

نموذج وصف البرنامج الأكاديمي

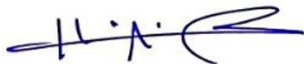
اسم الجامعة: القادسية
الكلية: الهندسة
القسم العلمي: هندسة المواد

اسم البرنامج الأكاديمي او المهني: بكالوريوس هندسة مواد

اسم الشهادة النهائية: بكالوريوس علوم في هندسة المواد

النظام الدراسي: نظام فصلي

تاريخ اعداد الوصف: ٢٠٢٦\٨\٣٠



التوقيع
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التاريخ: ٢٠٢٦\٨\٢٣



التوقيع
اسم رئيس القسم: أ. د. محمد عبد الرزاق
التاريخ: ٢٠٢٦\٨\٢٣

دقق الملف من قبل

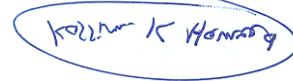
شعبة ضمان الجودة والأداء الجامعي:

التاريخ:

التوقيع



مصادقة السيد العميد





جامعة القادسية

بكالوريوس هندسة - هندسة مواد



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١. بيان المهمة والرؤية

بيان الرؤية

يطمح قسم هندسة المواد في جامعة القادسية إلى أن يكون جامعة بحثية تكنولوجية عامة رائدة، ملتزمة بالسعي إلى الاكتشاف ورعاية الإبداع وتشجيع الابتكار. هدفنا الأساسي هو تعليم خريجينا بثقافة الفضول والإبداع والثقة التي لا تتزعزع. ونتيجة لذلك، سوف يمتلكون الخصائص الأساسية التي يرغب فيها الشركاء العالميون، الذين يدركون أن مؤسستنا هي المصدر الأبرز للموظفين المدربين تدريباً عالياً والموهوبين ورجال الأعمال. نحن ملتزمون بتوفير أبحاث مبتكرة تمتد إلى حدود المعرفة والبرامج التعليمية والمنتجات والخدمات التي تظل ذات صلة في عالم متغير باستمرار. بالإضافة إلى ذلك، نطمح إلى أن نكون مركزاً للابتكار التكنولوجي، ونعمل باستمرار على توليد أفكار وحلول مبتكرة لمواجهة التحديات الهائلة في عصرنا. ومن خلال السعي بنشاط إلى التعاون مع الشركاء العالميين، نسعى جاهدين لتبادل المعرفة والتكنولوجيا والأفكار التقدمية التي تساهم في تحقيق تقدم ثوري.

بيان المهمة

يتمثل التزامنا في نهضة بيئة تعليمية أكاديمية صارمة ومنتجة وذات صلة داخل قسم هندسة المواد. ونعطي الأولوية باستمرار لمهامنا الأساسية في التدريس والبحث والخدمة لتزويد الطلاب وأعضاء هيئة التدريس والموظفين بتجربة تعليمية شاملة. هدفنا الأساسي هو تزويد الطلاب بتعليم شامل قائم على أساسيات علم هندسة المواد وممارستها. نسعى جاهدين لتنمية مهاراتهم في حل المشكلات في هذه التخصصات حتى يتمكنوا من مواجهة التحديات المعقدة بشكل إبداعي. نريد أن ننشئ محترفين أكفاء ومتنوعين ومنتجين من خلال نقل المهارات اللازمة.

نحن نؤكد بقوة على أهمية المنح الدراسية والتعليم المتقدم وتطوير المعرفة والمهارات في المجالات التقليدية لهندسة المواد. بالإضافة إلى ذلك، نسعى بنشاط إلى التعاون بين التخصصات المختلفة، وتجاوز الحدود لترسيخ أنفسنا كرواد مشهورين في مجال البحث والابتكار والاكتشاف، والحصول على اعتراف من مجتمعات البحث والأعمال المحلية والدولية. كما نلتزم بخدمة مهنتنا بكل تميز. وهذا يتطلب المشاركة الفعالة في أنشطة الخدمة داخل مجتمعاتنا المهنية على كافة المستويات المحلية والوطنية والدولية. بالإضافة إلى ذلك، نفي بمسؤولياتنا في إدارة الحرم الجامعي والإدارات، ومبادرات التوعية، وأنشطة الخدمة، لضمان أن تمتد مساهماتنا إلى ما هو أبعد من الأوساط الأكاديمية.

٢. مواصفات البرنامج

240	نظام النقاط الأوروبي ECTS	بكالوريوس في هندسة المواد	كود البرنامج: BSc-MTE
دوام كامل	طريقة الحضور:	4 مستويات، 8 فصول دراسية	المدة:

هندسة المواد هي موضوع واسع النطاق بشكل رائع. يركز البرنامج على إنشاء مهندسين متخصصين بهندسة المواد عاليي الجودة يتمتعون بمنظور عالمي وغرس الاحتراف وأخلاقيات العمل فيهم لبناء مجتمع أقوى. تحظى هذه الدرجة بشعبية - بالنسبة للبعض، فإن اتساع الموضوع هو ما يجذبهم، وبالنسبة للآخرين، فهي طريق للتخصص.

يُعرض المستوى الأول الطلاب لأساسيات هندسة المواد، وهو ما يناسب التقدم إلى جميع البرامج ضمن مجموعة البرامج المتعلقة بهندسة المواد. يتم تغطية الموضوعات الأساسية الخاصة بالبرنامج في المستوى الثاني، مما يعد تحضيرًا لوحدات المواد المتخصصة التي يقودها البحث في المستويين 3 و4.

في المستويات 2 و3 و4، يتمتع الطلاب بحرية اختيار أكثر من نصف وحداتهم الدراسية، بشرط اختيار مجموعة من الوحدات الدراسية التي تدرب الطالب على المواد الأساسية، من قوة المواد المختلفة وتطبيقاتها، لضمان اتساع المعرفة المتوقعة من الخريج الحاصل على درجة في هندسة المواد. وهذا يسمح للطلاب بتطوير اهتماماتهم الواسعة النطاق في علم المواد. يتم اتخاذ القرارات بشأن ما يدرسه بناءً على مدخلات من المعلمين الشخصيين.

البحث يتم تطوير وتعزيز الأخلاقيات منذ البداية من خلال التدريبات العملية، إما المضمنة في وحدات المحاضرات أو التي يتم تدريسها في وحدات عملية مخصصة وندوات بحثية ودروس تعليمية. هناك دورة ميدانية إلزامية في المستوى 1، والتي يجب على الطلاب اجتيازها للتقدم إلى المستوى 2. في المستوى 4، يقوم جميع الطلاب بإجراء مشروع بحث مستقل، والذي قد يكون وحدتين معتمدتين للفصل الدراسي الأول وحدتين معتمدتين للفصل الدراسي الثاني.

يتم أيضًا تقديم التدريب الصناعي. تتم مناقشة الاحتياجات الفردية مع المعلم المناسب، الذي يستوعبها حيثما أمكن ذلك.

٣. أهداف البرنامج

يهدف برنامج هندسة المواد إلى:

1. إعداد الطلاب ليكونوا ناجحين كمهندسين في مجال هندسة المواد.

2. المشاركة في مشاريع الخدمة التي تؤكد على المزايا المجتمعية لمفاهيم الهندسة.

3. - القدرة على مواصلة الدراسات العليا والتفرغ للنمو المهني المستمر والتعلم مدى الحياة من خلال ربط المهن الهندسية وغير الهندسية.

٤. نتائج تعلم الطلاب

يسعى البرنامج إلى توفير تجربة تعليمية شخصية وشاملة وعالمية المستوى بما يتماشى مع جامعة القادسية. وهو يمكن الخريجين من:

المهني: الحصول على منصب في حل مشاكل العالم الحقيقي باستخدام مهارات ومبادئ هندسة المواد التي تم تطويرها أثناء الدراسة في جامعة القادسية؛ الشخصية: المشاركة في النمو الشخصي والمهني المستمر من خلال البحث بنشاط عن مهارات وخبرات إضافية، على سبيل المثال، الانخراط في التعليم المستمر و/أو الحصول على درجات علمية متقدمة؛ المجتمعي: المساهمة في المجتمع من خلال إنشاء بيئات تعاونية وشاملة واستخدام مهارات حل المشكلات لخلق عالم أكثر عدلاً.

المخرج 1

القدرة على تحديد وصياغة وحل المشاكل الهندسية المعقدة من خلال تطبيق مبادئ الهندسة والعلوم والرياضيات.

المخرج 2

القدرة على تطبيق التصميم الهندسي لإنتاج حلول تلبي احتياجات محددة مع مراعاة الصحة العامة والسلامة والرفاهية، فضلاً عن العوامل العالمية والثقافية والاجتماعية والبيئية والاقتصادية.

المخرج 3

القدرة على التواصل بشكل فعال مع مختلف الجماهير، شفها وكثابا.

المخرج 4

القدرة على التعرف على المسؤوليات الأخلاقية والمهنية في المواقف الهندسية وإصدار أحكام مستنيرة، والتي يجب أن تأخذ في الاعتبار تأثير الحلول الهندسية في السياقات العالمية والاقتصادية والبيئية والمجتمعية.

المخرج 5

القدرة على العمل بشكل فعال في فريق يوفر أعضاؤه القيادة، ويخلقون بيئة تعاونية وشاملة، ويضعون الأهداف، ويخططون للمهام، ويحققون الأهداف.

