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	175		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1and #2
	Assignments	2	5% (5)	2 and 12	LO #2 and #3
	Projects / Lab.	9	15% (15)	Continuous	LO #1 and #3
	Report	1	10% (10)	13	LO #3
Summative assessment	Midterm Exam	2hr.	10% (10)	7	LO #1 - #2
	Final Exam	2hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
Week	Material Covered
Week 1	D.C motors, construction, commutator, types of D.C motors
Week 2	Back e.m.f, speed equation, speed control
Week 3	Load Toque Requirement, types Load Torque
Week 4	Starting of D.C motor, starter connection, torque of D.C motors
Week 5	Speed-torque characteristics of each type of D.C motor
Week 6	Examples to evaluate the starting current of D.C motor with and without starter, speed control
Week 7	Single phase induction motor, split-phase, capacitor-start, shaded-pole type
Week 8	3-phase induction motor, construction, synch. Speed, slip.
Week 9	Control of three-phase induction motor using voltage frequency control.

Week 10	Starting of 3-phase induction motor, star-delta method, step down transformer
Week 11	Torque characteristic, max torque
Week 12	3-phase system, star and delta connection, line current, line voltage, phase current and voltage
Week 13	Instruments and measurements, ammeters, voltmeter, ohmmeter, kw - h meters.
Week 14	Contactors, relays, timers
Week 15	Thermal overload, starter (contactor +timer)
Week 16	Final Examination

Delivery Plan (Weekly Lab. Syllabus)	
Week	**Material Covered**
Week 1	Lab 1: Basic wiring diagram for electrical measurements
Week 2	Lab 2: Measurement of inductive reactance of comp. windings
Week 3	Lab 3: Test of current, voltage and solid-state relay
Week 4	Lab 4: Test and calibrate pressure switch and thermostat
Week 5	Lab 5: Test of overload and defrost.
Week 6	Lab 6: Start-up compressor with solid state relay.
Week 7	Lab 7: Start-up compressor with current relay
Week 8	Lab 8: Rotor Voltage Control of Induction Motor
Week 9	Lab 9: Frequency Control of Induction Motor
Week 10	Lab 10: slip power control by dc converter of Induction Motor
Week 11	Lab 11: Single phase Dismantling of induction motor
Week 12	Lab 12: Make fault on voltage and current relay, effect of faults
Week 13	Lab 13: damage, notice the effects
Week 14	Lab 14: Dismantling of induction motor

Learning and Teaching Resources		
	Text	**Available in the Library?**

Required Texts	1. "Electric Machinery and Power System Fundamentals" by Stephen J. Chapman 2. "Electricity and Electronics for HVAC" by Rex Miller and Mark R. Miller 3. "Principles of Electric Machines and Power Electronics" by P.C. Sen 4. "Electrical Power Systems: Design and Analysis" by Mohamed E. El-Hawary	
Recommended Texts	1. "Electrical Wiring Residential" by Ray C. Mullin and Phil Simmons 2. "Industrial Electrical Troubleshooting" by Lynn Lundquist 3. "Electrical Safety Handbook" by John Cadick, Mary Capelli - Schellpfeffer, and Dennis Neitzel 4. "Digital Control Systems" by Benjamin C. Kuo 5. "Electromechanical Energy Conversion" by David J. Braun	
Websites	• (www.allaboutcircuits.com) • (www.electrical4u.com) • (www.khanacademy.org)	

Grading Scheme

مخطط الدرجات

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

				required

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

Code	Course/Module Title	ECTS	Semester
TEMO 201	**Electrical and Electronic Engineering**	**7**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**3**	**78**	**97**

Description

Electrical and Electronic Engineering is a dynamic and rapidly evolving field that focuses on the study, design, and application of electrical systems, devices, and technologies. This discipline plays a critical role in shaping the modern world, as it encompasses a wide range of areas, including power generation and distribution, communication systems, electronics, control systems, and renewable energy. In Electrical and Electronic Engineering, students delve into the fundamental principles of electricity, circuits, and electromagnetism. They learn how to analyze and design electrical systems, apply mathematical and scientific principles to solve complex problems, and utilize advanced tools and software for simulation and modeling. The field emphasizes hands-on experience through laboratory work, where students gain practical skills in building, testing, and troubleshooting electrical circuits and devices. They also explore emerging technologies, such as renewable energy sources and sustainable power systems, to address the growing demand for cleaner and more efficient energy solutions. Through their studies, students develop a strong foundation in engineering principles, critical thinking, problem-solving, and project management. They become adept at designing, implementing, and maintaining electrical and electronic systems that are safe, reliable, and sustainable. Graduates of Electrical and Electronic Engineering programs find diverse career opportunities in industries such as power generation, telecommunications, electronics, automation, and research and development.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية				
Module Title	**Numerical & Engineering Analysis**		**Module Delivery**	
Module Type	**core**		☒ **Theory**	
Module Code	**AM 300**		☐ **Lecture**	
ECTS Credits	**6**		☐ **Lab**	
SWL (hr/sem)	**150**		☐ **Tutorial**	
			☐ **Practical**	
			☒ **Seminar**	
Module Level	**3**	**Semester of Deliver**	**5**	
Administering Department	**AM**	**College**	**TEMO**	
Module Leader	**Dr. Haitham M. Wadullah**	**e-mail**	**Dr.haitham@ntu.edu.iq**	
Module Leader's Acad. Title	**Prof.**	**Module Leader's Qualification**	**Ph.D.**	
Module Tutor		**e-mail**		
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	**23/9/2023**	**Version Number**	**1.0**	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**NO**	**Semester**	
Co-requisites module	**NO**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**1.** Develop a solid foundation in mathematical concepts and techniques used in engineering analysis. **2.** Understand the principles and applications of numerical methods for solving engineering problems. **3.** Gain proficiency in using software tools and programming languages for numerical analysis. **4.** Acquire the skills to analyze and interpret numerical results to make

	informed engineering decisions. 5. Apply mathematical modeling techniques to solve real-world engineering problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The intended subject specific learning outcomes. On successfully completing the module students will be able to: 1. Acquire a comprehensive understanding of the fundamental principles and concepts underlying a broad range of basic methods used in engineering analysis. 2. Demonstrate proficiency in applying a variety of established techniques and effectively utilizing computational tools to solve engineering problems. 3. Apply the acquired knowledge and skills in basic numerical approximation to address complex problems in diverse contexts, demonstrating the ability to critically assess and select appropriate tools and techniques. 4. Effectively employ MATLAB commands and functions to implement and execute engineering analysis tasks, demonstrating competence in utilizing computational tools for problem-solving.
Indicative Contents المحتويات الإرشادية	**Part A** Introduction, Mathematical Analysis, Function Analysis and Complex Function Analysis **[20 hr.]** Mathematical Modeling, Logistic Regression Analysis, Probability and Statistics Analysis and Advanced Probability and Statistics Analysis **[20 hr.]** Revision problem classes and quiz [3 hrs] **Part B** Linear and Nonlinear Regression Analysis, Optimization Analysis and Optimal Control and Nonlinear Optimization Analysis **[20 hr.]**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Establish a solid foundation: Start by thoroughly understanding the fundamental concepts and principles of engineering analysis. This includes grasping the mathematical techniques and numerical methods commonly used in the field. 2. Practice problem-solving: Engineering analysis involves solving complex problems. Regularly practice solving a variety of problems to enhance your problem-solving skills and develop a deeper understanding of the subject matter. 3. Utilize resources: Take advantage of textbooks, online resources, and reference materials specific to engineering analysis. These resources can provide additional explanations, examples, and practice problems to reinforce your understanding.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**63**	**Structured SWL (hr/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**4**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**87**	**Unstructured SWL (hr/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**5**
Total SWL (h/sem)	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	٤	٢٠% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	٤	٢٠% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	٠	٠% (10)	Continuous	All
	Report	٠	٠% (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 Engineering Analysis	Introduction to Engineering Analysis; Fundamental concepts in engineering analysis Tools and techniques of engineering analysis
	Mathematical Analysis; Differential equations and their applications in engineering, Differentiation and integration
Week 2	Function Analysis; Algebraic and transcendental functions, Trigonometric and exponential functions
	Complex Function Analysis; Complex numbers and operations, Analysis of complex functions
Week 3	Mathematical Modeling; Mathematical models of growth, Mathematical models of regression
	Logistic Regression Analysis; Logistic regression analysis, Applications in engineering
Week 4	Probability and Statistics Analysis; Probability and statistics concepts, Data analysis and probability distributions
	Advanced Probability and Statistics Analysis; Joint and conditional probability analysis, Advanced statistics analysis and non-normal distributions
Week 5	Linear Regression Analysis; Simple linear regression analysis, Multiple linear regression analysis
	Nonlinear Regression Analysis; Nonlinear regression analysis, Applications in engineering
Week 6	Optimization Analysis and Optimal Control; Optimization analysis and optimal control problems, Applications in engineering
	Nonlinear Optimization Analysis; Nonlinear optimization analysis, Applications in engineering

Week 7 Numerical Analysis	Introduction to Numerical Analysis; numerical analysis and its applications in engineering, Sources of error in numerical computations
	Numerical Methods for Solving Equations; Bisection method, Newton-Raphson method, Secant method
Week 8	Interpolation and Approximation; Polynomial interpolation, Lagrange interpolation, least squares approximation
	Numerical Differentiation and Integration; Forward, backward, and central difference approximations, Trapezoidal rule, Simpson's rule
Week 9	Numerical Solutions of Ordinary Differential Equations; Euler's method, Runge-Kutta methods, Multistep methods
	Systems of Linear Equations; Direct methods: Gaussian elimination, LU decomposition, Iterative methods: Jacobi method, Gauss-Seidel method=
Week 10	Eigenvalues and Eigenvectors; Power method, QR method
	Numerical Solutions of Partial Differential Equations; Finite difference methods, Finite element methods
Week 11	Interpolation and Approximation; Polynomial interpolation, Lagrange interpolation, least squares approximation
	Numerical Differentiation and Integration; Forward, backward, and central difference approximations, Trapezoidal rule, Simpson's rule
Week 12	Numerical Optimization; Unconstrained optimization: Golden section search, Newton's method, Constrained optimization: Linear programming, quadratic programming
	Numerical Methods for Data Analysis; Curve fitting, Statistical regression
Week 13	Numerical Methods in Probability and Statistics; Monte Carlo simulation, Numerical integration of probability density functions
	Numerical Methods for Signal Processing; Discrete Fourier transform, Fast Fourier transform
Week 14	Numerical Methods for Image Processing; Image enhancement techniques, Image restoration methods
	Numerical Methods for Control Systems; Numerical simulation of control, systems, Model predictive control
Week 15	Review and Project Presentations
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	1. "Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale 2. "Numerical Analysis" by Timothy Sauer 3. "Numerical Methods in Engineering with MATLAB" by Jaan Kiusalaas	**No**
Recommended Texts	1. "Applied Numerical Methods with MATLAB for Engineers and Scientists" by Steven C. Chapra 2. "Numerical Methods: Design, Analysis, and Computer Implementation of Algorithms" by Anne Greenbaum and Timothy P. Chartier	**No**
Websites	• (https://www.mathworks.com/) • (http://www.numericalmethods.eng.usf.edu/) • (https://www.engineering.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.

Code	Course/Module Title	ECTS	Semester
AM 300	Numerical & Engineering Analysis	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/ sem)**
4	0	63	87

Description

Numerical & Engineering Analysis is a field of study that focuses on the application of mathematical and computational methods to solve complex engineering problems. It involves the use of various mathematical techniques, numerical methods, and computer simulations to analyze and interpret data, make informed decisions, and optimize engineering designs and processes.

In Engineering Analysis, students learn fundamental principles and concepts of mathematics, including calculus, linear algebra, and differential equations. They develop skills in using numerical methods, such as interpolation, numerical integration, and numerical solution of differential equations, to solve engineering problems. Students also gain proficiency in using computational tools and software, such as MATLAB, to perform mathematical modeling, data analysis, and simulations. They learn to analyze and interpret the results obtained from numerical calculations and simulations, and apply these findings to real-world engineering applications. Engineering Analysis plays a crucial role in various engineering disciplines, including mechanical engineering, civil engineering, electrical engineering, and aerospace engineering. It provides engineers with the tools and techniques to analyze and optimize designs, predict system behavior, and make informed engineering decisions. By studying Engineering Analysis, students develop critical thinking skills, problem-solving abilities, and a strong foundation in mathematical and computational methods, which are essential for success in the field of engineering.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**Computer application 2 (ANSYS)**	**Module Delivery**
Module Type	**Core**	☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical**
Module Code	**AM 301**	
ECTS Credits	**6**	
SWL (hr/sem)	**150**	

		☒ Seminar	
Module Level	**3**	**Semester of Delivery**	**5**
Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Tariq khalid**	**e-mail**	**tariqalkhalidi@ntu.edu.iq**
Module Leader's Acad. Title	**Lecturer**	**Module Leader's Qualification**	**M.Sc.**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23/9/2023**	**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. For ANSYS application Gain a solid understanding of the principles and fundamentals of finite element analysis, including the concept of discretization, meshing, and the finite element method. 2. earn Simulation Workflow: Develop the skills necessary to perform a complete simulation workflow, including pre-processing tasks like geometry creation, mesh generation, and defining boundary conditions, as well as post-processing tasks for interpreting and analyzing results. 3. Perform Structural Analysis: Gain competence in setting up and running structural analysis simulations in ANSYS. Learn how to define materials, apply loads and boundary conditions, and interpret results for stress, strain, deformation, and other structural behavior. 4. Conduct Thermal Analysis: Acquire knowledge and skills to perform thermal analysis using ANSYS. Understand how to define thermal loads, boundary conditions, and material properties for analyzing heat transfer, temperature distribution, and thermal behavior.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Problem Solving and Critical Thinking: Through working on design projects and exercises, students will enhance their problem-solving and critical thinking skills. 2. The module learning outcomes of studying ANSYS application can vary depending on the level and focus of the course, gain a comprehensive understanding of the simulation workflow, including pre-processing, solving, and post-processing stages. 3. Technical Skills: Develop proficiency in using ANSYS software, including its user interface, tools, and commands. Acquire practical skills in geometry creation, mesh generation, material assignment, and defining boundary conditions in conditions in ANSYS. 4. Analysis and Interpretation: Gain the ability to analyze and interpret simulation results obtained from ANSYS. Understand how to assess the structural behavior, deformation, stress, strain, temperature distribution, fluid flow parameters, and electromagnetic fields. 5. Develop problem-solving skills by identifying and troubleshooting issues that may arise during simulations. Learn optimization techniques to improve designs and achieve desired performance or efficiency. Apply ANSYS to solve practical engineering problems and make informed design decisions based on simulation results.

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

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem)	**78**	**Structured SWL (h/w)**	**5**

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
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)**	**3, 8 and 12**	**LO #1, #2, #4, #7 and #8**
	Assignments	**6**	**10% (10)**	**4, 6, 7, 9, 11 and 13**	**LO #3, #5, #6 and #9**
	Projects / Lab.	**10**	**20% (20)**	**Continuous**	**All**
	Report				
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1 - #7**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1,2,3,4	Introduction to ANSYS :Overview of ANSYS software and its applications, Familiarization with the ANSYS user interface , creating a simple 2D model and performing basic analysis.
Week 5,6,7,8	Geometry Creation: Creating complex geometries using ANSYS Design Modeler Importing CAD models and cleaning up geometry Applying mesh controls and generating mesh for analysis
Week 9,10,11	Static Structural Analysis: Introduction to static structural analysis, applying boundary conditions (constraints and loads).Running a structural analysis and interpreting results
Week 12,13,14,15	Modal Analysis : Understanding modal analysis and its significance Setting up modal analysis in ANSYS , Extracting natural frequencies and mode shapes
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 6	Creating a simple 2D ANSYS model and performing basic analysis.
Week 7	Creating complex geometries using ANSYS Design Modeler

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	An Introduction to ANSYS Fluent 2021	no

Recommended Texts	ANSYS Tutorial Release 2023: Structural & Thermal Analysis Using the ANSYS Mechanical APDL Release 2023 Environment	no
Websites	https://www.ansys.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.

Code	Course/Module Title	ECTS	Semester

AM 301	Computer application 2	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	4	78	72
Description			
Studying ANSYS applications provides students with essential skills for engineering analysis, ANSYS, a powerful simulation software suite, equips students with the tools to analyze and optimize engineering designs. By studying ANSYS, students can perform structural, thermal, fluid dynamics, and electromagnetics analyses, enabling them to evaluate design performance, predict behavior, and make informed engineering decisions. Together, mastering ANSYS empowers students to effectively design and analyze complex systems, enhancing their problem-solving skills and preparing them for careers in engineering and related fields.			

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Technology of Materials**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 304**			☐ **Seminar**	
ECTS Credits	**6**			☒ **Lab**	
SWL (hr/sem)	**150**			☐ **lecture** ☐ **Practical** ☐ **Tutorial**	
Module Level	**3**	**Semester of Delivery**	**5**		
Administering Department	**AM**	**College**	**TEMO**		
Module Leader	**Ayman Sabah**	**e-mail**	**aymansabah@ntu.edu.iq**		
Module Leader's Acad. Title	**Lecturer**	**Module Leader's Qualification**	**Ph.D.**		
Module Tutor		**e-mail**			

Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**٢٣/٩/2023**	**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.** communicate the aspects of materials and material technology related to mechanical engineering, **2.** recognize the needs for specific material competence in different engineering projects and **3.** be able to make sound estimates and judgments about the feasibility of engineering solutions involving materials and material selection.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** List different property classifications of materials that determine their applicability. **2.** Define engineering stress and strain and the relation between them for engineering materials. **3.** Identify treatments and processes that alter the performance of common engineering materials. **4.** Develop material testing procedures to determine the mechanical properties of common engineering materials. **5.** understand the underlying mechanisms of the techniques that are used to strengthen and harden metals and their alloys. **6.** demonstrate knowledge in types of metal alloys and cite compositional differences, distinctive properties, and typical uses for each. **7.** Name and describe different ionic point defects that are found in ceramic compounds, and get familiar with their applications. **8.** Describe a typical polymer molecule in terms of its chain structure, describe the general types of polymer molecular structures, Name and briefly describe fabrication techniques used for plastic polymers.

	9. demonstrate knowledge of the types and an understanding of the mechanisms and causes of corrosion and degradation, take measures to prevent them from occurring. **10.** demonstrate knowledge in the principles for rational and knowledge-based selection of materials. **11.** demonstrate knowledge about the types of imperfections that exist and the roles they play in affecting the behavior of materials. **12.** Note the types of nanomaterials and its distinctive feature. **13.** Diagram the total materials cycle and briefly discuss relevant issues that pertain to each stage of this cycle. **14.** Briefly define smart material/system and get familiar with their applications.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Introduction to Materials Science and Engineering** • Overview of materials and their classification • Structure of materials: atomic arrangement, crystal structure, and defects **Mechanical Properties of Materials** • Stress and strain • Elastic and plastic deformation • Tensile testing and mechanical behavior **Phase Diagrams and Phase Transformations** • Introduction to phase diagrams • Solidification and crystallization • Phase transformations and microstructure development **Heat Treatment of Materials** • Annealing, quenching, and tempering • Heat treatment processes and their effects on material properties **Mechanical Behavior of Materials** • Strengthening mechanisms: solid solution strengthening, precipitation hardening, and grain refinement • Fatigue, creep, and fracture **Metal Alloys and their Applications**

- Ferrous and non-ferrous alloys
- Properties and applications of common alloys

Ceramic and Composite Materials

- Introduction to ceramics and their properties
- Composite materials: types, fabrication, and properties

Polymers and Polymer Processing

- Polymer structure and properties
- Polymer processing techniques: molding, extrusion, and forming

Corrosion and Degradation of Materials

- Causes and prevention of corrosion
- Degradation mechanisms: wear, oxidation, and environmental effects

Material Selection and Design

- Material selection criteria
- Design considerations and materials in engineering applications

Testing and Characterization Techniques

- Non-destructive testing methods
- Microscopy and spectroscopy techniques

Nanomaterials and their Applications

- Introduction to nanomaterials
- Properties and applications of nanomaterials

Environmental and Sustainability Issues in Materials

- Sustainable materials and recycling
- Environmental impact assessment of materials

Emerging Trends in Materials Science

- Advanced materials: biomaterials, smart materials, and nanocomposites
- Future directions and emerging technologies in materials science

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 online videos and by considering types of experiments.

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	**87**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	**4**	**10% (10)**	**3,6,10 and 13**	**LO #2, #6 and #8, #12**
	Assignments	**5**	**10% (10)**	**2, 5, 8,12 and 15**	**LO #1, #5 and #7, #9, #13,#14**
	Lab.	**7**	**15% (15)**	**Continuous**	**All**
	Report	**1**	**5% (5)**	**14**	**LO #3, #4, #10, #14, #11**
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 Materials Technology**
Week 2	**Metals and Alloys**
Week 3	**Polymers and Composites**
Week 4	**Ceramics and Glasses**
Week 5	**Semiconductors and Electronic Materials**
Week 6	**Mechanical Testing of Materials**
Week 7	**Mid-Term Exam**
Week 8	**Materials Characterization Techniques**
Week 9	**Corrosion and Degradation of Materials**
Week 10	**Material Selection and Design**
Week 11	**Sustainable Materials and Recycling**
Week 12	**Nanomaterials and their Applications**
Week 13	**Environmental and Sustainability Issues in Materials**
Week 14	**Materials in Biomedical Engineering**
Week 15	**Emerging Trends in material science**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Determining the physical properties of engineering materials
Week 2	Tensile test
Week 3	Compression test
Week 4	Hardness test
Week 5	Impact test

Week 6	Shear test
Week 7	Visual inspection

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	MATERIAL SCIENCE AND ENGINEERING AN INTRODUCTION by William D. Callister and David G. Rethwisch	**Yes**
Recommended Texts	Introduction to MATERIALS SCIENCE FOR ENGINEERS by James F. Shackelford	**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.

Code	Course/Module Title	ECTS	Semester
AM 304	Materials Technology	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	2	63	87

Description

This module is designed for a third course in applied mechanics. The field that covers this area of the engineering profession has come to be known as “materials technology.” this label serves important functions.it is an accurate description of the balance between scientific principles and practical engineering that is required in selecting the proper materials for modern technology. After a short introductory on “The Fundamentals.” The module covers various topics in applied physics and chemistry. These are the foundation for understanding the principles of “materials science.” The words “materials technology” gives us a label for Part II of the module that deals with “Materials and Their Applications.” First, we discuss the categories of *structural materials*: metals, ceramics, and polymers and composites, and we give examples of each type of structural material and describe their processing, the techniques used to produce the materials, and finally we discuss the environmental and sustainability issues in materials and the latest trends in materials science.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Machine Design**	**Module Delivery**	
Module Type	**Core**	☒ **Theory**	
Module Code	**AM 305**	☐ **Lecture**	
ECTS Credits	**6**	☒ **Lab**	
SWL (hr/sem)	**150**	☒ **Tutorial**	
		☐ **Practical**	
		☐ **Seminar**	
Module Level	**3**	**Semester of Delivery**	**6**

Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Hussein Mohammed Ali**	**e-mail**	**alabadi.hussein@ntu.edu.iq**
Module Leader's Acad. Title	**Assist. Professor**	**Module Leader's Qualification**	**Ph.D.**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23/9/2023**	**Version Number**	**1.0**

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**AM203**	**Semester**	**Four**
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 aim of the module is to enhance students' knowledge and understanding of the mathematics and scientific principles related to mechanics, materials, manufacturing and design processes, and to develop their ability to apply this knowledge in a number of topics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module students should be able to: 1. Demonstrate knowledge and understanding of the mathematics and scientific principles related to the analysis of machine elements, components, and systems. 2. Design and realize a physical system or component to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. 3. Manage the engineering design process, identify, formulate, and solve engineering problems and evaluate outcomes. 4. Demonstrate an ability to communicate effectively and work well on team-based engineering projects. 5. Identify and manage cost drivers applied to the design and selection of components and systems constrained by a brief.

	6. Work with technical uncertainty to develop technical solutions. **7.** Understand the impact of design decisions on scale up production potential of products and manufacturing unit costs. **8.** Conduct a critical analysis of existing product designs taking into account product life cycle considerations. **9.** Understand the importance of engineering drawings, especially general assembly and detailed component drawings, as a formal means to communicate technical requirements for assembly and process designs. **10.** Present a case for a chosen assembly and process designs for a given product formally and persuasively, including the use of British Standards.
Indicative Contents المحتويات الإرشادية	• Indicative Contents: • Introduction to Machine Design • Definition and scope of machine design • Importance of machine design in engineering • Factors influencing machine design • Overview of the design process • Engineering Materials and their Selection • Properties of engineering materials (mechanical, thermal, electrical, etc.) • Material selection criteria for machine design • Commonly used materials in machine design (metals, polymers, composites) • Material testing and characterization • Design Considerations and Constraints • Functional requirements and specifications • Safety factors and design margins • Power Transmission Systems • Introduction to power transmission • Belt and chain drives • Gear drives and gear trains

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy for this module is to encourage students to actively participate in exercises and improve their critical thinking skills. We will achieve this through interactive classes, tutorials, and simple experiments that involve sampling activities students find interesting. The goal is to engage students, stimulate their curiosity, and help them develop their ability to think critically and analyze information effectively. By incorporating hands-on activities and encouraging collaboration, students will have the opportunity to apply what they've learned in practical ways. These strategies aim to create an enjoyable and inclusive learning environment that empowers students to

	become active learners and think critically about the subject matter.

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	**(78/15)=5**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**72**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**(72/15)=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**	**5**	**15% (15)**	**2, 4, 6, 9 and 12**	**LO #1, #2, #3, #6 and #10,**
	Assignments	**4**	**15% (15)**	**3, 5, 7 and 11**	**LO #4, #5, #7,#8 and #9**
	Projects / Lab.	**2**	**10% (10)**	**Continuous**	**All**
	Report				
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**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 Machine Design
Week 2	Selection of Materials in Machine Design
Week 3	Design of Piston

Week 4	Design of Cylinder
Week 5	Design of Connecting Rod
Week 6	Design of Crankshaft
Week 7	Design of Belts
Week 8	Design of springs
Week 9	Power Transmitted by a Shaft
Week 10	Design of Flywheel
Week 11	Design of clutch
Week 12	Design of Bearings
Week 13	Design Consideration for a Gear Drive
Week 14	Design of Gears
Week 15	Gear Trains
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to SolidWorks
Week 2	Lab 2: Design of Piston by SolidWorks
Week 3	Lab 3: Design of Connecting Rod by SolidWorks
Week 4	Lab 4: Design of Crank Shaft by SolidWorks
Week 5	Lab 5: Design of Belts by SolidWorks
Week 6	Lab 6: Design of Flywheel by SolidWorks
Week 7	Lab 7: Design of springs by SolidWorks

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Machine Design, R.S.Khurmi and J.K. Gupta.	**Yes**
Recommended	Budynas, R., Nisbett, J.K., Shigley's Mechanical	**No**

Texts	Engineering Design,McGraw-Hill	
Websites	https://www.coursera.org/learn/machine-design1	

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

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

Code	**Course/Module Title**	**ECTS**	**Semester**
AM 305	**Machine Design**	**6**	**6**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**3**	**78**	**72**
Description			
Machine design is a complex and intricate process that involves carefully selecting the appropriate materials, shapes, sizes, and arrangements of mechanical components to ensure optimal performance of the intended			

machine. It encompasses both the creation of innovative new machines and the improvement of existing ones. In this comprehensive module, students will delve into the world of machine design, acquiring a deep understanding of the mathematical and scientific principles underlying mechanics, materials science, manufacturing techniques, and design processes. They will explore various topics and gain the ability to apply their knowledge and skills in practical scenarios. Through this course, students will develop a strong foundation in conceptualizing, modeling, and analyzing machines, enabling them to tackle real-world challenges in the field. They will gain proficiency in identifying suitable materials, designing robust and efficient mechanical elements, and ensuring the machine meets the required specifications. By honing their expertise in machine design, students will be equipped to contribute to technological advancements and innovation.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**Manufacturing Processes**	**Module Delivery**	
Module Type	**Core**	☒ **Theory**	
Module Code	**AM 306**	☐ **Seminar**	
ECTS Credits	**6**	☒ **Lab**	
SWL (hr/sem)	**150**	☐ **lecture**	
		☐ **Practical**	
		☐ **Tutorial**	
Module Level	**3**	**Semester of Delivery**	**6**
Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Prof. Dr. Haitham M. Wadullah**	**e-mail**	**Dr. haitham@ntu.edu.iq**
Module Leader's Acad. Title	**Prof.**	**Module Leader's Qualification**	**Ph.D.**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	23/12/2023	**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. Understand fundamental principles and concepts. 2. Develop skills in process selection and optimization. 3. Acquire practical knowledge of different manufacturing techniques. 4. Apply problem-solving and critical thinking. 5. Foster understanding of manufacturing systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand various manufacturing processes and their principles. 2. Develop practical skills in selecting and applying manufacturing processes. 3. Apply problem-solving techniques to analyze and improve manufacturing processes. 4. Ensure quality control and adhere to safety standards in manufacturing. 5. Demonstrate effective communication and collaboration skills. 6. Enhance professional development and ethical responsibilities in manufacturing.
Indicative Contents المحتويات الإرشادية	Part A: Part B :

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Active Learning: Engage actively in class discussions, practical exercises, and hands-on activities. 2. Practical Application: Apply theoretical knowledge to real-world scenarios through projects and practical assignments. 3. Conceptual Understanding: Develop a deep understanding of the

	fundamental principles and concepts of manufacturing processes. 4. Problem-Solving Skills: Enhance problem-solving skills by analyzing and solving manufacturing-related problems. 5. Collaborative Learning: Engage in group discussions and teamwork to exchange ideas and learn from others. 6. Time Management: Create a study schedule and allocate dedicated time for studying Manufacturing Processes. 7. Utilize Resources: Make use of textbooks, online resources, and educational materials to supplement learning. 8. Continuous Practice and Review: Regularly review and practice learned concepts to reinforce understanding. 9. Seek Support: Seek assistance from instructors and peers when needed and utilize available support resources.