المخرج 6

القدرة على تطوير وإجراء التجارب المناسبة، وتحليل البيانات وتفسيرها، واستخدام الحكم الهندسي لاستنتاج النتائج.

المخرج 7

القدرة على اكتساب المعرفة الجديدة وتطبيقها باستخدام استراتيجيات التعلم المناسبة.

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٦. الاعتمادات والتقييم والمتوسط التراكمي

الاعتمادات

تتبع جامعة القادسية عملية بولونيا من خلال نظام تحويل الاعتمادات الأوروبي (ECTS) يوجد 240 برنامجاً للحصول على درجة علمية، 30 وحدة تحويل اعتمادات أوروبية لكل فصل دراسي. وحدة تحويل اعتمادات أوروبية واحدة تعادل 25 عبئاً من العمل للطلاب، بما في ذلك حملات العمل المنظمة وغير المنظمة.

التصنيف

قبل التقييم، يتم تقسيم النتائج إلى مجموعتين فرعيتين: النجاح والرسوب. وبالتالي، تكون النتائج مستقلة عن الطلاب الذين فشلوا في الدورة. يتم تعريف نظام الدرجات على النحو التالي:

مخطط التصنيف مخطط الدرجات				
تعريف	العلامات (%)	التقدير	درجة	مجموعة
أداء متميز	100 – 90	امتياز	أ - ممتاز	مجموعة النجاح (50 - 100)
فوق المتوسط مع بعض الأخطاء	89 – 80	جيد جداً	ب - جيد جداً	
عمل صوتي به أخطاء ملحوظة	79 – 70	جيد	ج - جيد	
عادل ولكن مع عيوب كبيرة	69 – 60	متوسط	د - مرضي	
العمل يلبي الحد الأدنى من المعايير	59 – 50	مقبول	هـ - كافية	
مطلوب المزيد من العمل ولكن تم منح الائتمان	(49-45)	مقبول قانوني	FX – فشل	مجموعة فاشلة

كمية كبيرة من العمل مطلوبة	(44-0) راسب	ف - فشل	(49 - 0)
ملحوظة:			
ملاحظة: سيتم تقريب الأماكن العشرية أعلى أو أقل من 0.5 إلى العلامة الكاملة الأعلى أو الأدنى (على سبيل المثال، سيتم تقريب علامة 54.5 إلى 55، بينما سيتم تقريب علامة 54.4 إلى 54. تتبّع الجامعة سياسة عدم التسامح مع "حالات الفشل القريبة من النجاح"، لذا فإن التعديل الوحيد على العلامات الممنوحة من قبل المصححين الأصليين سيكون التقريب التلقائي الموضح أعلاه.			

حساب المعدل التراكمي

1. يتم حساب المعدل التراكمي عن طريق ضرب كل درجة وحدة في ECTS الخاص بها وقسمة النتيجة على إجمالي ECTS للبرنامج.

المعدل التراكمي لدرجة البكالوريوس في العلوم لمدة 4 سنوات:

$$\text{المعدل التراكمي} = [(\text{درجة الوحدة الأولى} \times \text{ECTS}) + (\text{درجة الوحدة الثانية} \times \text{ECTS}) + \dots] / 240$$

Academic Year 2025-2026

7. وصف البرنامج / المنهج الدراسي

يعرض الجدول التالي خطة الدراسة المعتمدة حسب المستوى الأكاديمي والفصل الدراسي، متضمنة رموز المقررات، أسماء المقررات، ، عبء عمل الطالب، وتصنيف المادة (ECTS) الساعات الأوروبية

النوع	عبء العمل (ساعة))	الساعات الأوروبية (ECTS)	اسم المقرر	رمز المقرر	الفصل الدراسي	السنة / المستوى
B	150	6.00	الرياضيات - ١	MTE 111	1	السنة الأولى
C	200	8.00	مبادئ علم المواد	MTE 112	1	السنة الأولى
S	125	5.00	الرسم الهندسي والميكانيكي	MTE 113	1	السنة الأولى
S	75	3.00	مبادئ الحاسوب	QU04	1	السنة الأولى
B	150	6.00	كيمياء المواد	MTE 115	1	السنة الأولى
S	50	2.00	حقوق الإنسان والديمقراطية	QU02	1	السنة الأولى
C	150	6.00	استخلاص المعادن (التعدين (الاستخلاص)	MTE 121	2	السنة الأولى
B	150	6.00	الفيزياء	MTE 122	2	السنة الأولى

النوع	عبء العمل (ساعة))	الساعات الأوروبية (ECTS)	اسم المقرر	رمز المقرر	الفصل الدراسي	السنة / المستوى
S	100	4.00	البرمجة - ١	MTE 123	2	السنة الأولى
S	100	4.00	الإحصاء والاحتمالات	MTE 124	2	السنة الأولى
B	150	6.00	الرياضيات - ٢	MTE 125	2	السنة الأولى
S	50	2.00	اللغة الإنجليزية - ١	QU01	2	السنة الأولى
S	50	2.00	اللغة العربية	QU06	2	السنة الأولى
B	150	6.00	مقاومة المواد	MTE 211	3	السنة الأولى
C	150	6.00	الميتالورجيا الفيزيائية (علم المعادن الفيزيائي)	MTE 212	3	السنة الثانية
C	150	6.00	الميتالورجيا الكيميائية (علم المعادن الكيميائي)	MTE 213	3	السنة الثانية
S	75	3.00	الرسم بمساعدة الحاسوب	MTE 214	3	السنة الثانية
B	75	3.00	الرياضيات - ٣	ENG	3	السنة الثانية

النوع	عبء العمل (ساعة))	الساعات الأوروبية (ECTS)	اسم المقرر	رمز المقرر	الفصل الدراسي	السنة / المستوى
				211		
B	100	4.00	المواد المغناطيسية والإلكترونية	MTE 216	3	السنة الثانية
S	50	2.00	اللغة العربية ٢	QU 26	3	السنة الثانية
B	150	6.00	استدامة المواد	MTE 221	4	السنة الثانية
C	175	7.00	المعادن والسبائك	MTE 222	4	السنة الثانية
C	175	7.00	البوليمرات	MTE 223	4	السنة الثانية
S	75	3.00	مبادئ الحاسوب ٢	QU 24	4	السنة الثانية
B	75	3.00	الرياضيات - ٤	ENG 221	4	السنة الثانية
S	50	2.00	اللغة الإنجليزية ٢	QU 21	4	السنة الثانية
S	50	2.00	جرائم النظام البائد في العراق	QU08	4	السنة الثانية

النوع	عبء العمل (ساعة))	الساعات الأوروبية (ECTS)	اسم المقرر	رمز المقرر	الفصل الدراسي	السنة / المستوى
C	125	5.00	السبك واللحام	MTE 311	5	السنة الثانية
C	125	5.00	ميكانيكا الكسور	MTE 312	5	السنة الثانية
C	125	5.00	هندسة السيراميك	MTE 313	5	السنة الثانية
C	100	4.00	التحولات الطورية	MTE 314	5	السنة الثانية
B	100	4.00	التحليل الرياضي	MTE 315	5	السنة الثالثة
C	125	5.00	هندسة التآكل	MTE 316	5	السنة الثالثة
S	50	2.00	الورشة الهندسية	MTE 317	5	السنة الثالثة
C	125	5.00	اختبار المواد الهندسية	MTE 321	6	السنة الثالثة
C	125	5.00	الحماية من التآكل	MTE 322	6	السنة الثالثة

النوع	عبء العمل (ساعة))	الساعات الأوروبية (ECTS)	اسم المقرر	رمز المقرر	الفصل الدراسي	السنة / المستوى
C	125	5.00	عمليات التشغيل الآلي للمواد الهندسية	MTE 323	6	السنة الثالثة
C	100	4.00	المعاملات الحرارية	MTE 324	6	السنة الثالثة
B	100	4.00	التحليل الإحصائي / التحليلي	MTE 325	6	السنة الثالثة
C	100	4.00	مواد وموارد الطاقة المتجددة	MTE 326	6	السنة الثالثة
S	75	3.00	البرمجة - ٢	MTE 327	6	السنة الثالثة
C	125	5.00	الهندسة الصناعية	MTE 411	7	السنة الثالثة
C	150	6.00	عمليات تشكيل المواد الهندسية	MTE 412	7	السنة الثالثة
C	150	6.00	هندسة السطوح	MTE 413	7	السنة الثالثة
S	125	5.00	المحاكاة بالحاسوب	MTE 414	7	السنة الثالثة

النوع	عبء العمل (ساعة))	الساعات الأوروبية (ECTS)	اسم المقرر	رمز المقرر	الفصل الدراسي	السنة / المستوى
S	125	5.00	تصميم واختيار المواد الهندسية - ١	MTE 415	7	السنة الثالثة
C	75	3.00	مشروع التخرج	ENG 416	7	السنة الرابعة
C	150	6.00	المواد النانوية	MTE 421	8	السنة الرابعة
C	175	7.00	المواد الحيوية	MTE 422	8	السنة الرابعة
C	125	5.00	تصميم واختيار المواد الهندسية - ٢	MTE 423	8	السنة الرابعة
C	175	7.00	المواد المركبة	MTE 424	8	السنة الرابعة
S	50	2.00	أخلاقيات المهنة الهندسية	QU	8	السنة الرابعة
C	75	3.00	مشروع التخرج	ENG 416	8	السنة الرابعة

١٢. التطوير المهني

يتم دعم التطوير المهني لأعضاء هيئة التدريس من خلال المشاركة في المؤتمرات العلمية، والندوات، وورش العمل، والدورات التدريبية، والأنشطة البحثية، والمنظمات المهنية، واللجان الأكاديمية. يشجع القسم التحسين المستمر في أساليب التدريس، وتصميم طرق التقييم، وسلامة المختبرات، ومحاكاة العمليات، وأدوات التعلم الرقمي، والبحث العلمي، والكتابة الأكاديمية، وممارسات الاعتماد الهندسي. كما يتم

إشراك أعضاء هيئة التدريس الجدد في تنسيق المقررات، والمجموعات البحثية، واللجان، والأنشطة الأكاديمية التعاونية لتعزيز كفاءتهم التدريسية والمهنية.