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	**87**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**4**	**10% (10)**	**3,6,10 and 13**	**LO #2, #6 and #8, #12**
	Assignments	**5**	**10% (10)**	**2, 5, 8,12 and 15**	**LO #1, #5 and #7, #9, #13,#14**

	Lab.	**7**	**15% (15)**	**Continuous**	**All**
	Report	**1**	**5% (5)**	**14**	**LO #3, #4, #10, #14, #11**
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 Manufacturing Processes**
Week 2	**Casting Processes**
Week 3	**Forming Processes**
Week 4	**Machining Processes**
Week 5	**Joining Processes**
Week 6	**Additive Manufacturing Processes**
Week 7	**Mid-Term Exam**
Week 8	**Powder Metallurgy**
Week 9	**Non-Conventional Manufacturing Processes**
Week 10	**Surface Treatment and Finishing**
Week 11	**Quality Control in Manufacturing**
Week 12	**Automation and Robotics in Manufacturing**
Week 13	**Sustainable Manufacturing Practices**
Week 14	**Lean Manufacturing and Process Optimization**
Week 15	**Manufacturing Cost Estimation and Economic Analysis**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	**Lab: Manufacturing Processes**
Week 2	**Lab: Casting Processes**
Week 3	**Lab: Forming Processes**
Week 4	**Lab: Machining Processes**
Week 5	**Lab: Joining Processes**
Week 6	**Lab: Additive Manufacturing Processes**
Week 7	**Lab: Powder Metallurgy**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. "Manufacturing Engineering and Technology" by Serope Kalpakjian and Steven R. Schmid. 2. "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems" by Mikell P. Groover. 3. "Manufacturing Processes for Engineering Materials" by Serope Kalpakjian and Steven R. Schmid.	**Yes**
Recommended Texts	1. "Principles of Manufacturing Materials and Processes" by James S. Campbell. 2. "Manufacturing Processes: Materials, Productivity, and Process Improvement" by Elsayed A. Elsayed and Richard A. Wysk. 3. "Manufacturing Engineering Handbook" edited by Hwaiyu Geng.	**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.

Code	Course/Module Title	ECTS	Semester
AM 306	**Manufacturing Processes**	**6**	**6**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	**63**	**87**

Description

Manufacturing Processes is a course that provides students with an in-depth understanding of various processes involved in the production of goods and products. The course explores the fundamental principles and techniques used in manufacturing, including material selection, forming, machining, joining, and finishing. Students will learn about different manufacturing methods such as casting, molding, machining, welding, and additive manufacturing. Emphasis is placed on process selection, optimization, and quality control to ensure efficient and cost-effective production. Through theoretical knowledge and practical applications, students will gain a comprehensive understanding of how raw materials are transformed into finished products. Additionally, the course covers topics such as process planning, automation, and sustainability in manufacturing. By the end of the course, students will have the skills and knowledge to

analyze, evaluate, and improve manufacturing processes in various industrial settings.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Vibration**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 302**			☐ **Lecture**	
ECTS Credits	**6**			☒ **Lab**	
SWL (hr/sem)	**150**			☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Level	**3**		**Semester of Deliver**		**5**
Administering Department	**AM**		**College**	**TEMO**	
Module Leader	**Yasir Hassan Ali**		**e-mail**	**yha2006@ntu.edu.iq**	
Module Leader's Acad. Title	**Lecturer**		**Module Leader's Qualification**		**PhD**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	**٢٣/٩/2023**		**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. This course deals with the Theory of Vibration with Applications. 2. Understand the basic principles of mechanical vibration. 3. To understand natural frequencies 4. To understand the fundamental un damped free and forced vibration. 5. Identify and describe the damped free Vibration and forced Vibration. 6. To explain Energy method (Rayleigh Principle) 7. To explain Single and Multi-degree of freedom.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define Basic concepts of vibration and oscillatory motion and identify vibration applications. 2. Define and calculate Free vibration of undamped single degree of freedom system. 3. Define and calculate Free vibration of damped single degree of freedom system. 4. Define and calculate forced vibration of undamped single degree of freedom systems. 5. Define and calculate forced vibration of a damped single degree of freedom system. 6. Recognize how to calculate Equivalent springs and dampers. 7. Analyze the Multi-degree of freedom system . 8. Describe Vibration isolation. 9. Identify determining natural frequencies . 10. Recognize the Vibration measuring instruments
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A** Basic concepts of vibration,Vibration definition , Vibration systems and applications, Fundamental properties of Vibration; Introduction to oscillatory motion. [6 hrs] Free vibration of an undamped single degree of freedom system, Energy method (Rayleigh Principle), Free vibration of a viscously damped single degree of freedom system, Equivalent springs and dampers, Decay rate(logarithmic decrement).[20 hrs] Forced vibration of a damped and undamped single degree of freedom system. [14 hrs]

	Part B Rotating unbalance, Whirling of rotating shaft , Base excitation (support motion) Vibration isolation , Vibration measuring instruments , Two - degree of freedom system , Normal modes , Orthogonality principle of normal modes , Lagrange's equation, Rayleigh and Dunkerly methods for determining natural frequencies. [40 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The Vibration module employs a range of effective learning and teaching strategies. Students engage in theoretical lectures, practical demonstrations, and hands-on laboratory sessions to grasp the underlying principles and gain practical skills. Case studies and real-world scenarios enhance problem-solving abilities, while group projects foster teamwork and communication skills. Continuous assessment methods, including assignments and practical assessments, ensure students' progress and understanding of the subject matter. The module promotes equipping students with the knowledge and skills necessary for success in the field of vibration measurements.

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	٥
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**72**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٥
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)	2, 4 and 10	LO #1, #2, #3, #6 and #8
	Assignments	4	15% (15)	3, 5, 9 and 13	LO #4, #5, #7, #9 and #10
	Projects / Lab.	10	15% (15)	Continuous	All
	Report				
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1, #2 and #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Basic concepts of vibration
Week 2	Introduction to oscillatory motion.
Week 3	Free vibration of an undamped single degree of freedom system
Week 4	Energy method (Rayleigh Principle)
Week 5	Free vibration of a viscously damped single degree of freedom system
Week 6	Equivalent springs and dampers
Week 7	Decay rate (logarithmic decrement)
Week 8	Forced vibration of a single degree of freedom system
Week 9	Forced vibration of a single degree of freedom system
Week 10	Forced vibration of a single degree of freedom system
Week 11	Rotating unbalance
Week 12	Whirling of rotating shaft

Week 13	Base excitation (support motion)
Week 14	Vibration isolation
Week 15	Vibration measuring instruments
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Mass Spring System
Week 2	Lab 2: Measuring the Damping Factor and damping ratio (air).
Week 3	Lab 3: Springs stiffness (Equivalent).
Week 4	Lab 4: Bifilar suspension.
Week 5	Lab 5: Different types of fluid damper.
Week 6	Lab 6: whirling shaft.
Week 7	Lab 7: Diagnosis of Shift Misalignment.
Week 8	Lab 8: Machinery Soft - Foot.
Week 9	Lab 9: Measuring the Damping Factor and damping ratio (water).
Week 10	Lab 10: Mechanical Looseness.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Theory of Vibration with Applications, Fourth Edition William T. Thomson	Yes
Recommended Texts	Theory of Vibration with Applications, Fourth Edition William T. Thomson	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.

Code	Course/Module Title	ECTS	Semester
AM 302	**Vibration**	**6**	**5**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**3**	**78**	**٧٢**

Description

The Vibration Principles module offers students a thorough comprehension of the principles, components, and applications of vibration systems. This module integrates theoretical knowledge with practical skills to provide a well-rounded learning experience. Students explore the foundational principles of dynamics, including equations of motion, which serve as the building blocks for understanding vibration processes.

The module emphasizes hands-on activities and laboratory sessions, allowing students to calculate and analyze various vibration systems and processes. By engaging in these practical exercises, students develop a deeper understanding of the subject matter and enhance their problem-solving abilities.

Furthermore, the module promotes effective communication and teamwork, as students collaborate in simulated real-world scenarios commonly encountered in the field. This encourages the development of important skills required for successful professional practice.

By the end of the module, students will have acquired a comprehensive understanding of vibration principles,

along with the ability to apply their knowledge to analyze and address vibration-related challenges in practical settings.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Metal forming**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 303**			☐ **Seminar**	
ECTS Credits	**6**			☒ **Lab**	
SWL (hr/sem)	**150**			☐ **lecture**	
				☐ **Practical**	
				☐ **Tutorial**	
Module Level	**3**	**Semester of Delivery**	**5**		
Administering Department	**AM**	**College**	**TEMO**		
Module Leader	**Haitham M. Wadullah**	**e-mail**	**Dr.haitham@ntu.edu.iq**		
Module Leader's Acad. Title	**Prof.**	**Module Leader's Qualification**	**Ph.D.**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**٢٣/٩/2023**	**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	These objectives aim to provide engineering students with a strong foundation in the theoretical principles of metal forming, coupled with practical skills and problem-solving abilities essential for their future careers in materials engineering, manufacturing, and related fields. **15.** Understanding of Fundamental Principles; Objective and Key Outcomes **16.** Application of Metal forming Techniques **17.** Practical Skills and Problem-Solving
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By achieving these learning outcomes, engineering students will be well-equipped with the knowledge, skills, and critical thinking abilities necessary to understand, apply, and optimize metal forming processes in various engineering applications. 1 Knowledge and Understanding: • Explain the fundamental principles of metal forming • Describe various metal forming processes 2 Application and Analysis: • Apply appropriate metal forming techniques to enhance material properties, considering factors like material composition, desired properties, and end-use conditions. • Analyze microstructures of materials before and after metal forming using metallographic techniques and interpret the effects of metal forming on material properties. • Calculate and design metal forming processes, including heating and cooling rates, time-temperature profiles, and critical transformation temperatures. 3 Practical Skills: • Perform laboratory experiments to observe the effects of different metal forming processes on materials and analyze the resulting microstructures and mechanical properties. • Operate metal forming equipment and demonstrate safe practices in handling high temperatures and various types of furnaces. • Troubleshoot common metal forming defects, identify their causes, and implement corrective measures to prevent defects in industrial applications. 4 Problem-Solving and Critical Thinking: • Apply problem-solving skills to optimize metal forming processes for specific materials and applications, considering factors such as cost, time, and energy efficiency. • Evaluate the impact of metal forming on material properties and select appropriate metal forming methods to achieve desired mechanical, thermal,

	and corrosion-resistant properties. • Analyze case studies and real-world examples of metal forming applications in different industries, identifying best practices and potential areas for improvement. 5 Communication and Collaboration: • Communicate metal forming concepts, experimental results, and analyses effectively through written reports, presentations, and technical discussions. • Collaborate with peers in group projects to solve complex metal forming-related problems, encouraging teamwork and sharing of diverse perspectives.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Week 1-2: Introduction to Metal forming Definition and objectives of metal forming Basic concepts: temperature, heat, energy transfer Phases and phase diagrams in materials science Iron-carbon phase diagram • Week 3-4: Metal forming Processes • Week 5-6: Metal forming Equipment Types of furnaces: batch, continuous, vacuum, atmosphere-controlled Furnace atmosphere and its effects on heat treatment Heat treatment cycles and parameters Furnace instrumentation and control • Week 7-8: Heat Treatment of Ferrous Alloys Tempering and its effects on hardness and toughness Austempering and martempering Precipitation hardening Effects of alloying elements on heat treatment • Week 9-10: Heat Treatment of Non-Ferrous Alloys Aluminum alloys: annealing, solution heat treatment, aging Copper alloys: annealing, stress relief, softening Heat treatment of titanium alloys

	Heat treatment of nickel-based alloys • Week 11-12: Heat Treatment Defects and Quality Control Common heat treatment defects: cracking, distortion, decarburization Methods for defect prevention and control Non-destructive testing methods Quality control in heat treatment processes • Week 13-14: Advanced Heat Treatment Techniques Induction heating and its applications Laser heat treatment Selective laser melting (SLM) in additive manufacturing Cryogenic treatment and its effects on materials • Week 15: Recent Developments and Future Trends Current research and advancements in heat treatment technology Industry applications and case studies Future trends in heat treatment processes and materials **Assessment Methods:** Quizzes and assignments to assess theoretical knowledge Laboratory experiments and reports on heat treatment processes Mid-term and final exams to evaluate overall understanding Group discussions and presentations on advanced techniques and recent developments. This syllabus provides a balanced coverage of fundamental concepts, practical applications, and emerging trends in the field of heat treatment. Adjustments can be made based on the specific goals and focus of the course.

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 online videos and by considering types of experiments.

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	**87**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**4**	**10% (10)**	**3,6,10 and 13**	**LO #2, #6 and #8, #12**
	Assignments	**5**	**10% (10)**	**2, 5, 8,12 and 15**	**LO #1, #5 and #7, #9, #13,#14**
	Lab.	**7**	**15% (15)**	**Continuous**	**All**
	Report	**1**	**5% (5)**	**14**	**LO #3, #4, #10, #14, #11**
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 Heat Treatment – Definition and objectives of heat treatment – Basic concepts: temperature, heat, energy transfer – Phases and phase diagrams in materials science – Iron-carbon phase diagram
Week 2	
Week 3	– Heat Treatment Processes – Annealing Processes – Full annealing – Process annealing – Isothermal annealing – Normalizing and Hardening Processes – Normalizing – Hardening processes: quenching, martensite formation – Surface hardening techniques: carburizing, nitriding
Week 4	
Week 5	– Heat Treatment Equipment and Furnaces – Types of furnaces: batch, continuous, vacuum, atmosphere-controlled – Furnace atmosphere and its effects on heat treatment
Week 6	

	– Heat treatment cycles and parameters – Furnace instrumentation and control
Week 7	– Heat Treatment of Ferrous Alloys – Tempering and its effects on hardness and toughness – Austempering and martempering – Precipitation hardening – Effects of alloying elements on heat treatment
Week 8	
Week 9	– Heat Treatment of Non-Ferrous Alloys – Aluminum alloys: annealing, solution heat treatment, aging – Copper alloys: annealing, stress relief, softening – Heat treatment of titanium alloys – Heat treatment of nickel-based alloys
Week 10	
Week 11	– Heat Treatment Defects and Quality Control – Common heat treatment defects: cracking, distortion, decarburization – Methods for defect prevention and control – Non-destructive testing methods – Quality control in heat treatment processes
Week 12	
Week 13	– Advanced Heat Treatment Techniques – Induction heating and its applications – Laser heat treatment – Selective laser melting (SLM) in additive manufacturing – Cryogenic treatment and its effects on materials
Week 14	
Week 15	– Recent Developments and Future Trends – Current research and advancements in heat treatment technology – Industry applications and case studies – Future trends in heat treatment processes and materials
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1 - 4	– Definition of Basic concepts: temperature, heat, energy transfer, Phases and phase diagrams and Iron-carbon phase diagram
Week 5 - 8	– Heat Treatment Processes, Annealing and Full annealing, Isothermal annealing, Normalizing and Hardening Processes : quenching, martensite formation, Surface hardening techniques: carburizing, nitriding
Week 9 - 12	– Heat Treatment Equipment and Furnaces – Types of furnaces: batch, continuous, vacuum, atmosphere-controlled – Furnace atmosphere and its effects on heat treatment – Heat treatment cycles and parameters – Furnace instrumentation and control
Week 13-1٥	– Experimental work: The student will be trained laboratory-based on all vocabulary for the purpose of applying knowledge and acquiring the skills necessary to apply various heat treatment processes in engineering applications in the future.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. "Principles of Heat Treatment of Steels" by George Krauss 2. "Introduction to the Heat Treatment of Metals" by David Scott 3. "Heat Treatment: Structure and Properties of Nonferrous Alloys" by C.M. Cotell, C. M. Wayman, and E.A. Starke Jr. 4. "Heat Treatment, Selection, and Application of Tool Steels" by William E. Bryson 5. "Introduction to Physical Metallurgy and Engineering Materials" by R. E. Smallman and R. J. Bishop 6. "Heat Treatment of Gears: A Practical Guide for Engineers" by A.K. Rakhit and Jon L. Dossett 7. "Steels: Microstructure and Properties" by Harry Bhadeshia and Robert Honeycombe	**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.

Code	Course/Module Title	ECTS	Semester
AM 303	Metal forming	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	2	63	87

Description

The course "Understanding Heat Treatments in Engineering Materials" is designed to provide engineering students with a comprehensive understanding of the principles, processes, and applications of heat treatments in various materials. Heat treatment is a critical aspect of materials engineering, influencing the mechanical, thermal, and electrical properties of metals and alloys. Through this course, students will delve into the theoretical foundations and practical applications of heat treatments, essential knowledge for engineers working in fields such as manufacturing, aerospace, automotive, and materials science.

Assessment Methods:

- Laboratory Reports: Assessing students' ability to conduct experiments, analyze results, and draw conclusions.
- Quizzes and Examinations: Evaluating theoretical knowledge, including principles, processes, and phase diagrams.
- Assignments and Case Studies: Applying heat treatment methods to real-world scenarios, encouraging problem-solving skills.
- Group Projects and Presentations: Collaborative projects simulating engineering challenges, fostering teamwork and communication skills.
- Final Examination: Comprehensive assessment covering all aspects of the course, ensuring a thorough understanding of heat treatments in engineering materials.

By the end of this course, engineering students will possess a strong theoretical foundation, practical skills, and problem-solving abilities, enabling them to make informed decisions regarding material selection and heat treatment processes in their future engineering careers.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**Measurement Systems**	**Module Delivery**
Module Type	**Core**	☒ **Theory**

Module Code	**AM 307**			☐ **Seminar**
ECTS Credits	**6**			☒ **Lab**
SWL (hr/sem)	**150**			☐ **lecture** ☐ **Practical** ☐ **Tutorial**
Module Level	**3**	**Semester of Delivery**	**6**	
Administering Department	**AM**	**College**	**TEMO**	
Module Leader	**Haitham M. Wadullah**	**e-mail**	**Dr.haitham@ntu.edu.iq**	
Module Leader's Acad. Title	**Prof.**	**Module Leader's Qualification**	**Ph.D.**	
Module Tutor		**e-mail**		
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	**٢٣/٩/2023**	**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	These objectives aim to provide students with a comprehensive understanding of fundamental measurement concepts and systems used in engineering applications. Coupled with practical skills and problem-solving abilities essential for their future careers in devices, manufacturing, and related fields. 1. Understanding of Fundamental Principles; Objective and Key Outcomes 2. Measurement Techniques and Instruments: 3. Data Acquisition and Signal Processing 4. Measurement System Design and Calibration 5. Integration of Measurements into Engineering Projects
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of the course, students will be able to: 1. Demonstrate Understanding of Measurement Fundamentals: • Explain fundamental measurement terminologies, including accuracy, precision, resolution, and sensitivity. • Understand the importance of measurement units and standards in engineering applications. • Describe the working principles of various sensors, transducers, and measurement instruments. 2. Apply Measurement Techniques: • Apply analog and digital measurement techniques appropriately in engineering scenarios. • Select and use suitable measurement instruments such as multimeters, oscilloscopes, and signal analyzers for specific tasks. • Implement advanced measurement tools, including sensors for temperature, pressure, strain, and displacement, in practical applications. 3. Analyze and Process Measurement Data: • Analyze measurement data using statistical methods to draw meaningful conclusions. • Utilize digital signal processing techniques for filtering, noise reduction, and feature extraction from measured signals. • Apply software tools for data analysis and visualization,

	interpreting results effectively. 4. Design and Implement Measurement Systems: • Design measurement systems tailored for specific engineering applications, considering sensor selection, signal conditioning, and data acquisition methods. • Implement and troubleshoot measurement setups, demonstrating proficiency in sensor integration and data acquisition. • Apply calibration techniques to enhance measurement accuracy and reliability in engineered systems. 5. Integrate Measurements into Engineering Projects: • Integrate sensors and measurement systems into engineering projects related to automation, control systems, robotics, and IoT applications. • Evaluate the effectiveness of measurement systems in improving the efficiency and reliability of engineering projects. • Collaborate in interdisciplinary teams to design and implement comprehensive engineering solutions incorporating measurement technologies. By achieving these learning outcomes, engineering students will be well-equipped to design, implement, and analyze measurement systems for a wide range of engineering applications, ensuring accuracy, reliability, and ethical conduct in their professional practice.
Indicative Contents المحتويات الإرشادية	Module 1: Introduction to Measurement Systems • Importance of measurements in engineering • Basic measurement terminologies: accuracy, precision, resolution • Measurement units and standards • Sensors and transducers: types, principles, and applications • Signal conditioning techniques Module 2: Measurement Techniques and Instruments • Analog and digital measurement techniques • Overview of measurement instruments: multimeters, oscilloscopes, signal analyzers • Sensors for temperature, pressure, strain, displacement, and other physical properties

- Data acquisition systems: types, components, and selection criteria
- Laboratory demonstrations and hands-on exercises with measurement instruments

Module 3: Data Analysis and Signal Processing

- Statistical analysis of measurement data
- Digital signal processing: filtering, Fourier analysis, spectral analysis
- Software tools for data analysis and visualization (e.g., MATLAB, LabVIEW)
- Time and frequency domain analysis
- Case studies on signal processing applications in engineering measurements

Module 4: Measurement System Design and Calibration

- Principles of measurement system design
- Sensor selection and integration into measurement systems
- Calibration techniques: methods, standards, and procedures
- Error analysis and compensation in measurement systems
- Practical exercises on designing and calibrating measurement setups

Module 5: Advanced Measurement Technologies (Part I)

- Remote sensing and wireless sensor networks
- MEMS (Micro-Electro-Mechanical Systems) sensors and applications
- Internet of Things (IoT) devices and sensors
- Real-time measurements and control systems
- Emerging trends and innovations in measurement technologies

Module 6: Advanced Measurement Technologies (Part II)

- Internet of Things (IoT) devices and sensors
- Real-time measurements and control systems
- Emerging trends and innovations in measurement technologies

Module 7: Integration of Measurements into Engineering Projects (Part I)

- Automation and control systems: sensors, actuators, and feedback loops
- Robotics and mechatronics applications: sensors for robotic perception and control

Module 8: Integration of Measurements into Engineering Projects (part II)

	• IoT applications in engineering: smart sensors, data communication, and cloud integration • Case studies and group projects integrating measurement systems into real-world engineering applications Assessment Methods: • Quizzes and examinations assessing theoretical knowledge • Laboratory reports evaluating practical skills in using measurement instruments • Group projects integrating measurement systems into engineering applications • Individual assignments on data analysis and system design • Class presentations and discussions on case studies and ethical considerations

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 online videos and by considering types of experiments.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٦٣	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٤
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٨٧	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٦
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٥٠		

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

Formative assessment	**Quizzes**	**4**	**10% (10)**	**3,6,10 and 13**	**LO #2, #6 and #8, #12**
	Assignments	**5**	**10% (10)**	**2, 5, 8,12 and 15**	**LO #1, #5 and #7, #9, #13,#14**
	Lab.	**7**	**15% (15)**	**Continuous**	**All**
	Report	**1**	**5% (5)**	**14**	**LO #3, #4, #10, #14, #11**
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 Measurement Systems
Week 2	– Overview of Measurement Systems in Mechanical Engineering – Fundamental Concepts: Accuracy, Precision, Resolution – Measurement Units, Standards, and Calibration – Introduction to Basic Measurement Instruments: Vernier Calipers, Micrometers – Hands-on Exercises: Basic Measurements and Instrument Familiarization
Week 3	Sensors and Transducers
Week 4	– Types of Sensors: Strain Gauges, Thermocouples, Pressure Transducers, Accelerometers – Principles of Operation and Applications – Selection Criteria and Considerations for Mechanical Engineering Applications – Lab: Sensor Testing and Calibration
Week 5	Signal Conditioning and Data Acquisition
Week 6	– Signal Conditioning Techniques: Amplification, Filtering, Analog-to-Digital Conversion – Introduction to Data Acquisition Systems (DAQ) – Lab: Signal Conditioning and DAQ Setup for Various Sensors – Introduction to LabVIEW for Data Acquisition and Control
Week 7	Measurement System Design and Calibration

Week 8	– Principles of measurement system design – Sensor selection and integration into measurement systems – Calibration techniques: methods, standards, and procedures – Error analysis and compensation in measurement systems – Practical exercises on designing and calibrating measurement setups
Week 9	Advanced Measurement Technologies Part I – Remote sensing and wireless sensor networks – MEMS (Micro-Electro-Mechanical Systems) sensors and applications – Internet of Things (IoT) devices and sensors
Week 10	
Week 11	Advanced Measurement Technologies Par II – Real-time measurements and control systems – Emerging trends and innovations in measurement technologies
Week 12	
Week 13	Integration of Measurements into Engineering Projects Part I – Automation and control systems: sensors, actuators, and feedback loops – Robotics and mechatronics applications: sensors for robotic perception and control
Week 14	
Week 15	Integration of Measurements into Engineering Projects Part II – IoT applications in engineering: smart sensors, data communication, and cloud integration Case studies and group projects integrating measurement systems into real-world engineering applications
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1 - 2	Introduction to Measurement Instruments – Lab Orientation and Safety Guidelines – Introduction to Basic Measurement Instruments: Multimeters and Oscilloscopes – Hands-on Exercise: Using Multimeters for Voltage, Current, and Resistance Measurements
Week 3 - 4	Analog and Digital Signal Measurements – Analog Signal Measurements: Voltage, Current, and Frequency – Digital Signal Measurements: Logic Levels and Timing Analysis – Lab Experiment: Analog and Digital Signal Measurements using Oscilloscopes

Week 5 - 6	Sensors and Transducers – Types of Sensors: Temperature, Pressure, Strain, and Displacement Sensors – Calibration of Sensors: Procedures and Techniques – Lab Activity: Calibrating Temperature and Pressure Sensors
Week 7-8	Data Acquisition Systems – Introduction to Data Acquisition Systems (DAQ) – Configuring DAQ Hardware and Software – Lab Project: Building a Simple Data Acquisition System for Temperature Sensing
Week 9-10	Digital Signal Processing for Measurements – Introduction to Digital Signal Processing (DSP) – Filtering Techniques: Low-pass, High-pass, and Band-pass Filters – Lab Exercise: Implementing Filters for Signal Conditioning
Week 11 -12	Real-time Measurements and Control Systems – Real-time Measurements and Feedback Control Systems – Introduction to PID Controllers – Lab Project: Implementing a PID Control System for Temperature Regulation

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	8. "Principles of Heat Treatment of Steels" by George Krauss 9. "Introduction to the Heat Treatment of Metals" by David Scott 10. "Heat Treatment: Structure and Properties of Nonferrous Alloys" by C.M. Cotell, C. M. Wayman, and E.A. Starke Jr. 11. "Heat Treatment, Selection, and Application of Tool Steels" by William E. Bryson 12. "Introduction to Physical Metallurgy and Engineering Materials" by R. E. Smallman and R. J. Bishop 13. "Heat Treatment of Gears: A Practical Guide for Engineers" by A.K. Rakhit and Jon L. Dossett 14. "Steels: Microstructure and Properties" by Harry Bhadeshia and Robert Honeycombe	**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.

Code	Course/Module Title	ECTS	Semester
AM 303	Heat Treatments	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	2	63	87

Description

The course "Understanding Heat Treatments in Engineering Materials" is designed to provide engineering students with a comprehensive understanding of the principles, processes, and applications of heat treatments in various materials. Heat treatment is a critical aspect of materials engineering, influencing the mechanical, thermal, and electrical properties of metals and alloys. Through this course, students will delve into the theoretical foundations and practical applications of heat treatments, essential knowledge for engineers working in fields such as manufacturing, aerospace, automotive, and materials science.

Assessment Methods:

- Laboratory Reports: Assessing students' ability to conduct experiments, analyze results, and draw conclusions.
- Quizzes and Examinations: Evaluating theoretical knowledge, including principles, processes, and phase diagrams.
- Assignments and Case Studies: Applying heat treatment methods to real-world scenarios, encouraging problem-solving skills.
- Group Projects and Presentations: Collaborative projects simulating engineering challenges, fostering teamwork and communication skills.
- Final Examination: Comprehensive assessment covering all aspects of the course, ensuring a thorough understanding of heat treatments in engineering materials.

By the end of this course, engineering students will possess a strong theoretical foundation, practical skills, and problem-solving abilities, enabling them to make informed decisions regarding material selection and heat treatment processes in their future engineering careers.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**Theory of Machine**	**Module Delivery**
Module Type	**Core**	☒ **Theory**

Module Code	**AM 308**	☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**
ECTS Credits	**6**	
SWL (hr/sem)	**150**	

Module Level	**3**	**Semester of Deliver**	**6**
Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Yasir Hassan Ali**	**e-mail**	**yha2006@ntu.edu.iq**
Module Leader's Acad. Title	**Lecturer**	**Module Leader's Qualification**	**PhD**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23/9/2023**	**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.** This course deals with the Theory of Machine. **2.** To develop students fundamental knowledge and insight into the theory of machines. **3.** Identify velocity, and acceleration diagram. **4.** To understand balancing of rotating masses **5.** To understand the theory of gears. **6.** Identify and describe the governors system. **7.** To explain cams to be used in machines design.