١٣. خطة تطوير البرنامج

تستند خطة تطوير البرنامج إلى التحسين المستمر والمراجعة الدورية. وتشمل الأولوية ما يلي:

- (١) المراجعة السنوية للمنهج الدراسي ومحتوى المقررات بما يتناسب مع مخرجات الخريجين واحتياجات سوق العمل.
- (٢) تحديث المختبرات، ومرافق محاكاة العمليات، وموارد التعلم الرقمي.
- (٣) تعزيز جوانب التصميم، والسلامة، والاستدامة، والتطبيقات الصناعية.
- (٤) الاستخدام المنهجي لأراء وملاحظات الطلاب، والخريجين، وأصحاب العمل، وأعضاء هيئة التدريس.
- (٥) التطوير المستمر لأعضاء هيئة التدريس.
- (٦) تحديث الكتب الدراسية والموارد الإلكترونية.
- (٧) توثيق إجراءات التحسين وتأثيرها على تعلم الطلاب وأداء البرنامج.

14. Curriculum Mapping Matrix (Courses vs. Graduate Outcomes)

The curriculum mapping matrix shows the contribution of each course to the seven Graduate Outcomes (GO1-GO7). An X indicates a direct and substantial contribution of the course to the corresponding graduate outcome.

GO1	GO2	GO3	GO4	GO5	GO6	GO7
48	29	28	14	10	39	23

Number of curriculum modules mapped as substantially contributing to each Graduate Outcome. The zero-ECTS Sports activity is included where relevant to teamwork/leadership.

Semester 1 Mapping

Code	Course Name	GO1	GO2	GO3	GO4	GO5	GO6	GO7
MTE 111	Mathematics-I	x	x					
MTE 112	Principles of Materials Science	X	x	X				
MTE 113	Engineering and Mechanical Drawing		X		x			x
QU04	Computer Principles			x			x	X
MTE 115	Materials Chemistry	x		X				
QU02	Human Rights and Democracy				X	X		

Semester 2 Mapping

Code	Course Name	GO1	GO2	GO3	GO4	GO5	GO6	GO7
MTE 121	Extraction Metallurgy	X	X	X				
MTE 122	Physics	x	x	x				
MTE 123	Programming-I			x			X	X
MTE 124	Statistics and probability	x		X				x
MTE 125	Mathematics-II	x	x					
QU01	English Language-I				X		x	
QU06	Arabic language-I				X	x		

Semester 3 Mapping

Code	Course Name	GO1	GO2	GO3	GO4	GO5	GO6	GO7
MTE 211	Strength of Materials	X	X	X				
MTE 212	Physical Metallurgy	X		X				x
MTE 213	Chemical Metallurgy	X	X					
MTE 214	Computer Aid Drawing		X		x			X
ENG 211	Mathematics-III	x	X					
MTE 216	Magnetic and electronic materials	X		X				
QU 26	Arabic language-II				X	x		

Semester 4 Mapping

Code	Course Name	GO1	GO2	GO3	GO4	GO5	GO6	GO7
MTE 221	Sustainability of materials		X			X	X	
MTE 222	Mathematics-IV	x	x					
MTE 223	Metals and Alloys	X	X	X				
QU 24	Polymer	X	X					
ENG 221	Computer Principles-II			x			X	X
QU 21	English Language-II				X		x	
QU08	Crimes of the Ba'ath regime in Iraq				X	X		

Semester 5 Mapping

Code	Course Name	GO1	GO2	GO3	GO4	GO5	GO6	GO7
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Code	Course Name	GO1	GO2	GO3	GO4	GO5	GO6	GO7
MTE 311	Casting and Welding	X	X					X
MTE 312	Fracture Mechanics	X		X				
MTE 313	Ceramic Engineering	X		X				
MTE 314	Phase Transformations	X		X				
MTE 315	Mathematical Analysis	x	x					
MTE 316	Corrosion Engineering	X	X					
MTE 317	Engineering workshop		X					X

Semester 6 Mapping

Code	Course Name	GO1	GO2	GO3	GO4	GO5	GO6	GO7
MTE 321	Testing of Engineering Materials			X				X
MTE 322	Corrosion Protection	X	X					
MTE 323	Machining Processes of Eng. Materials		X					X
MTE 324	Heat Treatments	X		X				
MTE 325	Analytical Analysis			X			x	
MTE 326	Material and resources of renewable energy		X			X	X	
MTE 327	Programming-II			x			X	X

Semester 7 Mapping

Code	Course Name	GO1	GO2	GO3	GO4	GO5	GO6	GO7
MTE 411	Forming Processes Eng. Materials	X	X					
MTE 412	Surface Engineering	X		X				
MTE 413	Computer Simulation			X			X	X
MTE 414	Design and Selection of Eng. Materials I	X	X					
MTE 415	Industrial Engineering		X			X	X	
ENG 416	Graduation Project	X	X	X	X		X	X

Semester 8 Mapping

Code	Course Name	GO1	GO2	GO3	GO4	GO5	GO6	GO7
MTE 421	Nano-Materials	X		X				
MTE 422	Biomaterials	X	X					
MTE 423	Design and Selection of Eng. Materials II	X	X					X
MTE 424	Composite Materials	X	X					
QU	Engineering Ethics				X	X	X	
ENG 416	Graduation Project	X	X	X	X		X	X

Graduate Outcome Legend

GO	Outcome Focus
GO1	Engineering problem solving
GO2	Engineering design
GO3	Experimentation and data
GO4	Communication
GO5	Ethics and professional responsibility
GO6	New knowledge / lifelong learning
GO7	Teamwork and leadership

١. المنهج الدراسي/الوحدات الدراسية

تُقدّم نماذج وصف المقررات التالية معلومات المقرر، وأهدافه، ومخرجات التعلم، واستراتيجيات التدريس والتعلم، وهيكل المقرر، وطرق التقييم، ومصادر التعلم الخاصة بالمقررات الدراسية المدرجة ضمن منهج هندسة المواد.

Fourth Year / Semester 1

15. Course Description Forms

The following Course Description Forms provide the course information, objectives, learning outcomes, teaching and learning strategies, course structure, assessment methods, and learning resources for the modules included in the Materials Engineering Curriculum.

1. MTE 411 - Composite Materials

Course Name	Composite Materials
Course Code	MTE 411
Year / Semester	Fourth Year / Semester 1
Language	English
Total Study Hours / ECTS	٦٠ Hours / ٣ ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial + Lab
Course Administrator	Ahmed Mudhafar Hashim

Course Objectives

- 1-To provide students with a knowledge of the structure, properties, processing and applications of composite materials.
- 2-The module covers polymer, ceramic and metal matrix composites and advanced materials to enable student to apply the knowledge in a wide range of industries.
- 3-The course provides practical methods and theoretical tools that are necessary for leading design structures formed from composite materials, in terms of constructive and production aspect.
- 4-The course will discuss the mechanical properties of composite materials (composite), and how these properties are affected by the microscopic structure of the material and production techniques; it will also provide an overview of the strengths and weaknesses of composite materials as well that should be used or treated in the design of constructive elements.

Course Learning Outcomes

- 1-Understand the relationships between the constituents, structure, properties and processing techniques of composites.
- 2-Understand micromechanics, classical laminate theory and some of the complexities of laminated systems.
- 3-Understand the fundamentals of manufacturing defects, machining and joining, failure mechanisms and damage limitation and repair.
- 4-Demonstrate an understanding of composite constituents: fibers and matrices, and their properties.

5-The ability to critically evaluate manufacturing techniques and choose an appropriate manufacturing method.

6-Assessment of the mechanical performance of composites from the given properties of the constituents.

7-Describe and calculate the response of composite laminae and laminates to external loading via laminate theory involving matrix construction and manipulation.

8-Demonstrate an understanding of manufacturing defects, machining of composites and joining methods.