	8. To explain belts to be used in machines design.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** Define Basic concepts of the Theory of Machine. **2.** Define and calculate velocity, and acceleration. **3.** Define and calculate Gyroscope. **4.** Define and calculate Balancing of rotating masses. **5.** Define and calculate Types of governors. **6.** Recognize Classification of gears. **7.** Analyze the Types of belts. **8.** Describe Velocity ratio of a compound belt drive Length of belt Vibration. **9.** Identify determining Cam profile construction. **10.** Recognize the Flywheel.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A** Fundamental knowledge and insight into the theory of machines, velocity, and acceleration diagram, balancing of rotating masses, theory of gears. [30 hrs] **Part B** Governors system, Types of belts, Gyroscope ,Types of brakes, Cam, Flywheel. [30 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The Theory of machine module employs a range of effective learning and teaching strategies. Students engage in theoretical lectures, practical demonstrations, and hands-on laboratory sessions to grasp the underlying principles and gain practical skills. Case studies and real-world scenarios enhance problem-solving abilities, while group projects foster teamwork and communication skills. Continuous assessment methods, including assignments and practical assessments, ensure students' progress and understanding of the subject matter. The module promotes equipping students with the knowledge and skills necessary for success in the field of machine.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	**93**	**Structured SWL (h/w)**	**6**

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**57**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**4**
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 #3**
	Assignments	**2**	**10% (10)**	**7 and 13**	**LO #2, #3 and #4, #6**
	Projects / Lab.	**10**	**10% (10)**	**2 - 11**	**LO #2, #3 and #4, #6**
	Report	**10**	**10% (10)**	**3 - 12**	**LO #2, #3 and #4, #6**
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1, #2 and #3**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction and Definition.
Week 2	Velocity in Mechanisms.
Week 3	Solved problems for velocity in mechanisms
Week 4	Acceleration in mechanisms
Week 5	Solved problems for Acceleration in mechanisms

Week 6 - 8	Balancing of a single rotating mass by a single mass rotating in the same plane. Balancing of a single rotating mass by two masses rotating in different planes. Balancing of several masses rotating in the same plane. Balancing of several masses rotating in different planes. (a) Analytical method. (b) Graphical method. Solved problems.
Week 9,10	Classification of gears, spur gears, velocity ratio (gear ratio). Center to center distance.
Week 11,12	Gear trains, velocity ratio of simple gear trains, velocity ratio of compound gear trains, solved problems.
Week 13	Epicyclic gear trains, simple epicyclic gear trains.
Week 14	Compound epicyclic gear trains.
Week 15	Solved problems.
Week 16, 17	Types of governors, solved problems.
Week 18	Gyroscope
Week 19,20	Types of belts, types of flat belt drive, selection of belt drive. Velocity ratio of open belt drive. Effect of belt thickness on Velocity ratio, slip of the belt. Creep of the belt.
Week 21,22	Velocity ratio of a compound belt drive. Length of belt. (a) Open belt. (b) Cross belt. Ratio of driving tension for flat belts. Determination of angle of contact. (a) Open belt. (b) Cross belt.
Week 23,24	Power transmitted by a belt. Centrifugal tension (Tc). Maximum tension in the belts (Tmax). Condition for the Transmission of Maximum Power. Initial tension in the belt (to). V – Belt drive and rope drive. Solved problems.
Week 25,26	Types of brakes. Solve problems.
Week 27,28	Cam profile construction.

	Solve problems.
Week 29,30	Flywheel Solve problems.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Balancing of a single rotating mass by a single mass rotating in the same plane.
Week 2	Lab 2: Balancing of several masses rotating in the same plane.
Week 3	Lab 3: Balancing of several masses rotating in different planes.
Week 4	Lab 4: Spur Gear.
Week 5	Lab 5: Gear Trains.
Week 6	Lab 6: Governors.
Week 7	Lab 7: Flat Belts.
Week 8	Lab 8: V- Belts.
Week 9	Lab 9: Gyroscope
Week 10	Lab 10: Flywheel

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Mechanics of machines: elementary theory and examples J Hannah and RC Stephens	Yes
Recommended Texts	Mechanics of machines: elementary theory and examples J Hannah and RC Stephens	Yes
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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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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Code	Course/Module Title	ECTS	Semester
AM 308	**Theory of Machine**	**6**	**6**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**3**	**93**	**57**
Description			
The Theory of Machine Principles module provides students with a comprehensive understanding of the principles, components, and applications of Mechanics of machines. This module combines theoretical knowledge with practical skills. Throughout the module, students delve into the fundamental principles of Dynamics, and Mechanics of machines, which form the basis of machines processes. Hands-on activities and			

laboratory sessions enable students to calculate and analyze different processes machines systems. The module encourages the students to communicate effectively and work collaboratively in teams, simulating real-world scenarios they may encounter in the field.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Applications 3** (MATLAB)			**Module Delivery**	
Module Type	**core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**AM 309**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	**3**	**Semester of Deliver**	**6**		
Administering Department	**AM**	**College**	**TEMO**		
Module Leader	**Ayman Sabah Rashad**	**e-mail**	**Aymansabah@ntu.edu.iq**		
Module Leader's Acad. Title	**Lecturer**	**Module Leader's Qualification**	**Ph.D**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**23/9/2023**	**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	**10.** Understanding the MATLAB environment **11.** Being able to do simple calculations using MATLAB **12.** Being able to carry out simple numerical computations and analyses using MATLAB
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After attending the module, the students **14.** are familiar with the MATLAB environment and can perform basic operations, such as simple programming, importing data and plotting graphics **15.** are able to create and combine variables (scalars, vectors, matrices) **16.** are familiar with basic numerical methods, such as numerical differentiation and integration integrals, approximate derivatives, and solving linear systems **17.** can use MATLAB solver(s) for solving differential equations **18.** Use the MATLAB GUI effectively **19.** Design simple algorithms to solve problems **20.** Know where to find help
Indicative Contents المحتويات الإرشادية	**15.** We will learn how to start MATLAB and will familiarize ourselves with its user interface. We will learn how to use MATLAB as a sophisticated calculator. We will learn about syntax and semantics. We will see ways in which MATLAB provides help. Finally, we will learn how to create plots in MATLAB. **16.** The basic unit with which we work in MATLAB is the matrix. We solve problems by manipulating matrices, and operators are the primary means by which we manipulate them. We will learn how to define matrices, extract parts of them and combine them to form new matrices. We will learn how to use operators to add, subtract, multiply, and divide matrices, and we will learn that there are several different types of multiplication and division. Finally, we will learn MATLAB's rules for determining the order in which operators are carried out when more than one of them appear in the same expression. **17.** Functions let us break up complex problems into smaller, more manageable parts. We will learn how functions let us create reusable software components that can be applied in many different programs. We will learn how the environment inside a function is separated from the outside via a well-defined interface through which it communicates with that outside world. We will learn how to define a function to allow input to it when it initiates its execution and output from it when it is done.

	18. MATLAB has useful built-in functions and we will explore many of them in this section. We will learn about polymorphism and how MATLAB exploits it to change a function's behavior on the basis of the number and type of its inputs. Because random numbers play an important role in computer programming, we will learn how to use the MATLAB random number generator. We will learn how to get input from the keyboard, how to print to the Command Window, and how to plot graphs in a Figure window. Finally, we will learn how to find programming errors with the help of the debugger. **19.** Selection is the means by which MATLAB makes decisions about the order in which it executes its statements. We will learn how to use the if-statement, which is the most important method of selection. We will learn how to use relational operators and logical operators. We will learn how to write polymorphic functions and how to make functions resistant to error. **20.** Loops give computers their power. We will learn how to use both of MATLAB's loop constructs: the for-loop and the while-loop. We will learn how the break-statement works, and we will use nested loops. We will learn how to make loops more efficient. We will learn about logical indexing and will see how to use it to produce implicit loops that are efficient and easy for a user to understand. **21.** Computers operate on bits, but humans think in terms of numbers, words, and other types of data. Like any good language, MATLAB organizes bits into convenient data types. We will study those types in this section. We will learn that there are ten types of numbers and that there are conversion functions to change one type into another. We will learn much more about strings and how the characters in them are encoded as numbers. We will learn how to produce heterogeneous collections of data via structures and cells, and we will learn how to store points in time and time durations. **22.** Files are named areas in permanent memory for storing data that can be used as input or output to MATLAB and to other programs. We will be introduced to MATLAB's most important methods for reading and writing files. We will learn how to create, read from, and write into MAT-files, Excel files, text files, and binary files. We will learn how to navigate among folders with MATLAB commands.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for 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)	3,8 and 12	LO #1, #2,#4,#5 and #6
	Assignments	4	10% (10)	2,5,10 and 14	LO #1, #3,#5 and #7
	Projects / Lab.	3	20% (20)	Continuous	All
	Report				
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #3
	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 MATLAB
Week 2	The MATLAB environment
Week 3 &4	Matrices and operators
Week 5&6	Functions
Week 7& 8& 9	Programmer's toolbox

Week 10&11	If statement
Week 12	Loops
Week 13	Data type
Week 14	File input/output
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	MATLAB documentation https://www.mathworks.com/help/MATLAB/	No
Recommended Texts	Introduction to MATLAB for Engineering Students	No
Websites	https://www.mathworks.com/products/MATLAB.html	

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

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

Code	Course/Module Title	ECTS	Semester
NTU 101	COMPUTER PRINCIPLES	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	4	78	72
Description			
This course teaches computer programming to those with little to no previous experience. It uses the programming system and language called MATLAB to do so because it is easy to learn, versatile and very useful for engineers and other professionals. MATLAB is a special-purpose language that is an excellent choice for writing moderate-size programs that solve problems involving the manipulation of numbers. The design of the language makes it possible to write a powerful program in a few lines. The problems may be relatively complex, while the MATLAB programs that solve them are relatively simple: relative, that is, to the equivalent program written in a general-purpose language, such as C++ or Java. As a result, MATLAB is being used in a wide variety of domains from the natural sciences,			

through all disciplines of engineering, to finance, and beyond, and it is heavily used in industry. Hence, a solid background in MATLAB is an indispensable skill in today's job market. Nevertheless, this course is not a MATLAB tutorial. It is an introductory programming course that uses MATLAB to illustrate general concepts in computer science and programming. Students who successfully complete this course will become familiar with general concepts in computer science, gain an understanding of the general concepts of programming, and obtain a solid foundation in the use of MATLAB.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Design of Robot Arms**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 404**			☐ **Tutorial**	
ECTS Credits	**7**			☒ **Lab**	
SWL (hr/sem)	**175**			☐ **lecture** ☐ **Practical** ☒ **Seminar**	
Module Level	**4**		**Semester of Delivery**		**8**
Administering Department	**AM**		**College**		**TEMO**
Module Leader	**Ayman Sabah**		**e-mail**		**aymansabah@ntu.edu.iq**
Module Leader's Acad. Title	**Lecturer**		**Module Leader's Qualification**		**Ph.D.**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	**23/9/2023**		**Version Number**		**1.0**

Relation with other Modules العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of robotics through the application of techniques. 2. Understand robot configuration, structures, basic components, workspace and generations of robots. 3. Get acquainted with performing spatial transformations and solve kinematics of the robot 4. Learn about various sensors, actuators, and robot programming. 5. Understand the present & future applications of a robot.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate knowledge of industrial robots. 2. Apply spatial transformation to obtain forward and inverse kinematics. 3. Solve robot dynamics problems. 4. Demonstrate knowledge of sensors and actuators. 5. Demonstrate knowledge in control systems for motion control 6. Demonstrate knowledge of end effectors and grippers. 7. Learn numerical methods to solve problems in kinematics. 8. generate trajectory for path planning. 9. Appreciate applications of robots in industry. 10. Learn about trends in robot design. 11. Demonstrate knowledge in parallel manipulators and its applications. 12. Development of critical thinking and problem-solving skills.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A – kinematics** A manipulator can be schematically represented from a mechanical viewpoint as a kinematic chain of rigid bodies(links) connected by means of ***joints*** (revolute, prismatic etc.). one end of the chain is constrained to a ***base***, while an ***end-effector*** is mounted to the other end, in order to manipulate an object in space it is necessary to describe the end-effector position and orientation.

	Kinematics is the science of geometry in motion, it is restricted to pure geometrical description by means of position and orientation and their time derivatives, there are two problems in kinematics. **1- The direct kinematic problem** is finding the pose of the end effector position and orientation for specific inputs. **2-The inverse kinematics problem** involves mapping the known position and orientation of the end effector to a set of input joint variables while achieving that pose. **Part B – dynamics and control** Dynamics is the science of ***motion***. It describes why and how a motion occurs when forces and moments are applied on massive bodies, in robotics the dynamic equation of motion for manipulators is utilized to set up the fundamental equations for control. Control is the science of ***desired motion***. It relates the dynamics and kinematics of a robot to a prescribed motion; it includes optimization problems to determine forces so that the system will behave optimally. Path and trajectory planning is part of control in which we plan a path followed by the manipulator in a planned time profile.

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 online videos.

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	**97**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**4**	**10% (10)**	**2,5 and 8,12**	**LO #1, #4 and #9, #11**
	Assignments	**5**	**10% (10)**	**3, 6 and 9, 11, 14**	**LO #2, #3 and #7, #10, #12**
	Lab.	**7**	**15% (15)**	**Continuous**	**All**
	Report	**1**	**5% (5)**	**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	Introduction of Robotic Systems
Week 2	Robot Arm components
Week 3	Robot Arm Kinematics
Week 4	Robot Arm Dynamics
Week 5	Robot Arm Dynamics
Week 6	Numerical Methods in Kinematics
Week 7	**Mid-Term Exam**
Week 8	Robot Arm Programming languages and systems
Week 9	Robot Arm Design Considerations
Week 10	Robot Arm Motion Planning

Week 11	Robot Arm Linear Control Systems
Week 12	Robot Arm Nonlinear Control Systems
Week 13	Robot Arm Applications in Applied Engineering
Week 14	Emerging Trends in Robot Arm Design
Week 15	Parallel Robotic Manipulators
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: servo motors
Week 2	Lab 2: Construction of sequence and steps for robot arm motion
Week 3	Lab 3: LabVIEW
Week 4	Lab 4: Construction and Control of Mobile robot using NXT-LabVIEW
Week 5	Lab 5: Introduction to simulink
Week 6	Lab 6: robotics toolbox in Simulink
Week 7	Lab 7: Building a robot arm model with Simulink

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Introduction to Robotics Mechanics and Control by John J. Craig	**No**
Recommended Texts	Theory of applied robotics by Reza N. Jazar	**No**
Websites	https://www.edx.org/search?q=robotics robotics foundation	

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

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

Code	Course/Module Title	ECTS	Semester
AM 404	**Design of Robot Arms**	**7**	**8**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**2**	**78**	**97**
Description			
The study of robotics concerns itself with the desire to synthesize some aspects of human function by the use of mechanisms, sensors, actuators, and computers. This module introduces the science and engineering of mechanical manipulation. This subdiscipline of robotics has its foundations in several classical fields. The major relevant fields are mechanics, control theory, and computer science. In this module we cover topics from mechanical engineering and mathematics, control-theoretical material, it is helpful if the student			

has had one basic course in statics and dynamics and control and a course in linear algebra. this module is appropriate for a fourth course graduate level.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**CAD/CAM**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 405**			☐ **Lecture**	
ECTS Credits	**7**			☒ **Lab**	
SWL (hr/sem)	**175**			☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Level	**4**	**Semester of Delivery**	**8**		
Administering Department	**AM**	**College**	**TEMO**		
Module Leader	**Hasan abdulellah Abdulla**	**e-mail**	**hasan.alsarraf@ntu.edu.iq**		
Module Leader's Acad. Title	**Asst. Lecturer**	**Module Leader's Qualification**	**M.Sc.**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**23/9/2023**	**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	This course is to teach the theory and tools of Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) with an emphasis on the central role of the geometric model in their seamless integration. It focuses on the integration of these tools and the automation of the product development cycle. It is to introduce geometric modeling techniques, data structure design and algorithms for solid modeling. It also covers the machining theory, automated CNC machining, and process control.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. explain the concepts and underlying theory of modeling and the usage of models in different engineering applications. 2. Create accurate and precise geometry of complex engineering systems and use the geometric models in different engineering applications. 3. Compare the different types of modeling techniques and explain the central role solid models play in the successful completion of CAD/CAM-based product development. 4. Use and assess commercial CAD/CAM tools efficiently, effectively and intelligently in advanced engineering applications. 5. Use current state-of-the-art CAD/CAM technology in research. 6. Extend CAD/CAM technology for research and development purposes 7. Explain the basic concepts of CNC programming and machining
Indicative Contents المحتويات الإرشادية	Fundamentals of CAD: The design process, applications of computer for design, creating the Manufacturing, Database, The design workstation, Graphical Terminal, Operator input Devices, Plotters and other devices, Computer graphics Software and Database: Configuration, Graphics Packages, Constructing the Geometry, transformations, solid modeling CAM – Introduction, Numerical Control and NC Part Programming: NC Coordinate system, NC motion control system, Economics of NC, Manual and Computer Aid Programming, NC programming with interactive graphics Machine Tools and related Equipment, Materials Handling and Storage system, computer system.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The primary approach utilized in this module is to foster active student engagement through exercises, which aim to enhance their critical thinking abilities. This will be accomplished through a combination of interactive classes, tutorials, and hands-on experiments that involve various sampling activities, specifically designed to capture students' interest. By encouraging participation and providing opportunities for

	practical application, students will be able to refine and expand their critical thinking skills. The module will prioritize creating an interactive learning environment that enables students to actively engage with the subject matter and develop a deeper understanding of the concepts through real-world examples and problem-solving exercises.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
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	**97**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	**3**	**10% (10)**	**3, 8 and 12**	**LO #1, #2, #4, and #7**
	Assignments	**6**	**10% (10)**	**4, 6, 7, 9, 11 and 13**	**LO #3, #5, and #6**
	Projects / Lab.	**10**	**20% (20)**	**Continuous**	**All**
	Report				
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1 - #7**
	Final Exam	**3hr**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered

Week 1	CAD/CAM theory
Week 2	Introduction to CAD/CAM
Week 4	Geometric modeling
Week 5	Computer graphics
Week 6	Product Design and development
Week 7	Product Manufacturing and management
Week 8	Future directions for CAD/CAM
Week 9	Solidworks CAD/CAM package (labs)
Week 10,11,12	CAD/CAM Programming
Week 12,13,14	CNC machining (labs)
Week 15	ACIS open architecture kernel (labs)
Week 16	**Preparatory week before the final Exam**

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	CAD/CAM: Computer-Aided Design and Manufacturing by M. Groover	Yes
Recommended Texts	CAD/CAM/CIM P.Radhakrishnan & Subramanyam, Willey Eastern Limited.	yes
Websites	https://learnengineering.in/mechanical-drawing-books/	

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

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

Code	Course/Module Title	ECTS	Semester
AM 405	**CAD/CAM**	**7**	**8**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	**4**	**78**	**97**
Description			
This course is to introduce computer-aided design (CAD) and computer-aided manufacturing (CAM) theory and applications. The course subjects include CAD/CAM systems, Geometric modeling, data exchange and integration, mechanical assembly, mechanical tolerancing, process planning and Tool path generation,			

integration of CAD/CAM with the production machine, and Computer control of machines and processes in manufacturing systems. Projects will focus on sold modeling for design and manufacturing applications and the use of commercial CAD/CAM software for automating the production cycle. Applications include NC machining, design of (optimum) cutting tools and modeling and design of fixtures for dies and molds.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Systems modeling and simulation**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 406**			☐ **Lecture**	
ECTS Credits	**7**			☒ **Lab**	
SWL (hr/sem)	**175**			☐**Tutorial**	
				☐ **Practical**	
				☒ **Seminar**	
Module Level	**4**	**Semester of Deliver**	8		
Administering Department	**AM**	**College**	TEMO		
Module Leader	Tariq Khaild	**e-mail**	asmaa.taha@ntu.edu.iq		
Module Leader's Acad. Title	Assist Professor	**Module Leader's Qualification**	M.Sc.		
Module Tutor	Name (if available)	**e-mail**	E-mail		
Peer Reviewer Name	Name	**e-mail**	E-mail		
Scientific Committee Approval Date	23/9/2023	**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. Understand the fundamental concepts and principles of systems modeling and simulation. 2. Develop the skills to create mathematical models of complex systems using appropriate modeling techniques. 3. Acquire knowledge of simulation methods and tools for analyzing and evaluating system behavior. 4. Apply modeling and simulation techniques to solve practical engineering problems and make informed decisions. 5. Enhance critical thinking and problem-solving skills through the analysis and interpretation of simulation results. 6. Develop the ability to validate and verify simulation models to ensure their accuracy and reliability
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. Upon satisfactory completion of the course, the student will be able to: 2. Understand the principles and techniques of systems modeling and simulation. 3. Develop the skills to create and analyze mathematical models of complex systems. 4. Apply simulation tools and software to simulate and study the behavior of systems. 5. Interpret and analyze simulation results to gain insights into system performance and behavior. 6. Design and execute simulation experiments to test hypotheses and validate models. 7. Collaborate effectively in teams to develop and implement simulation projects. 8. Communicate simulation findings and results effectively through written reports and presentations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Introduction to Systems Modeling and Simulation, Mathematical Modeling, Discrete Event Modeling and Continuous System Modeling [15 hrs] Verification and Validation of Models, Simulation Output Analysis, Modeling and Simulation of Mechanical Systems and Optimization in Simulation [15 hrs] Revision problem classes [6 hrs]

	Part B Agent-Based Modeling and Simulation, System Dynamics Modeling, Monte Carlo Simulation [15 hrs] Simulation Modeling in Manufacturing, Simulation of Energy Systems, Simulation for Decision Support [15 hrs] Final Project and Presentation

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The primary approach utilized in this module is to foster active student engagement through exercises, which aim to enhance their critical thinking abilities. This will be accomplished through a combination of interactive classes, tutorials, and hands-on experiments that involve various sampling activities, specifically designed to capture students' interest. By encouraging participation and providing opportunities for practical application, students will be able to refine and expand their critical thinking skills. The module will prioritize creating an interactive learning environment that enables students to actively engage with the subject matter and develop a deeper understanding of the concepts through real-world examples and problem-solving exercises.

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	112	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluationتقييم المادة الدراسية				
	Time/Numbe	**Weight (Marks)**	**Week Due**	**Relevant Learning**

		r			Outcome
Formative assessment	**Quizzes**	4	15% (15)	2, 4, 8, and 10	LO #1, #2, #3, #5 and #8
	Assignments	2	10% (10)	3 and 9	LO #4, #6, #7, #9 and #10
	Projects / Lab.	6	15% (15)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
syllabus	**Material Covered**
Week 1	**Introduction to Systems Modeling and Simulation**
Week 2	**Mathematical Modeling**
Week 3	**Discrete Event Modeling**
Week 4	**Continuous System Modeling**
Week 5	**Verification and Validation of Models**
Week 6	**Simulation Output Analysis**
Week 7	**Mid-term exam**
Week 8	**Modeling and Simulation of Mechanical Systems**
Week 9	**Optimization in Simulation**
Week 10	**Agent-Based Modeling and Simulation**
Week 11	**System Dynamics Modeling**
Week 12	**Monte Carlo Simulation**
Week 13	**Simulation Modeling in Manufacturing**

Week 14	**Simulation of Energy Systems**
Week 15	**Simulation for Decision Support**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: **Systems Modeling and Simulation**
Week 2	Lab ٢: **Mathematical Modeling**
Week 3	Lab ٣: **Discrete Event Modeling**
Week 4	Lab ٤: **Continuous System Modeling**
Week 5	Lab ٥: **Verification and Validation of Models**
Week 6	Lab ٦: **Simulation Output Analysis**
Week ٧	Lab ٧: **Modeling and Simulation of Mechanical Systems**
Week ٨	Lab ٨: **Optimization in Simulation**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. **"System Simulation Techniques with MATLAB and Simulink" by Dingyu Xue and Yangquan Chen** 2. **"Discrete-Event System Simulation" by Jerry Banks, John S. Carson II, Barry L. Nelson, and David M. Nicol** 3. **"System Dynamics" by William J. Palm III**	On-line
Recommended Texts	1. **"Simulation Modeling and Analysis" by Averill M. Law and W. David Kelton** 2. **"Principles of Modeling and Simulation: A Multidisciplinary Approach" by John A. Sokolowski and Catherine M. Banks**	No
Websites	1. **www.anylogic.com** 2. **www.mathworks.com** 3. **www.simio.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.

Code	Course/Module Title	ECTS	Semester
AM 406	Systems modeling and simulation	7	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	2	63	112

Description

Systems modeling and simulation is a discipline that involves the development and analysis of mathematical models to simulate the behavior of complex systems. It provides a powerful tool for understanding, predicting, and optimizing the performance of various systems, ranging from mechanical and electrical systems to biological and social systems. This course aims to introduce students to the fundamentals of systems modeling and simulation and equip them with the necessary knowledge and skills to apply these techniques in real-world engineering problems.

The course covers topics such as mathematical modeling techniques, simulation algorithms, system dynamics, discrete event simulation, and validation and verification of simulation models. Students will learn how to translate real-world systems into mathematical models, analyze the behavior of the models using simulation software, and interpret the simulation results to make informed decisions. Practical examples and case studies will be used to illustrate the application of systems modeling and simulation in different engineering domains. By the end of the course, students will have a solid understanding of systems modeling and simulation principles and will be able to apply these techniques to solve complex engineering problems.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**Engineering and Industrial Management**	**Module Delivery**
Module Type	**Basic**	☒ **Theory** ☐ **Lecture** ☐ **Lab**
Module Code	**TEMO 402**	
ECTS Credits	**7**	
SWL (hr/sem)	**175**	

		☒ Tutorial ☐ Practical ☒ Seminar

Module Level	**4**	**Semester of Deliver**	**8**
Administering Department	**AM**	**College**	**TEMO**
Module Leader	**Omar Abdulhadi Mustafa**	**e-mail**	**Omeralhayaly1@ntu.edu.iq**
Module Leader's Acad. Title	**Lecture**	**Module Leader's Qualification**	**Ph.D.**
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	**23/9/2023**	**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.** Introduce the student to the methods of management and the appropriation each of them in different fields work. **2.** Introduce the student to exercise the different methods of the management on the mini groups to elevate his ability in management. **3.** Enhance the student skills in management by giving the typical solution on the assumed problem. **4.** Introducing students to different types of feasibility study and how can do assessment each of them. **5.** Introducing students to make the network planning for the different engineering processes.

	6. Introducing the student to the administrative and production organization of industrial enterprises. 7. Introducing the student to Break-Even Analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enable the student to use knowledge to manage the different purposes organizations. 2. Enable engineers to use modern programs to solve the technical problems in organizations where they managed. 3. Enable engineers to layout the administrative and production organization of industrial enterprises. 4. Enable engineers to layout the network planning for the different engineering processes and finding the typical path of the minimum duration that offers the best quality of the production. 5. Enable engineers to study the feasibility of the industrial processes which leads to successful of the production. 6. Enable engineers to calculate the Break-Even of any production or trading process and calculating the duration of that case. 7. Enhance the student skills in management by giving the typical solution on the assumed problem.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** • BUILDING SURVEY Introduction to the management [10 hrs] Modern methods of the management [15 hrs] Feasibility study [15 hrs] • BREAK-EVEN ESTIMATION The necessity of calculations of the break-even point and its duration. [15 hrs] • FEASIBILITY STUDY The necessity of the different field feasibility study [15 hrs] • Administrative and production organization of industrial enterprises The meaning of the administrative and production organization of industrial

	enterprises and how can make the most appropriate administrative layout [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 management 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	**127**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**8**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

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

Formative assessment	**Quizzes**	**3**	**20% (20)**	**3, 5 and 10**	**LO #1, #2 and #5**
	Assignments	**3**	**20% (20)**	**4, 8 and 12**	**LO #3, #4, #6 and #7**
	Report				
Summative assessment	**Midterm Exam**	**2 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 1	Introduction – definition and examples related to the industrial engineering management - Functions of management
Week 2	Establish Goals and Objectives.
Week 3	Feasibility Study, Technical feasibility, Economic feasibility
Week 4	Feasibility Study, Schedule feasibility, Operational feasibility.
Week 5	Analyzing Costs vs. Benefits, Calculating Present Value, Net Present Value (NPV), Internal Rate of Return (IRR).
Week 6	Break-Even Analysis, Break-point calculations.
Week 7	Administrative and production organization of industrial enterprises, Linear structure, Consulting structure, Functional structure.
Week 8	Introduction in Network planning.

Week 9	Network planning, calculation of the critical path, float time, meaning of the early start, early finish, late start and late finish.
Week 10	Network planning, Program Evaluation and Review Technique (PERT).
Week 11	Quality Control and production inspection method
Week 12	Industrial costs and controllable cost techniques
Week 13	Maintenance
Week 14	Replacement
Week 15	Self-assessment control

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	د. عادل عبد المالك " الهندسة الصناعية "– دار الكتب للطباعة والنشر - جامعة البصرة - الطبعة الأولى ٢٠٠	**Yes**
Recommended Texts	د. خليل العاني ، د. إسماعيل إبراهيم القزاز ، د. عادل عبد المالك آوريال " إدارة الجودة الشاملة ومتطلبات الأيزو ٩٠٠١:٢٠٠٠ " الطبعة الأولى ٢٠٠١ ، مطبعة الأشقر - بغداد	**No**
Websites	**1.** https://www.workamajig.com/blog/critical-path-method **2.** https://www.editorialmanager.com/cherd/default2.aspx?pg=AuthorshipVerification.aspx&docid=50317&authorID=%7b0854344E-1B2D-43DE-9697-4095BA17131E%7d&msid=%7bC7C1D8B5-7EF8-4FDD-B449-5CE3CD0A947A%7d **3.** https://www.investopedia.com/terms/q/quality-control.asp	

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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Code	Course/Module Title	ECTS	Semester
TEMO 402	**Engineering and Industrial Management**	**7**	**8**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**1**	**48**	**127**
Description			

The subject aims to encourage students' participation in the management 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 assumptions involving some sampling activities that are interesting to the students.