9-The ability to critically assess possible failure mechanisms and how failure can be prevented

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problem. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
١,٢	Introduction to composite materials	Lecture + Tutorial	Continuous Assessment	4	1
١,٢	Particulate composites	Lecture + Tutorial	Continuous Assessment	4	2
١,٢	Fiber reinforced composites	Lecture + Tutorial	Continuous Assessment	4	3
١,٢	Composites: The Reinforcement Material	Lecture + Tutorial	Continuous Assessment	4	4
١,٢	Production models and mathematical activity	Lecture + Tutorial	Continuous Assessment	4	5
١,٢	Production models and mathematical activity	Lecture + Tutorial	Midterm / Test	4	6
١,٢	Structural composites: laminate composites	Lecture + Tutorial	Continuous Assessment	4	7
١,٢	Midterm Exam	Lecture + Tutorial	Continuous Assessment	4	8

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
١,٢	Structural composites: sandwich composites	Lecture + Tutorial	Continuous Assessment	4	9
١,٢	Micromechanical analysis of fiber reinforced composites	Lecture + Tutorial	Continuous Assessment	4	10
١,٢	Micromechanical analysis of fiber reinforced composites	Lecture + Tutorial	Continuous Assessment	4	11
١,٢	Micromechanical analysis of fiber reinforced composites	Lecture + Tutorial	Continuous Assessment	4	12
١,٢	Manufacturing processes of composites	Lecture + Tutorial	Continuous Assessment	4	13
١,٢	Failure of composite Materials	Lecture + Tutorial	Continuous Assessment	4	14
١,٢	Introduction to macromechanical analysis of a lamina	Lecture + Tutorial	Continuous Assessment	4	15

Laboratory / Practical Weekly Plan

Week	Laboratory / Practical Content
1	Lab 1: Preparation of nanoparticles polymer based composite
2	Lab 2: Preparation of woven polymer based composites
3	Lab 3: Preparation of short fiber composites
4	Lab 4: Preparation of laminate composites
5	Lab 5: Preparation of polymer matrix composite samples for tensile test
6	Lab 6: Preparation of polymer matrix composite samples for bending test

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Lab	10%	٧
Midterm Exam	20%	8
Final Exam	60%	15

Learning and Teaching Resources

Resource	Details
Required Texts	William D. Callister, Jr., Fundamentals of material science and engineering - An interactive, John Willey & Sons, Inc.d
Recommended Texts	Mechanics of composite materials, Autar K. Kaw, © 2006 by Taylor & Francis Group, LLC

٢. MTE 412 - Design and Selection of Engineering Materials-I

Course Name	Design and Selection of Engineering Materials -I
Course Code	MTE 412
Year / Semester	Fourth Year / Semester 1
Language	English
Total Study Hours / ECTS	٦٠ Hours / ٣ ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial + Lab
Course Administrator	Mohammed Abdulrazzaq

Course Objectives

- 1-To learn engineering materials
- 2-Make the selection of materials in the manufacturing of machine parts to be used in mechanical engineering
- 3-To be informed about the most suitable material selection in order to eliminate or minimize the problems during and after the production
- 4-To learn systematic approaches for the selection of materials and manufacturing processes learn
- 5-To introduce the sources of materials property data
- 6-To gain experience by studying different cases

Course Learning Outcomes

- 1-To provide the students a thorough systematic approach to the selection of metals, ceramics, polymers, and composites required for mechanical design.
 - 2- Students will demonstrate how performance indexes based on mechanics analyses can be overlaid on material property charts to identify promising materials for specific applications using both manual and computer techniques. Outcome
- To familiarize the students with material properties and materials fabrication processes and an approach for selecting a process capable of producing a component possessing the size, shape, properties, and cost dictated by the design.

3- Students will construct and use material property charts to identify a small set of materials meeting mechanical, physical, and cost requirements.

4- Students will use material processing charts to select suitable fabrication processes. Outcome

To teach students how to deal with multiple constraints and conflicting objectives including realistic constraints involving the economics, environment, manufacturability, and sustainability.

5- Students will construct a translation table for problems involving either multiple constraints or conflicting objectives, and systematically identify candidate materials. Outcome

6- To introduce the students to the methodologies for designing new materials and conceiving hybrid solutions.

7- Students will show that they can conceive hybrid material solutions that fill "white spaces" on the material property charts.

8-Students will demonstrate an understanding of the methodologies used in materials design.

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problem. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
1,2	Definition and Grouping of Engineering Materials, Criteria of Selection Material, Process-Design-Material Relation, Material Selection Diagrams	Lecture + Tutorial	Continuous Assessment	4	1
1,2	Selection of shape of structural components	Lecture + Tutorial	Continuous Assessment	4	2
1,2	Designing with hybrid	Lecture + Tutorial	Continuous Assessment	4	3
1,2	Designing with hybrid	Lecture + Tutorial	Continuous Assessment	4	4
1,2	Software for materials selection	Lecture + Tutorial	Continuous Assessment	4	5
1,2	Material Selection – Shape Relation and Importance of Shape Factor	Lecture + Tutorial	Midterm / Test	4	6
1,2	Structural composites: laminate composites	Lecture + Tutorial	Continuous Assessment	4	7

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
1,2	Midterm Exam	Lecture + Tutorial	Continuous Assessment	4	8
1,2	Materials selection without shape	Lecture + Tutorial	Continuous Assessment	4	9
1,2	Selection of material and shape	Lecture + Tutorial	Continuous Assessment	4	10
1,2	Hybrid materials, Bio-inspired materials	Lecture + Tutorial	Continuous Assessment	4	11
1,2	Hybrid materials, Bio-inspired materials	Lecture + Tutorial	Continuous Assessment	4	12
1,2	Numerous case studies	Lecture + Tutorial	Continuous Assessment	4	13
1,2	Numerous case studies	Lecture + Tutorial	Continuous Assessment	4	14
1,2	Numerous case studies	Lecture + Tutorial	Continuous Assessment	4	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Lab	10%	7
Midterm Exam	20%	8
Final Exam	60%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach, Copyright Year: 2020, dissidents.

٢. MTE 413 - Forming Processes of Engineering Materials

Course Name	Forming Processes of Engineering Materials
Course Code	

	MTE 41٣
Year / Semester	Fourth Year / Semester 1
Language	English
Total Study Hours / ECTS	٦٠ Hours / ٣ ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial + Lab
Course Administrator	Layth Fadhil Shakir

Course Objectives

- 1-To develop problem solving skills and understanding of forming processes
- 2-To understand true and engineering stress-strain relations.
- 3-This course deals with the basic and advanced concepts of forming.
- 4-This is the basic subject for all bulk deformation and sheet metal work.

Course Learning Outcomes

- 1-Knowing the concept of forming process
- 2-Understanding isotropy and anisotropy, true and engineering stress, properties required in forming.
- 3-Have a knowledge of dies and punches.
- 4-Knowing all forming processes and their results.
- 5-The advantages and limitations of each process..

Teaching and Learning 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 type of simple experiments involving some sampling activities that are interesting to the students.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
1,2	Introduction - Concepts of forming, stress-strain curve, isotropy	Lecture + Tutorial	Continuous Assessment	4	1
1,2	bar drawing	Lecture + Tutorial	Continuous Assessment	4	2

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
1,2	wire drawing	Lecture + Tutorial	Continuous Assessment	4	3
1,2	Forging	Lecture + Tutorial	Continuous Assessment	4	4
1,2	Rolling	Lecture + Tutorial	Continuous Assessment	4	5
1,2	Rolling	Lecture + Tutorial	Midterm / Test	4	6
1,2	Extrusion	Lecture + Tutorial	Continuous Assessment	4	7
1,2	Midterm Exam	Lecture + Tutorial	Continuous Assessment	4	8
1,2	Bending	Lecture + Tutorial	Continuous Assessment	4	9
1,2	Deep drawing	Lecture + Tutorial	Continuous Assessment	4	10
1,2	Deep drawing	Lecture + Tutorial	Continuous Assessment	4	11
1,2	Stamping, piercing	Lecture + Tutorial	Continuous Assessment	4	12
1,2	Incremental sheet metal forming	Lecture + Tutorial	Continuous Assessment	4	13
1,2	Advanced forming processes	Lecture + Tutorial	Continuous Assessment	4	14
1,2	Examinations, Quizzes, assignments	Lecture + Tutorial	Continuous Assessment	4	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Lab	10%	v
Midterm Exam	20%	8

Assessment Method	Weight	Week Due (if stated)
Final Exam	60%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Fundamentals of modern manufacturing by groover
Recommended Texts	•

4.MTE 41ε - Materials for Energy Storage and Conversion

Course Name	Materials for Energy Storage and Conversion
Course Code	MTE 41ε
Year / Semester	Fourth Year / Semester 1
Language	English
Total Study Hours / ECTS	ε°Hours / °ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial
Course Administrator	Dhuha Albusalih

Course Objectives

- 1-To introduce students to various energy storage systems (mechanical, thermal, electrochemical, and electromagnetic) and the role of materials in each.
- 2-To understand the fundamental principles of batteries (especially Li-ion), supercapacitors, and fuel cells.
- 3-To study advanced materials (nanostructured and porous materials) used in energy storage applications.
- 4-To relate material properties (structure, electrical properties, magnetic properties) to their performance in energy storage systems.
- 5-To develop students' ability to analyze and select suitable materials for renewable energy applications.

Course Learning Outcomes

- 1-Upon completion of this course, students will be able to:
- 2-Classify different energy storage systems based on their operating principles and applications.
- 3-Explain the working mechanism of Lithium-ion batteries and supercapacitors from a materials science perspective.
- 4-Compare electrode materials (anode and cathode) and electrolytes used in advanced batteries.
- 5-Evaluate the performance of nanostructured and porous materials in improving energy storage efficiency.
- 6-Describe the properties of magnetic and piezoelectric materials and their applications in energy systems.
- 7-Apply material selection criteria for environmentally friendly energy storage systems..

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problems. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems. Practical lab sessions are used to characterize and test energy storage materials.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
٢,٥,٦	Introduction to Energy Storage Systems	Lecture + Tutorial	Continuous Assessment	٣	1
٢,٥,٦	Mechanical and Thermal Energy Storage	Lecture + Tutorial	Continuous Assessment	٣	2
٢,٥,٦	Environmentally Friendly Energy	Lecture + Tutorial	Continuous Assessment	٣	3

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	Storage Systems				
٢,٥,٦	Fundamentals of Electrochemistry	Lecture + Tutorial	Continuous Assessment	٣	4
٢,٥,٦	Electrochemical Energy Storage	Lecture + Tutorial	Continuous Assessment	٣	5
٢,٥,٦	Lithium-ion Batteries (Li-ion): Components, working principle	Lecture + Tutorial	Midterm / Test	٣	6
٢,٥,٦	Anode Materials for Li-ion Batteries	Lecture + Tutorial	Continuous Assessment	٣	7
٢,٥,٦	Midterm Exam	Lecture + Tutorial	Continuous Assessment	٣	8
٢,٥,٦	Cathode Materials for Li-ion Batteries	Lecture + Tutorial	Continuous Assessment	٣	9
٢,٥,٦	Nanostructured and Porous Materials)	Lecture + Tutorial	Continuous Assessment	٣	10
٢,٥,٦	Advanced Hydrogen Storage Materials	Lecture + Tutorial	Continuous Assessment	٣	11
٢,٥,٦	Capacitors and Supercapacitors	Lecture + Tutorial	Continuous Assessment	٣	12
٢,٥,٦	Electromagnetic Energy Storage	Lecture + Tutorial	Continuous Assessment	٣	13
٢,٥,٦	Magnetic and Piezoelectric Materials	Lecture + Tutorial	Continuous Assessment	٣	14
٢,٥,٦	Comprehensive Review	Lecture + Tutorial	Continuous Assessment	٣	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Midterm Exam	20%	8
Final Exam	٧0%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Energy Storage: Fundamentals, Materials and Applications – Robert A. Huggins (Springer, 2nd Edition)
Recommended Texts	Materials for Energy Storage and Conversion – Runwei Mo (Cambridge Scholars Publishing)

• MTE 410 - Nanotechnology and Nanomaterials

Course Name	Nanotechnology and Nanomaterials
Course Code	MTE 410
Year / Semester	Fourth Year / Semester 1
Language	English
Total Study Hours / ECTS	60 Hours / 5 ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial + Lab
Course Administrator	Hasan Abdulkadhim Abbas

Course Objectives

- 1-This module aims to comprehensively understand the meaning of nanomaterials and nanotechnologies, and the recent advances in the material science community.
- 2-Learning the synthesis methods, structure, and characteristics of nanomaterials.
- 3-Understanding the main applications and uses of nanomaterials in industry.
- 4-Understanding how the small things, and light materials can work better than the conventional materials.

Course Learning Outcomes

1-Learning the fundamental science-based knowledge of how these nanomaterials and technologies might be used to address real societal needs or, more simply, to provide a basis for useful applications.

2-Understanding of how nanomaterials and nanotechnologies do offer new ways of addressing many current needs as well as providing the basis for a positive vision for future developments.

3-Understanding the principal nanostructure of materials in relation to their various applications, and understanding of the essential ideas underlying these nanomaterials and technologies to designers so that they might better be able to understand how to exploit their characteristics effectively within a design context..

Teaching and Learning Strategies

Different teaching methods are normally applied within this module in order to support student learning. These include in class theoretical teaching, tutorial and discussion, brain storming about some synthesis methods of nanomaterials these can produce uniform nano-size and good dispersion. Whenever needed, practical and experimental lecturing or virtual learning courses are sometimes provided. With the progress in stages of the learning journey of the students, quizzes, and seminars are performed from time to time based on the time allowance

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
1,3	Introduction to Nanomaterials, Nanotechnology and Nanoscience	Lecture + Tutorial	Continuous Assessment	4	1
1,3	Types of nano-size particles: Nanotubes, nanoparticles, and nanowires	Lecture + Tutorial	Continuous Assessment	4	2
1,3	Nano-lithography method	Lecture + Tutorial	Continuous Assessment	4	3
1,3	Preparation methods (Nanofabrication Technologies)	Lecture + Tutorial	Continuous Assessment	4	4
1,3	Methods using solid precursors	Lecture + Tutorial	Continuous Assessment	4	5
1,3	Fabrication of semiconductor nanowires.	Lecture + Tutorial	Midterm / Test	4	6
1,3	Fabrication of metal nanowires	Lecture + Tutorial	Continuous Assessment	4	7

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
1,3	Midterm Exam	Lecture + Tutorial	Continuous Assessment	4	8
1,3	Properties of Nanomaterials	Lecture + Tutorial	Continuous Assessment	4	9
1,3	Structure and Properties of Carbon Nanotube	Lecture + Tutorial	Continuous Assessment	4	10
1,3	Synthesis of carbon nanotubes	Lecture + Tutorial	Continuous Assessment	4	11
1,3	Graphene	Lecture + Tutorial	Continuous Assessment	4	12
1,3	Nanoindentation/Nano tribology	Lecture + Tutorial	Continuous Assessment	4	13
1,3	Characterization and Measurement techniques of nanostructures	Lecture + Tutorial	Continuous Assessment	4	14
1,3	Applications of Nanomaterials in Engineering	Lecture + Tutorial	Continuous Assessment	4	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Lab	10%	v
Midterm Exam	20%	8
Final Exam	60%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Nanomaterials, Nanotechnologies and Design An Introduction for Engineers and Architects, by Michael F. Ashby
Recommended Texts	Nanomaterials and Their Application, by Sajid Bashir, Jingbo Liu

6. MTE 416 - Industrial Engineering and Quality Engineering

Course Name	Industrial Engineering and Quality Control & Project ManagementI
Course Code	MTE 416
Year / Semester	Fourth Year / SemesterI
Language	English
Total Study Hours / ECTS	30 Hours / 1 ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial
Course Administrator	Amna Hamza Abdalhussain

Course Objectives

Industrial engineering is a branch of engineering which is concerned with figuring out how to make or do things better. Industrial engineers have the task of reducing production costs, increasing efficiency, improving the quality of products and services, ensuring worker health and safety, protecting the environment and complying with government regulations. They work to eliminate waste of time, money, materials, energy and other commodities.

Industrial engineering has the following objectives:

- 1-Establishing methods for improving operations and controlling production costs.
- 2-Developing ways of reducing costs.
- 4-Researching ways of improving efficiency of processes.
- 5- Improving production processes and simultaneously ensuring worker safety.s.

Course Learning Outcomes

- 1-Apply industrial engineering principles to production planning and control.
- 2-Use statistical process control (SPC) charts for variables and attributes.
- 3-Estimate costs, calculate break-even points, and perform profit planning.
- 4-Design facility layouts (process-based and product-based).
- 5-Apply quality assurance principles and inspection planning.
- 6-Manage projects using project management knowledge areas and organizational structures.
- 7-Communicate effectively through written reports and presentations.

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problem. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
2,5,6	Introduction to manufacturing or production process analysis	Lecture + Tutorial	Continuous Assessment	2	1
2,5,6	Manufacturing Specifications	Lecture + Tutorial	Continuous Assessment	2	2
2,5,6	Manufacturing specifications and typesy	Lecture + Tutorial	Continuous Assessment	2	3
2,5,6	Manufacturing specifications and types	Lecture + Tutorial	Continuous Assessment	2	4
2,5,6	Production models and mathematical activity	Lecture + Tutorial	Continuous Assessment	2	5
2,5,6	Production models and mathematical activity	Lecture + Tutorial	Midterm / Test	2	6
2,5,6	Cost estimation, profit planning, process optimization, and SPC	Lecture + Tutorial	Continuous Assessment	2	7
2,5,6	Cost estimation, profit planning, process optimization, and SPC	Lecture + Tutorial	Continuous Assessment	2	8
2,5,6	Measurement, inspection, facility layout, and quality assurance	Lecture + Tutorial	Continuous Assessment	2	9
2,5,6	Measurement, inspection, facility layout, and quality assurance	Lecture + Tutorial	Continuous Assessment	2	10
2,5,6	Measurement, inspection, facility layout, and quality assurance	Lecture + Tutorial	Continuous Assessment	2	11
2,5,6	Measurement, inspection, facility layout, and quality assurance	Lecture + Tutorial	Continuous Assessment	2	12
2,5,6	Project management, environment, organization, and cost	Lecture + Tutorial	Continuous Assessment	2	13
2,5,6	Project management, environment, organization, and cost	Lecture + Tutorial	Continuous Assessment	2	14
2,5,6	Project management, environment, organization, and cost	Lecture + Tutorial	Continuous Assessment	2	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Midterm Exam	40%	^
Final Exam	50%	1°

Learning and Teaching Resources

Resource	Details
Required Texts	Behavior in Organizations, by J. Greenberg and R. Baron, Prentice

Resource	Details
	Hall, 2000, 687 pages
Recommended Texts	Competitive Manufacturing Management, J. Nicholas, Irwin Mc Graw Hill, 1998, 840 pages
Websites / Electronic Resources	https://www.coursera.org

4. MTE 417 - Surface Engineering

Course Name	Surface Engineering
Course Code	MTE 41V
Year / Semester	Fourth Year / Semester 1
Language	English
Total Study Hours / ECTS	30 Hours / 3 ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial
Course Administrator	Esraa Faisal Ghazi