The results of this module study will leads to:

1. Enable the student to use knowledge to manage the different purposes organizations.
2. Enable engineers to layout the administrative and production organization of industrial enterprises.
3. Enable engineers to layout the network planning for the different engineering processes and finding the typical path of the minimum duration that offers the best quality of the production.
4. Enable engineers to study the feasibility of the industrial processes which leads to successful of the production.
5. Enhance the student skills in management by giving the typical solution on the assumed problem.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Control systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 400**			☐ **Lecture**	
ECTS Credits	**7**			☒ **Tutorial**	
SWL (hr/sem)	**175**			☒ **Lab**	
				☐ **Seminar**	
Module Level	**4**		**Semester of Deliver**		**7**
Administering Department	**AM**		**College**	**TEMO**	
Module Leader	**Prof. Dr. Haitham M. Wadullah**		**e-mail**	**Dr.haitham@ntu.edu.iq**	
Module Leader's Acad. Title	**Prof.**		**Module Leader's Qualification**		**PhD**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		

Scientific Committee Approval Date	23/9/2023	Version Number	1.0

Relation with other Modules			
Prerequisite module	**None**	**Semester**	
Co-requisites module	**None**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	on module objectives for a control systems course: Basic Control Systems Module Objectives: 1. Understanding Control Systems Basics: • Define key control system terms and concepts. • Explain the basic components of a control system. 2. Modeling of Systems: • Describe mathematical modeling techniques for physical systems. • Develop mathematical models for simple physical systems. 3. Analysis of Linear Time-Invariant Systems: • Analyze the behavior of linear time-invariant systems in time and frequency domains. • Apply Laplace transforms and transfer function analysis. 4. Control System Design: • Design basic control systems using proportional-integral-derivative (PID) controllers. • Understand stability criteria (like Routh-Hurwitz stability criterion). 5. Frequency Response Analysis: • Analyze systems using frequency response techniques. • Understand Bode plots and Nyquist plots. 6. Introduction to Modern Control Theory: • Introduce concepts of state-space representation. • Understand controllability and observability.

Module Learning Outcomes	Knowledge and Understanding: 1. Understanding Basic Concepts: • Demonstrate a clear understanding of fundamental concepts related to linear control systems, including system modeling, transfer functions, and feedback control. 2. Mathematical Representation: • Apply mathematical techniques to represent and analyze linear time-invariant systems using differential equations, Laplace transforms, and transfer functions. 3. Stability Analysis: • Analyze the stability of linear control systems using methods such as the Routh-Hurwitz criterion and root locus analysis. 4. Frequency Domain Analysis: • Apply frequency domain analysis techniques, including Bode plots and Nyquist plots, to analyze the behavior of systems in the frequency domain. Skills: 1. System Modeling: • Develop mathematical models for physical systems and represent them in transfer function or state-space form. 2. Controller Design: • Design and analyze controllers, such as proportional-integral-derivative (PID) controllers, to achieve desired system performance and stability. 3. Frequency Response Analysis: • Use frequency response analysis to design and optimize controllers for specific frequency-domain specifications. 4. Root Locus Analysis: • Apply root locus techniques to understand and design control systems by plotting the locations of poles as system parameters vary. 5. Stability Assessment: • Determine the stability of a given system using various stability criteria and assess the stability margins.

	Application and Problem Solving: 1. Real-world Applications: • Apply control system concepts to real-world engineering problems, such as robotics, electrical circuits, and mechanical systems. 2. Problem Solving: • Analyze and solve complex control system problems using appropriate methods and tools, demonstrating critical thinking and problem-solving skills. 3. Controller Tuning and Optimization: • Tune and optimize controllers to meet specific performance requirements, considering factors such as stability, transient response, and steady-state error. Practical Skills: 1. Simulation and Analysis: • Use simulation software to model and analyze the behavior of linear control systems and validate theoretical concepts through simulations. 2. Experimental Implementation: • Implement control algorithms on experimental platforms (such as microcontrollers) and analyze the real-time responses of control systems. Communication and Teamwork: 1. Technical Communication: • Communicate control system concepts effectively
Indicative Contents	**Part A:** Fundamentals of **control system**, General **control system** [25 hours] Introduction to control system, **control system** elements, Principles of **control system** [25 hours] Revision Session and Quiz [2 hours]

	Part B: tutorial of symbols, equipment's and Counters, timers, introduction to inverter [25 hours] PLC system structure, Basic ladder logic Timers, Counters & Comparators [25 hours] Up Counter (CTU), Down Counter (CTD), Latch and Unlatch Logic Memory Concept in Allen Bradley PLC, and Hardware of PLC circuit, review of PLC ladder. [25 hours] Revision Session and Quiz [2 hours] Revised Description: Part A of the Engineering Measurement and Control Systems course provides students with a solid understanding of the fundamental principles in this field. The module begins by covering the basics of measurement, including different measurement techniques and the use of instruments. Students will then delve into the topic of control systems and explore considerations related to Programmable Logic Controllers (PLCs). To reinforce the learned concepts, a revision session and quiz will be conducted, allowing students to review and assess their understanding. This module serves as a crucial foundation for further studies in the field of Engineering Measurement and Control Systems.
Learning and Teaching Strategies	
Strategies	1. Active Participation: Actively engage in class discussions, ask questions, and contribute to group activities. This will help you better understand the concepts and reinforce your learning. 2. Practical Application: Apply the theoretical knowledge to real-world examples and projects. Participate in laboratory sessions and hands-on activities to gain practical experience in measurement and control systems. 3. Problem-Solving Approach: Develop strong problem-solving skills by practicing solving different types of measurement and control problems. Work on assignments and projects that require critical thinking and analytical skills

Student Workload (SWL)			
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	82	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1and #2
	Assignments	2	5% (5)	2 and 12	LO #2 and #3
	Projects / Lab.	9	15% (15)	Continuous	LO #1 and #3
	Report	1	10% (10)	13	LO #3
Summative assessment	Midterm Exam	2hr.	10% (10)	7	LO #1 - #2
	Final Exam	2hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
Week	Material Covered
Week 1	Introduction to Control Systems
Week 2	• Definition and types of control systems

Introduction to Control Systems

Mathematical Modeling Mechanical Systems

Time Domain Analysis o Mechanical Systems

	• Open-loop vs. closed-loop systems • Importance of control systems in mechanical engineering • Examples of control systems in mechanical engineering applications
Week 3	Mathematical Modeling of Mechanical Systems • Modeling mechanical systems using Newton's laws and energy methods • Transfer function representation for mechanical systems
Week 4	• State-space representation and its applications in mechanical engineering
Week 5	Time Domain Analysis of Mechanical Systems
Week 6	• Time response analysis of first-order and second-order mechanical systems • Time response specifications in mechanical systems • Analysis of higher-order mechanical systems • Mechanical vibrations and control
Week 7	Laplace Transform and Transfer Functions
Week 8	• Laplace transform applications in mechanical systems • Derivation of transfer functions for mechanical systems • Poles and zeros of mechanical systems • Frequency response analysis for mechanical systems
Week 9	Stability Analysis and Controller Design
Week 10	• Routh-Hurwitz stability criterion for mechanical systems • Root locus analysis for mechanical systems • Controller design techniques: PID controllers for mechanical systems

	• Frequency domain controller design for mechanical systems
Week 11	State-Space Analysis and Modern Control Techniques
Week 12	• State-space representation for mechanical systems • Controllability and observability of mechanical systems • State feedback control for mechanical systems • Introduction to modern control techniques: adaptive control, intelligent control
Week 13	Digital Control Systems and Practical Implementation
Week 14	• Sampling theorem and digital control systems • Z-transform and digital controller design • Simulation of mechanical control systems using software tools (e.g., MATLAB/Simulink) • Hardware implementation of control algorithms on microcontrollers
Week 15	Advanced Topics and Applications • Robust control techniques for mechanical systems • Case studies of control systems in mechanical engineering applications (e.g., robotics, automotive systems) • Ethical considerations in control system design for mechanical engineering applications • Review, Q&A session, and final project presentations
Week 16	

Delivery Plan (Weekly Lab. Syllabus)

Week	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. **"Modern Control Engineering" by Katsuhiko Ogata** a. This book provides a comprehensive introduction to modern control theory and its practical applications. It covers topics such as state-space analysis, digital control systems, and robust control techniques. **b.**	**Yes**
Recommended Texts	1. **"Control Systems Engineering" by Norman S. Nise** a. Nise's book is known for its clear explanations and practical examples. It covers classical control theory, as well as modern control techniques and applications. The book also includes case studies and real-world examples.	**Yes**

Websites	**MIT OpenCourseWare - Control Systems Engineering** 1. MIT offers free course materials online, including lecture notes, assignments, and exams for a Control Systems Engineering course. Visit: MIT OCW - Control Systems 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
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	D – Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
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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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Code	Course/Module Title	ECTS	Semester
AM 400	**Control systems**	**7**	**7**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**4**	**93**	**82**

Description

Control systems involve the application of various techniques and technologies to measure, monitor, and control physical variables and processes in industrial, engineering, and scientific applications. This field encompasses the design, implementation, and optimization of systems that ensure accurate and reliable measurements, as well as effective control of processes.

Measurement and Control Systems play a crucial role in industries such as manufacturing, power generation, automation, and instrumentation. They involve sensors, transducers, data acquisition systems, signal processing techniques, and control algorithms. These systems enable precise measurement of variables like temperature,

pressure, flow rate, and level, and utilize control strategies to regulate and optimize processes.

Understanding Measurement and Control Systems requires knowledge of sensors, data acquisition methods, signal conditioning, measurement principles, control theory, and instrumentation. Professionals in this field need to analyze system behavior, design control algorithms, implement hardware and software components, and troubleshoot issues. This field is constantly evolving with advancements in technology, such as the integration of Internet of Things (IoT), machine learning, and cloud computing. Measurement and Control Systems are vital for ensuring efficiency, safety, and reliability in various industries, making it a critical area of study for engineers and scientists.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Programming Language**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 401**			☐ **Lecture**	
ECTS Credits	**7**			☒ **Lab**	
SWL (hr/sem)	**175**			☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Level	**4**		**Semester of Delivery**	**7**	
Administering Department	**AM**		**College**	**TEMO**	
Module Leader	**Ayman sabah**		**e-mail**	**aymansabah@ntu.edu.iq**	
Module Leader's Acad. Title	**lecturer**		**Module Leader's Qualification**	**Ph.D.**	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	23/9/2023		**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 Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To understand why Python is a useful scripting language for developers. 2. To learn how to design and program Python applications. 3. To learn how to use lists, tuples, and dictionaries in Python programs. 4. To learn how to identify Python object types. 5. To learn how to use indexing and slicing to access data in Python programs. 6. To define the structure and components of a Python program. 7. To learn how to write loops and decision statements in Python. 8. To learn how to write functions and pass arguments in Python. 9. To learn how to build and package Python modules for reusability. 10. To learn how to read and write files in Python. 11. To learn how to design object-oriented programs with Python classes. 12. To learn how to use class inheritance in Python for reusability. 13. To learn how to use exception handling in Python applications for error handling. 14. To learn computational thinking skills. 15. To develop creative and problem solving skills
Indicative Contents المحتويات الإرشادية	Introduction Strings and String Methods • What Is a String? • Concatenation, Indexing, and Slicing • Manipulate Strings with Methods • Interact with User Input Numbers and Math • Integers and Floating-Point Numbers • Arithmetic Operators and Expressions • Challenge: Perform Calculations on User Input • Math Functions and Number Methods • Complex Numbers Functions and Loops • What Is a Function, Really? • Write Your Own Functions

	Tuples, Lists, and Dictionaries • Tuples • Lists • Nesting, Copying, and Sorting Tuples and Lists • Store Relationships in Dictionaries Object-Oriented Programming (OOP) • Define a Class • Instantiate an Object • Inherit from Other Classes Modules and Packages • Working with Modules • Working with Packages File Input and Output • Files and the File System • Working with File Paths in Python • Reading and Writing Files Installing Packages with pip • Installing Third-Party Packages

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	**97**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem)	**175**		

الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10% (10)	5,7,9 and 13	LO #2 , #3 , #5 and #8
	Assignments	5	10% (10)	2,6,8,10 and 14	LO #1 ,#4 ,#6 ,#7 and #9
	Projects / Lab.	15	20%(20)	All	All
	Report				
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Course 1 Material Covered
Week 1,2	Introduction
Week 3	Strings and String Methods
Week 4	Numbers and Math
Week 5-6	Functions and Loops
Week 7-8	Tuples, Lists, and Dictionaries
Week 9-10	Object-Oriented Programming (OOP)
Week 11-12	Modules and Packages
Week 13	File Input and Output
Week 14-15	Installing Packages With pip

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Python Basics: A Practical Introduction to Python 3** **David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler**	**No**
Recommended Texts	**Learning Python, mark luiz**	**No**
Websites	**https://www.python.org/**	

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

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

Code	Course/Module Title	ECTS	Semester
AM 401	**Programming Language**	**7**	**7**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
1	**4**	**78**	**97**
Description			
This course aims to teach everyone the basics of programming computers using Python. We cover the basics of how one constructs a program from a series of simple instructions in Python. The course has no pre-requisites and avoids all but the simplest mathematics. Anyone with moderate computer experience should be able to master the materials in this course. Once a student completes this course, they will be			

ready to take more advanced programming courses.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

33Module Information معلومات المادة الدراسية					
Module Title	**Industrial Automation**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**AM 402**			☐ **Lecture**	
ECTS Credits	**7**			☒ **Lab**	
SWL (hr/sem)	**175**			☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Level	**4**	**Semester of Deliver**	**7**		
Administering Department	**AM**	**College**	**TEMO**		
Module Leader	**Asmaa Taha Hussein**	**e-mail**	**asmaa.taha@ntu.edu.iq**		
Module Leader's Acad. Title	**Lecture**	**Module Leader's Qualification**	**M.Sc.**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**23/9/2023**	**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	Upon satisfactory completion of the course, the student will be able to: 1. The main objective of process automation is to improve a company's workflows. 2. With automation, we can reduce costs, time, and waste as well as increase productivity, reduce mistakes, and control all the processes of the business in real time. 3. How robots are utilized in industrial applications 4. Enable the student to mode the control system to program. 5. Analyze the behavior of the system 6. Design and controller for the system and evaluate the outcome of the controlled system.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon satisfactory completion of the course, the student will be able to: 1. 1. Explain various reasons for employing automation in a manufacturing environment and describe various applications. 2. Describe the basic function of a sensor and an actuator in an automated system and give examples of both categories. 3. Select an appropriate sensor and/or actuator for a given automated application. 4. Describe the fundamentals of NC technology. 5. Use a Programmable Logic Controller (PLC) and embedded microcontroller, to perform specified control functions. 6. Describe the basic anatomy and attributes of an industrial robot. 7. Identify and distinguish the different components and interfaces in a Flexible Manufacturing System. 8. Troubleshoot a system and take appropriate action(s) to resolve the issue(s). 9. Design an automated system to meet defined operational specifications. 10. Research and summarize a unique technology and/or application in the field of robotics or automation.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A - Introduction to Automation** Basic principles and strategies of automation, Overview of manufacturing operations, Basic elements of an automated system [15 hrs]