Course Objectives

- 1-Giving the student an obvious idea of what surface engineering is by knowing what causes damage to metal surfaces and other surfaces.
- 2-Studying the most common methods that technical surfaces get damaged and coming up with ways to stop them
- 3-Clarification of the most important traditional and modern scientific manners for protecting engineering surfaces
- 4-Taking a look at the most important ways to measure and assess the amount of roof damage

Course Learning Outcomes

- 1-Know the nature of engineering surfaces.
- 2-Evaluation of the damaged surface from the other and comparison between them
- 3-Evaluation of metal surface protection
- 5-Comparison of protection methods for different surfaces

Teaching and Learning Strategies

This module aims to improve student's critical thinking abilities through active exercise participation. To do this, we will hold seminars, provide interactive tutorials, and think about other short experiments involving various sample tasks that students find intriguing.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
1,3	Introduction to Surface Engineering	Lecture + Tutorial	Continuous Assessment	3	1
1,3	Surface and Subsurface Regions	Lecture + Tutorial	Continuous Assessment	3	2
1,3	Scope and Role of Surface Properties	Lecture + Tutorial	Continuous Assessment	3	3
1,3	Properties for Mechanical Component Performance	Lecture + Tutorial	Continuous Assessment	3	4
1,3	Surface Roughness: Advantages, Limitations	Lecture + Tutorial	Continuous Assessment	3	5
1,3	Surface Damage: Causes and Mechanisms	Lecture + Tutorial	Midterm / Test	3	6
1,3	Material Properties Effect on Component Performance	Lecture + Tutorial	Continuous Assessment	3	7
1,3	Midterm Exam	Lecture + Tutorial	Continuous Assessment	3	8
1,3	Common Factors Leading to Surface Deterioration	Lecture + Tutorial	Continuous Assessment	3	9
1,3	Material Selection for Surface Engineering	Lecture + Tutorial	Continuous Assessment	3	10
1,3	Techniques for Surface Damage Evaluation	Lecture + Tutorial	Continuous Assessment	3	11
1,3	Surface Engineering via Surface Metallurgy	Lecture + Tutorial	Continuous Assessment	3	12
1,3	Surface Modification	Lecture + Tutorial	Continuous Assessment	3	13

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
1,3	Coating and Cladding	Lecture + Tutorial	Continuous Assessment	3	14
1,3	Characterization of Engineered Surfaces	Lecture + Tutorial	Continuous Assessment	3	15

Laboratory / Practical Weekly Plan

Week	Laboratory / Practical Content
1	Lab 1: Utilizing a metal analyzer for identifying alloy components
2	Lab 2: Improvement and refinement of some industrial low-carbon steel surfaces
3	Lab 3: Surface morphology assessment using a basic optical microscope
4	Lab 4: Evaluation of the deterioration caused by cavitation in the metals copper, zinc, and aluminium
5	Lab 5: Measurement of the hardness of some selected industrial materials
6	Lab 6: Estimation of the exchange current density to evaluate the damaged surface of steel samples
7	Study some non-metal surfaces and evaluate the damage and how to treat and protect it

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Midterm Exam	20%	8
Final Exam	70%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Surface Engineering Methods and Applications, By R.S. Walia, Qasim Murtaza.
Recommended Texts	Recommended Texts Modern Surface Technology by Friedrich-Wilhelm Bach

A. MTE 418 - English Language 7

Course Name	English Language 7
Course Code	MTE 41A
Year / Semester	Fourth Year / Semester1
Language	English

Total Study Hours / ECTS	10 Hours / 1 ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture
Course Administrator	Shamam Kazem Mohammed

Course Objectives

- 1-Communicative and intercultural competences are overarching learning goals.
- 2-An integrated approach to the teaching of languages is expected, in which the skills of listening, reading, spoken interaction, spoken production and writing should all have their place.
- 3-In teaching and learning the target language should be used as much as possible.
- 4-A variety of teaching methods and approaches should be used

Course Learning Outcomes

- 1- Knowledge objective:
- 2- Demonstrate insight and profound understanding of the cultures of the target language: society current affairs, literature and its context.

Skills objective:

An in-depth and extensive knowledge of concrete and abstract vocabulary adapted for the majority of communicative situations as well as a knowledge of some of the key idiomatic words and phrases.

- 2- General and qualifying skills (Other skills related to employability and personal development):

Develop the ability to perform duties and deliver them on time

Improving the critical thinking for students.

Building the idea of group working to solve the problems

Teaching and Learning 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..

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
١, ٢	Unit 1: Home and away	Lecture	Continuous Assessment	1	1
١, ٢	Unit 1: Home and away	Lecture	Continuous Assessment	1	2
١, ٢	Unit 2: Been there,	Lecture	Continuous Assessment	1	3

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
٤, ٦	Unit 2: Been there,	Lecture	Continuous Assessment	١	4
٤, ٦	Unit 3: News and	Lecture	Continuous Assessment	١	5
٤, ٦	Unit 3: News and	Lecture	Midterm / Test	١	6
٤, ٦	Unit 4: The naked	Lecture	Continuous Assessment	١	7
٤, ٦	Unit 4: The naked	Lecture	Continuous Assessment	١	8
٤, ٦	Unit 5: Looking ahead	Lecture	Continuous Assessment	١	9
٤, ٦	Unit 5: Looking ahead	Lecture	Continuous Assessment	١	10
٤, ٦	Unit 6: Making it big	Lecture	Continuous Assessment	١	11
٤, ٦	Unit 6: Making it big	Lecture	Continuous Assessment	١	12
٤, ٦	Review Units 1–3	Lecture	Continuous Assessment	١	13
٤, ٦	Review Units 4–6	Lecture	Continuous Assessment	١	14
٤, ٦	Final Exam (Units 1–6)	Lecture	Continuous Assessment	١	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Midterm Exam	٤0%	٨
Final Exam	٦0%	1٥

Learning and Teaching Resources

Resource	Details
Required Texts	Headway Upper intermediate Students book

٩. MTE 41٩ - Engineering Project

Course Name	Engineering Project
Course Code	MTE 41٩
Year / Semester	Fourth Year / Semester 1
Language	English
Total Study Hours / ECTS	60 Hours / 2 ECTS
Module Type	Core learning activity
Attendance Forms	Tutorial + Laboratory + Seminar
Course Administrator	Department Teaching Assignment

Course Objectives

Engineering Project II is the capstone stage in which students integrate process synthesis, material and energy balances, equipment design, control and safety, economics, environmental considerations, and professional communication into Complete Materials Engineering project. The course culminates in a written report, engineering drawings/simulation files, and oral defense.

Course Learning Outcomes

- Integrate Materials-engineering knowledge to define and complete an open-ended design/project problem.
- Develop process flow diagrams, material and energy balances, and justified process specifications.
- Perform detailed design/sizing of selected process equipment using appropriate standards and software.
- Evaluate process safety, environmental impacts, controllability, and sustainability considerations.
- Prepare an economic evaluation and compare feasible design alternatives.
- Produce a professional technical report and defend engineering decisions orally.
- Work effectively in a project team, manage tasks and deadlines, and demonstrate professional and ethical responsibility.

Teaching and Learning Strategies

Project-based learning is used under faculty supervision. Teams hold scheduled design reviews, maintain project records, use process simulation and engineering design tools, consult standards and literature, and receive iterative feedback on technical calculations, drawings, safety, economics, sustainability, report writing, and presentation.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
١,٢,٤,٦,٧	Project re-scoping, objectives, deliverables and responsibility matrix	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	1
١,٢,٤,٦,٧	Process basis, design criteria and updated literature review	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	2
١,٢,٤,٦,٧	Final process flow diagram and stream specifications	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	3
١,٢,٤,٦,٧	Material balance verification and simulation convergence	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	4
١,٢,٤,٦,٧	Energy balance and utility system definition	Tutorial + Laboratory + Seminar /	Continuous Assessment	4	5

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
		Project Supervision			
١,٢,٤,٦,٧	Detailed design of major equipment I	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	6
١,٢,٤,٦,٧	Midterm design review / oral progress presentation	Tutorial + Laboratory + Seminar / Project Supervision	Midterm / Test	2	7
١,٢,٤,٦,٧	Detailed design of major equipment II	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	8
١,٢,٤,٦,٧	Mechanical/material-selection considerations and equipment specifications	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	9
١,٢,٤,٦,٧	P&ID development, instrumentation and control philosophy	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	10
١,٢,٤,٦,٧	Process safety review: hazards, relief/containment and safeguards	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	11
١,٢,٤,٦,٧	Environmental assessment, emissions/effluents and waste management	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	12
١,٢,٤,٦,٧	Capital/operating cost estimation and economic evaluation	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	13
١,٢,٤,٦,٧	Sustainability review, optimization	Tutorial + Laboratory +	Continuous Assessment	4	14

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	and design reconciliation	Seminar / Project Supervision			
١,٢,٤,٦,٧	Final report, drawings, appendices and quality check	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	15
١,٢,٤,٦,٧	Final presentation / viva and submission of complete project	Tutorial + Laboratory + Seminar / Project Supervision	Final Examination / Review	2	16

Laboratory / Practical Weekly Plan

Week	Laboratory / Practical Content
1	Project simulation and stream-table verification
2	Equipment-sizing calculations and design spreadsheets
3	Process-flow-diagram / P&ID development
4	Safety and relief-system calculations / HAZOP-style review
5	Economic evaluation spreadsheet / cost estimation
6	Integrated process simulation and optimization
7	Final drawings, model files and technical-report compilation

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Supervisor Progress Reviews	15%	Continuous
Design Calculations and Technical Quality	20%	6, 10, 14
Simulation / Drawings / Project Artifacts	15%	Continuous
Safety, Environmental and Economic Evaluation	15%	11-14
Final Written Report	20%	15
Oral Presentation and Viva	15%	16
Written Midterm	0%	N/A
Written Final	0%	N/A

Learning and Teaching Resources

Resource	Details
Required Texts	Callister, W. D. and Rethwisch, D. G., Materials Science and Engineering: An Introduction, Wiley.
Recommended Texts	Ashby, M. F., Materials Selection in Mechanical Design, Butterworth-Heinemann. Kaw, A. K., Mechanics of Composite Materials, CRC Press
Websites / Electronic Resources	ASTM International standards; ASM International handbooks

Resource	Details
	and resources; NIST material property databases.

Fourth Year / Semester ٦

1.MTE 4٦1- Mechanics of Composite Materials

Course Name	Mechanics of Composite Materials
Course Code	MTE 4٦1
Year / Semester	Fourth Year / Semester ٦
Language	English
Total Study Hours / ECTS	٦٠ Hours / ٣ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial + Lab
Course Administrator	Ahmed Mudhafar Hashim

Course Objectives

- 1-To provide students with a knowledge of the structure, properties, processing and applications of composite materials.
- 2-The module covers polymer, ceramic and metal matrix composites and advanced materials to enable student to apply the knowledge in a wide range of industries.
- 3-The course provides practical methods and theoretical tools that are necessary for leading design structures formed from composite materials, in terms of constructive and production aspect.
- 4-The course will discuss the mechanical properties of composite materials (composite), and how these properties are affected by the microscopic structure of the material and production techniques; it will also provide an overview of the strengths and weaknesses of composite materials as well that should be used or treated in the design of constructive elements.

Course Learning Outcomes

- 1-Understand the relationships between the constituents, structure, properties and processing techniques of composites.
- 2-Understand micromechanics, classical laminate theory and some of the complexities of laminated systems.
- 3-Understand the fundamentals of manufacturing defects, machining and joining, failure mechanisms and damage limitation and repair.
- 4-Demonstrate an understanding of composite constituents: fibers and matrices, and their properties.
- 5-The ability to critically evaluate manufacturing techniques and choose an appropriate manufacturing method.
- 6-Assessment of the mechanical performance of composites from the given properties of the constituents.
- 7-Describe and calculate the response of composite laminae and laminates to external loading via laminate theory involving matrix construction and manipulation.
- 8-Demonstrate an understanding of manufacturing defects, machining of composites and joining methods.
- 9-The ability to critically assess possible failure mechanisms and how failure can be prevented

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problem. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
١,٢	Introduction to composite	Lecture + Tutorial	Continuous Assessment	4	1

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	materials				
١,٢	Mechanical Properties of Composites (Stress-strain behavior, anisotropy)	Lecture + Tutorial	Continuous Assessment	4	2
١,٢	Micromechanics: Rule of Mixtures	Lecture + Tutorial	Continuous Assessment	4	3
١,٢	Macromechanics of a Lamina	Lecture + Tutorial	Continuous Assessment	4	4
١,٢	Classical Lamination Theory (CLT) II	Lecture + Tutorial	Continuous Assessment	4	5
١,٢	Failure Criteria (Tsai-Hill, Tsai-Wu)	Lecture + Tutorial	Midterm / Test	4	6
١,٢	Hygrothermal Effects in Composites	Lecture + Tutorial	Continuous Assessment	4	7
١,٢	Midterm Exam	Lecture + Tutorial	Continuous Assessment	4	8
١,٢	Hygrothermal Effects in Composites	Lecture + Tutorial	Continuous Assessment	4	9
١,٢	Micromechanics: Halpin-Tsai Equations	Lecture + Tutorial	Continuous Assessment	4	10
١,٢	Micromechanics: Strength of Lamina	Lecture + Tutorial	Continuous Assessment	4	11
١,٢	Micromechanics: Critical Fiber Volume Fraction	Lecture + Tutorial	Continuous Assessment	4	12
١,٢	Manufacturing processes of composites	Lecture + Tutorial	Continuous Assessment	4	13
١,٢	Failure Criteria (Hashin, First-Ply Failure)	Lecture + Tutorial	Continuous Assessment	4	14
١,٢	Introduction to macromechanical analysis of a lamina	Lecture + Tutorial	Continuous Assessment	4	15

Laboratory / Practical Weekly Plan

Week	Laboratory / Practical Content
1	Lab 1: Introduction to composite material databases and selection
2	Lab 2: Micromechanics: Rule of Mixtures verification using software
3	Lab 3: Macromechanics: Lamina properties using FEM
4	Lab 4: Preparation of laminate composites
5	Lab 5: Preparation of polymer matrix composite samples for tensile test
6	Lab 6: Preparation of polymer matrix composite samples for bending test

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Lab	10%	✓
Midterm Exam	20%	8
Final Exam	60%	15

Learning and Teaching Resources

Resource	Details
Required Texts	William D. Callister, Jr., Fundamentals of material science and engineering - An interactive, John Wiley & Sons, Inc.d
Recommended Texts	Mechanics of composite materials, Autar K. Kaw, © 2006 by Taylor & Francis Group, LLC

٢. MTE 4٢2 - Design and Selection of Engineering Materials-II

Course Name	Design and Selection of Engineering Materials -II
Course Code	MTE 4٢2
Year / Semester	Fourth Year / Semester ٢
Language	English
Total Study Hours / ECTS	٦٠ Hours / ٣ ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial + Lab
Course Administrator	Mohammed Abdulrazzaq

Course Objectives

- 1-To learn engineering materials
- 2-Make the selection of materials in the manufacturing of machine parts to be used in mechanical engineering
- 3-To be informed about the most suitable material selection in order to eliminate or minimize the problems during and after the production
- 4-To learn systematic approaches for the selection of materials and manufacturing processes learn
- 5-To introduce the sources of materials property data
- 7-To gain experience by studying different cases

Course Learning Outcomes

- 1-To provide the students a thorough systematic approach to the selection of metals, ceramics, polymers, and composites required for mechanical design.
- 2- Students will demonstrate how performance indexes based on mechanics analyses can be overlaid on material property charts to identify promising materials for specific applications using both manual and computer techniques. Outcome
To familiarize the students with material properties and materials fabrication processes and an approach for selecting a process capable of producing a component possessing the size, shape, properties, and cost dictated by the design.
- 3- Students will construct and use material property charts to identify a small set of materials meeting mechanical, physical, and cost requirements.
- 4- Students will use material processing charts to select suitable fabrication processes. Outcome
To teach students how to deal with multiple constraints and conflicting objectives including realistic constraints involving the economics, environment, manufacturability, and sustainability.
- 5- Students will construct a translation table for problems involving either multiple constraints or conflicting objectives, and systematically identify candidate materials. Outcome
- 6- To introduce the students to the methodologies for designing new materials and conceiving hybrid solutions.
- 7- Students will show that they can conceive hybrid material solutions that fill "white spaces" on the material property charts.
- 8-Students will demonstrate an understanding of the methodologies used in materials design.

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problem. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the

student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
1,2	Definition and Grouping of Engineering Materials, Criteria of Selection Material, Process-Design-Material Relation, Material Selection Diagrams	Lecture + Tutorial	Continuous Assessment	4	1
1,2	Classification and meaning of design Phases of design	Lecture + Tutorial	Continuous Assessment	4	2
1,2	Design considerations and constraints Classes of materials and materials properties	Lecture + Tutorial	Continuous Assessment	4	3
1,2	Materials selection under multiple constraints and objectives	Lecture + Tutorial	Continuous Assessment	4	4
1,2	Processing of materials and process selection	Lecture + Tutorial	Continuous Assessment	4	5
1,2	Selection of shape of structural components	Lecture + Tutorial	Midterm / Test	4	6
1,2	Designing with hybrid and architected materials	Lecture + Tutorial	Continuous Assessment	4	7
1,2	Midterm Exam	Lecture + Tutorial	Continuous Assessment	4	8
1,2	Software for materials selection	Lecture + Tutorial	Continuous Assessment	4	9
1,2	Material Selection – Shape Relation and Importance of Shape Factor	Lecture + Tutorial	Continuous Assessment	4	10
1,2	Materials selection without shape	Lecture + Tutorial	Continuous Assessment	4	11
1,2	Selection of material and shape	Lecture + Tutorial	Continuous Assessment	4	12
1,2	Hybrid materials, Bio-inspired	Lecture + Tutorial	Continuous Assessment	4	13

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	materials				
1,2	Numerous case studies	Lecture + Tutorial	Continuous Assessment	4	14
1,2	Numerous case studies	Lecture + Tutorial	Continuous Assessment	4	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Lab	10%	✓
Midterm Exam	20%	8
Final Exam	60%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach, Copyright Year: 2020, dissidents.