	Overview of industrial control systems, Hardware components; sensors, actuators, ADC, DAC [15 hrs] Automation and Process Control, Logic control systems, Programmable Logic Controllers [10 hrs] Robotics and Automated Manufacturing Systems [4 hrs] Revision problem classes [6 hrs] **Part B - Industrial robotics** Fundamentals NC technology, Flexible manufacturing systems , [8hrs] Computer Integrated Manufacturing [10hrs] Flexible manufacturing systems (FMS), Computer Integrated Manufacturing (CIM) [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	**97**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**4**	**15% (15)**	**2, 4, 8, and 10**	**LO #1, #2, #3, #5 and #8**
	Assignments	**2**	**10% (10)**	**3 and 9**	**LO #4, #6, #7, #9 and #10**
	Projects / Lab.	**6**	**15% (15)**	**Continuous**	**All**
	Report				
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**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 Automation
Week 2	Manufacturing operations
Week 3	Introduction to automation, Introduction to industrial control systems
Week 4	Sensors, Actuators, Analog-to-Digital/Digital-to-Analog converters
Week 5	Analog-to-Digital/Digital-to-Analog converters
Week 6	Industrial Controllers, Logic control systems
Week 7	Logic Control
Week 8	Industrial Controllers, Programmable Logic Controllers (PLC)
Week 9	Industrial Controllers, Programmable Logic Controllers (PLC)
Week 10	Industrial Controllers, Microcontrollers
Week 11	Industrial Controllers, Microcontrollers
Week 12	Robotics and Automated Mfg System, Industrial robotics
Week 13	CAD-CAM system
Week 14	NC Technology
Week 15	Flexible manufacturing systems (FMS), Computer Integrated Manufacturing (CIM)
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: New Plant Development, Case Study
Week 2	Lab 2: ADC / DAC Conversions
Week 3	Lab 3: Ladder Logic / PLCs

Week 4	Lab 4: Embedded Control
Week 5	Lab 5: Robotics
Week 6	Lab 6: CIM Demonstration

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Automation, Production Systems, and Computer-Integrated Manufacturing, 3rd Ed. Pearson Education. ISBN 0-13-239321-2.	On-line
Recommended Texts	Handbook of Industrial Automation - Richard L. Shell and Ernest L. Hall.	No
Websites	https://mrcet.com/downloads/B.tech%20Digital%20Lecture%20notes/B.Tech%20IV%20Year%20I%20Semester/Automation%20And%20Control%20Engineering%20Digital%20Material.pdf	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
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Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
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Code	Course/Module Title	ECTS	Semester
AM 402	Automation system	7	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	3	78	97
Description			
The course on Automated Assembly Systems provides students with a comprehensive understanding of the concepts, principles, and relationships related to various automated manufacturing technologies. Topics covered include computer-aided drafting/design (CADD), computer-aided manufacturing (CAM), industrial			

robots, numerical control (NC), industrial lasers, programmable logic controllers (PLCs), automated guided vehicles (AGVs), flexible manufacturing systems (FMS), and computer-integrated manufacturing (CIM). Students will learn how these technologies work, their applications in industrial settings, and the principles behind their design and operation.

The course also focuses on control systems, where students will learn how to mathematically model a control system, analyze its behavior, design a suitable controller, and evaluate the performance of the controlled system. The prerequisite for this course is consent from the instructor. Through practical exercises, simulations, and case studies, students will gain hands-on experience in applying control theory to automated assembly systems. This course is essential for students pursuing careers in manufacturing engineering, industrial automation, and advanced manufacturing technologies.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Hydraulic and Pneumatic systems**			**Module Delivery**	
Module Type	**Core**			☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**AM 403**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	**3**	**Semester of Deliver**		**7**	
Administering Department	**AM**	**College**		**TEMO**	
Module Leader	**Tariq Khalid**	**e-mail**		**tariqalkhalidi@ntu.edu.iq**	
Module Leader's Acad. Title	**Assist. Professor**	**Module Leader's Qualification**		**M.Sc**	
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**23/9/2023**	**Version Number**		**1.0**	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**NO**	**Semester**	

Co-requisites module	**NO**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Module Objectives: Industrial Hydraulics and Pneumatics Systems Understanding the Fundamentals: **1-** Explain the basic principles of hydraulics and pneumatics, including fluid properties, pressure, flow, and force. Differentiate between hydraulic and pneumatic systems, their advantages, and limitations. Familiarize students with commonly used components and symbols in hydraulic and pneumatic systems. **2- Hydraulic Systems:** Describe the operation and components of hydraulic systems, such as pumps, actuators, valves, filters, and reservoirs. Demonstrate the ability to read and interpret hydraulic schematics and circuit diagrams. Analyze and calculate hydraulic system parameters, including pressure, flow rate, and force. Understand the principles of hydraulic system design, including sizing components and determining system efficiency. **3- Pneumatic Systems:** Explain the operation and components of pneumatic systems, such as compressors, actuators, valves, filters, and receivers. Interpret and analyze pneumatic schematics and circuit diagrams. Calculate and predict pneumatic system parameters, including pressure, flow rate, and force. Design and optimize pneumatic systems based on specific requirements, considering component selection and system efficiency. **4- System Maintenance and Troubleshooting:** Develop skills for troubleshooting common issues in hydraulic and pneumatic systems, such as leaks, pressure loss, and component failures. Understand preventive maintenance practices, including fluid quality control, filter replacement, and system inspections.

	Demonstrate the ability to diagnose and repair faults in hydraulic and pneumatic systems effectively. Implement safety protocols and procedures when working with hydraulic and pneumatic systems. **5- Applications and Integration:** Explore various industrial applications of hydraulic and pneumatic systems, such as material handling, robotics, automation, and control systems. Understand the integration of hydraulic and pneumatic systems with other mechanical and electrical systems. Evaluate system performance and efficiency in real-world applications. Analyze case studies and examples to identify opportunities for improvement and optimization.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** Understand the fundamental principles and concepts of hydraulics and pneumatics in industrial systems. **2.** Demonstrate knowledge of the components and their functions in hydraulic and pneumatic systems, including pumps, valves, actuators, and control devices. **3.** Analyze and interpret hydraulic and pneumatic circuit diagrams to understand the flow paths and control mechanisms. **4.** Apply fluid power laws and equations to calculate and predict system parameters such as pressure, flow rate, and force. **5.** Select appropriate hydraulic and pneumatic components based on system requirements and operational conditions. **6.** Design, assemble, and troubleshoot hydraulic and pneumatic circuits to meet specified performance objectives. **7.** Understand the principles of hydraulic and pneumatic actuators and their applications in industrial systems. **8.** Apply knowledge of hydraulic and pneumatic control systems to achieve desired motion and force control. **9.** Demonstrate an understanding of safety considerations and best practices when working with hydraulic and pneumatic systems. **10.** Apply principles of preventive maintenance and troubleshooting techniques to ensure efficient and reliable operation of hydraulic and pneumatic systems. **11.** Integrate hydraulic and pneumatic systems with other components and subsystems in industrial automation applications. **12.** Communicate effectively, both orally and in writing, to present and explain

	hydraulic and pneumatic concepts, designs, and solutions. By achieving these module learning outcomes, students will develop a solid understanding of industrial hydraulics and pneumatics and their applications in various industrial sectors. They will gain the knowledge and skills necessary to design, assemble, and troubleshoot hydraulic and pneumatic systems, ensuring optimal performance and reliability. Additionally, students will be able to integrate fluid power systems with other components in industrial automation, effectively communicate their ideas and solutions, and adhere to safety practices in working with hydraulic and pneumatic systems.
Indicative Contents المحتويات الإرشادية	**1. Introduction to Fluid Power Systems** • Overview of hydraulics and pneumatics in industrial applications • Advantages and limitations of hydraulic and pneumatic systems • Comparison between hydraulic and pneumatic systems **2. Basic Principles of Fluid Power** • Properties of fluids (liquids and gases) • Pascal's law and Boyle's law • Fluid flow and pressure measurement • Fluid power laws and equations **3. Hydraulic Components and Systems** • Hydraulic pumps and motors • Hydraulic cylinders and actuators • Control valves and directional control valves • Pressure control and flow control valves • Hydraulic reservoirs and filters **4. Pneumatic Components and Systems** • Compressors and air preparation units • Pneumatic cylinders and actuators • Directional control valves and flow control valves • Pressure regulators and quick exhaust valves • Pneumatic reservoirs and filters **5. Hydraulic and Pneumatic Circuit Design** • Reading and interpreting hydraulic and pneumatic circuit diagrams • Design considerations for fluid power circuits • Sequential control and logic operations • Safety and emergency shutdown systems

	• Troubleshooting techniques for circuit design **6. Actuators and Control Systems** • Hydraulic and pneumatic actuators: cylinders, motors, and rotary actuators • Actuator sizing and selection criteria • Position control and force control systems • Interfacing with other components and subsystems **8. Maintenance and Troubleshooting** **9. Applications of Industrial Hydraulics and Pneumatics** • Industrial machinery and equipment • Material handling systems • Mobile equipment and vehicles • Robotics and automation systems • Case studies and real-world examples Note: The indicative contents provided above give an overview of the topics typically covered in an Industrial Hydraulics and Pneumatics course. The actual contents may vary depending on the specific curriculum and academic institution, and may include additional topics or case studies based on industry-specific applications.

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)	**78**	**Structured SWL (h/w)**	**5**

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**97**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**2**	**10% (10)**	**4 and 11**	**LO #1,#2,#3,#4and #9,#10,#11**
	Assignments	**4**	**10% (10)**	**5,10,11 and 14**	**LO #5,#6,#8 and #12**
	Projects / Lab.	**15**	**15% (15)**	**Continuous**	**All**
	Report	**1**	**5% (5)**	**8**	**#7**
Summative assessment	**Midterm Exam**	**2hr**	**10% (10)**	**7**	**LO #1 - #6**
	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 Hydraulics and Pneumatics Overview of industrial hydraulics and pneumatics Differentiation between hydraulic and pneumatic systems
Week 2	Fundamentals of fluid properties, pressure, flow, and force
Week 3	Hydraulic Systems Components of hydraulic systems: pumps, actuators, valves, filters, and reservoirs
Week 4	Reading and interpreting hydraulic schematics and circuit diagrams
Week 5	Calculating hydraulic system parameters: pressure, flow rate, and force
Week 6	Pneumatic Systems Components of pneumatic systems: compressors, actuators, valves, filters, and receivers

Week 7	Interpreting and analyzing pneumatic schematics and circuit diagrams
Week 8	Calculating pneumatic system parameters: pressure, flow rate, and force
Week 9	Hydraulic System Design Principles of hydraulic system design Sizing components for optimal performance Determining system efficiency and power requirements
Week 10	Pneumatic System Design Principles of pneumatic system design Selecting appropriate components for specific applications Optimizing pneumatic system efficiency
Week 11	Safety in Hydraulics and Pneumatics
Week 12	System Maintenance and Troubleshooting Common issues in hydraulic and pneumatic systems Troubleshooting techniques for identifying and resolving problems
Week 13	Applications of Hydraulics and Pneumatics Industrial applications of hydraulic systems: material handling, robotics, automation Industrial applications of pneumatic systems: control systems, actuation, conveying Case studies and examples showcasing real-world applications
Week 14	Integration of Hydraulics and Pneumatics Integration with other mechanical and electrical systems Interfacing hydraulic and pneumatic systems with control systems Evaluating system performance and efficiency in integrated setups
Week 15	Study Review

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي العملي

Week	Material Covered
Week 1	Introduction to Hydraulic and Pneumatic Systems Overview of fluid power systems Applications and advantages of hydraulic and pneumatic systems
Week 2	Basic principles of fluid mechanics Safety considerations in fluid power systems
Week 3	Fluid Properties and Components Properties of hydraulic fluids and pneumatic gases
Week 4	Selection and characteristics of fluid power components (pumps, compressors, reservoirs, filters) Pressure, flow rate, and force calculations in fluid power systems
Week 5	Hydraulic Systems Hydraulic pumps and their types
Week 6	Control valves and their functions Hydraulic actuators: cylinders and motors
Week 7	Hydraulic circuit design and analysis
Week 8	Pneumatic Systems Compressors and their types Valves used in pneumatic systems
Week 9	Pneumatic actuators: cylinders and rotary motors Pneumatic circuit design and analysis
Week 10	Fluid Power Control Pressure control devices: relief valves, pressure regulators
Week 11	Flow control devices: flow control valves, orifices

	Directional control valves and their applications Proportional and servo valves
Week 12	Design considerations for efficient and reliable fluid power systems
Week 13	Advanced Hydraulic Systems Hydraulic accumulators and their applications
Week 14	Hydraulic motors: types and selection Electro-hydraulic systems and control
Week 15	Advanced Pneumatic Systems Air treatment: filtration, drying, and lubrication Pneumatic control valves and their functions

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Industrial Hydraulics and Pneumatics For Diploma in Mechanical Engg Purushottam Balaso Pawar	**yes**
Recommended Texts	Hydraulics and Pneumatics A technician's and engineer's guide Second edition Andrew Parr MSc., CEng., MIEE, MInstMC	**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.

Code	Course/Module Title	ECTS	Semester
AM 403	Hydraulic and Pneumatic systems	7	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	97

Description

The study of hydraulic and pneumatic systems involves understanding the fundamental principles of fluid mechanics, as well as the components and circuits used in these systems. Students learn about fluid properties, flow characteristics, pressure, and force calculations. They also explore topics such as pumps, valves, filters, reservoirs, pipelines, and actuators specific to hydraulic and pneumatic systems

By studying hydraulic and pneumatic systems, engineers gain the knowledge and skills to design, analyze, and troubleshoot these systems. They learn how to select appropriate components, determine system specifications, and optimize performance. Additionally, they understand the importance of safety considerations, maintenance, and efficient energy usage in fluid power applications.

Hydraulic and pneumatic systems offer several advantages in engineering applications. They provide high power density, precise control, and the ability to transmit forces over long distances. They are also known for their flexibility, as the fluid power can be easily routed and distributed throughout a system. Furthermore, these systems are generally reliable, durable, and resistant to harsh environmental conditions