٣. MTE 4٢٣ - CAD-CAM

Course Name	CAD-CAM
Course Code	MTE 4٢٣
Year / Semester	Fourth Year / Semester ٢
Language	English
Total Study Hours / ECTS	٦٠ Hours / ٣ ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial + Lab
Course Administrator	Laith Fadel

Course Objectives

- 1-To introduce the historical perspective and evolution of CAD/CAM systems.
- 2-To understand the design process and the role of computers in design.
- 3-To familiarize students with computer hardware components (CPU, memory, input/output devices).
- 4-To study different types of computers and their use in engineering (PCs, workstations, parallel processing).
- 5-To explore CAD software, graphics tools, solid modeling, and data exchange standards (IGES, STEP, DXF, ACIS).
- 6-To apply CAD tools in optimization, virtual and rapid prototyping, and computer-aided manufacturing.

Course Learning Outcomes

- 1-Upon completion of this course, students will be able to:
 Explain the historical development and importance of CAD/CAM in modern engineering.
 Identify the main hardware components used in CAD systems (CPU, memory, input/output devices).
- 2-Describe the types of computers and memory systems used in engineering applications.
- 3-Use CAD software for 2D drafting and 3D solid modeling.
- 4-Apply data exchange standards (IGES, STEP, DXF) for interoperability between different systems.
- 4-Analyze engineering problems using CAD-based optimization and simulation tools.
- 6-Demonstrate the use of CAD in virtual prototyping, rapid prototyping, and CAM.

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problem. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems. Practical lab sessions are used to apply CAD software and tools for design and manufacturing.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
٢,٦,٧	INTRODUCTION TO CAD: Historical Perspective, Design Process, Applying Computers to Design	Lecture + Tutorial	Continuous Assessment	4	1

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
٣,٦,٧	HARDWARE: Central Processing Unit, Input / Output	Lecture + Tutorial	Continuous Assessment	4	2
٣,٦,٧	THE COMPUTER: Evolution, Classes, CPU, CISC/RISC, PCs, Workstations, Parallel Processing	Lecture + Tutorial	Continuous Assessment	4	3
٣,٦,٧	MEMORY SYSTEMS: Organizational Methods, Internal/External Memory, Magnetic Media, Disks, Tape, Optical Storage	Lecture + Tutorial	Continuous Assessment	4	4
٣,٦,٧	INPUT DEVICES	Lecture + Tutorial	Continuous Assessment	4	5
٣,٦,٧	OUTPUT DEVICES: Electronic Displays, Hard-Copy Devices	Lecture + Tutorial	Midterm / Test	4	6
٣,٦,٧	SOFTWARE: Operating Systems, GUI, X Window System, Computer Languages	Lecture + Tutorial	Continuous Assessment	4	7
٣,٦,٧	Midterm Exam	Lecture + Tutorial	Continuous Assessment	4	8
٣,٦,٧	CAD SOFTWARE: Graphics Software, Solid Modeling	Lecture + Tutorial	Continuous Assessment	4	9
٣,٦,٧	CAD STANDARDS & TRANSLATORS: IGES, STEP, DXF, ACIS	Lecture + Tutorial	Continuous Assessment	4	10
٣,٦,٧	Analysis Software & Problem Types	Lecture + Tutorial	Continuous Assessment	4	11
٣,٦,٧	APPLICATIONS OF CAD: Optimization Applications	Lecture + Tutorial	Continuous Assessment	4	12
٣,٦,٧	Virtual Prototyping	Lecture + Tutorial	Continuous Assessment	4	13
٣,٦,٧	Rapid Prototyping	Lecture + Tutorial	Continuous Assessment	4	14

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
٣,٦,٧	Computer-Aided Manufacturing (CAM) & Final Review	Lecture + Tutorial	Continuous Assessment	4	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Lab	10%	٧
Midterm Exam	20%	8
Final Exam	60%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Groover, M. P., & Zimmers, E. W. (1984). CAD/CAM: Computer-Aided Design and Manufacturing
Recommended Texts	Rao, P. N. (2010). CAD/CAM: Principles and Applications (3rd ed.)

٤.MTE 4٦٤ - Advanced Engineering Materials

Course Name	Advanced Engineering Materials
Course Code	MTE 4٦٤
Year / Semester	Fourth Year / Semester ٦
Language	English
Total Study Hours / ECTS	٤٠Hours / ٧ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial
Course Administrator	Dhuha Albusalih

Course Objectives

- 1-To introduce students to the concept and classification of advanced engineering materials.
- 2-To study the properties, processing, and applications of superalloys and shape memory alloys.
- 3-To explore unusual behaviors of materials and self-healing materials.
- 4-To understand electro-restrictive, thermo-responsive, pH-sensitive, and light-sensitive materials.
- 5-To introduce smart polymers, intelligent gels (hydrogels), and smart catalysts.
- 6-To evaluate the applications of advanced materials in modern engineering.

Course Learning Outcomes

- 1-Classify advanced engineering materials based on their properties and applications.
- 2-Explain the behavior and applications of superalloys and shape memory alloys.
- 3-Describe unusual material behaviors and self-healing mechanisms.
- 4-Identify the characteristics and applications of electro-restrictive, thermo-responsive, pH-sensitive, and light-sensitive materials.
- 5-Analyze the role of smart polymers, hydrogels, and smart catalysts in modern technology.
- 6-Evaluate the engineering applications of advanced materials in various industries.

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problem. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
Γ,ο,λ	Introduction to advanced materials	Lecture + Tutorial	Continuous Assessment	۳	1
Γ,ο,λ	Super alloys.	Lecture + Tutorial	Continuous Assessment	۳	2
Γ,ο,λ	Applications of super alloys	Lecture + Tutorial	Continuous Assessment	۳	3
Γ,ο,λ	Unusual Behaviors of Materials	Lecture + Tutorial	Continuous Assessment	۳	4
Γ,ο,λ	Self-healing materials	Lecture + Tutorial	Continuous Assessment	۳	5
Γ,ο,λ	Electro-restrictive Materials	Lecture + Tutorial	Midterm / Test	۳	6
Γ,ο,λ	Thermo-responsive Materials	Lecture + Tutorial	Continuous Assessment	۳	7
Γ,ο,λ	Midterm Exam	Lecture + Tutorial	Continuous Assessment	۳	8
Γ,ο,λ	Light-Sensitive Materials	Lecture + Tutorial	Continuous Assessment	۳	9
Γ,ο,λ	Smart Polymers	Lecture + Tutorial	Continuous Assessment	۳	10
Γ,ο,λ	Smart (Intelligent) Gels (Hydrogels)	Lecture + Tutorial	Continuous Assessment	۳	11
Γ,ο,λ	Smart Catalysts	Lecture + Tutorial	Continuous Assessment	۳	12
Γ,ο,λ	Applications of Advanced materials	Lecture + Tutorial	Continuous Assessment	۳	13
Γ,ο,λ	Applications of Advanced materials	Lecture + Tutorial	Continuous Assessment	۳	14
Γ,ο,λ	Applications of Advanced materials	Lecture + Tutorial	Continuous Assessment	۳	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
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Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Midterm Exam	20%	8
Final Exam	70%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Advanced Materials: An Introduction to Modern Materials Science
Recommended Texts	Smart Polymer Catalysts and Tunable Catalysis (Elsevier, 2019) .

• MTE 470 - Biomaterials

Course Name	Biomaterials
Course Code	MTE 470
Year / Semester	Fourth Year / Semester I
Language	English
Total Study Hours / ECTS	70 Hours / 7 ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial + Lab
Course Administrator	Maha Jasim Mohammed

Course Objectives

- 1-To introduce students to the fundamentals of biomaterials, nanobiomaterials, and nanobiotechnology.
- 2-To understand the biomineralization process and its applications in bone and silica formation.
- 3-To explore biomimetic mineralization and its role in material synthesis.
- 4-To study biogenic nanoparticles and their synthesis methods.
- 5-To introduce stealth nanoparticles and virus-like nanoparticles for gene delivery.
- 6-To understand smart drug delivery systems and targeted nano delivery systems.
- 7-To introduce the role of biomaterials and nanostructured scaffolds in tissue engineering, and the use of biosensors in materials characterization and biomedical applications

Course Learning Outcomes

Upon completion of this course, students will be able to:

- 1-Explain the basic concepts of biomaterials, nanobiomaterials, and nanobiotechnology.
- 2-Describe the biomineralization process and its applications in bone and silica formation.
- 3-Apply biomimetic mineralization techniques in material design.
- 4-Identify biogenic nanoparticles and their synthesis methods.
- 5-Analyze the structural, surface, and functional properties of stealth nanoparticles and virus-like nanoparticles used in drug delivery systems .
- 6-Design smart drug delivery systems and targeted nano delivery systems based on material selection, surface functionalization, and release mechanisms.
- 7-Evaluate the use of biomaterials (polymers, ceramics, composites) as scaffolds, and biosensors for materials characterization in tissue engineering applications

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problem. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
١,٣	Introduction to Biomaterials, Nanobiomaterials, Nanobiotechnology	Lecture + Tutorial	Continuous Assessment	4	1

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
١,٣	Biom mineralization Process, Biom mineralization of Bone	Lecture + Tutorial	Continuous Assessment	4	2
١,٣	Biom mineralization of Silica, Microemulsion Biom mineralization	Lecture + Tutorial	Continuous Assessment	4	3
١,٣	Biomimetic Mineralization	Lecture + Tutorial	Continuous Assessment	4	4
١,٣	Biogenic nanoparticles	Lecture + Tutorial	Continuous Assessment	4	5
١,٣	Biogenic metal nanoparticle	Lecture + Tutorial	Midterm / Test	4	6
١,٣	Biogenic Synthesis of metal nanoparticles	Lecture + Tutorial	Continuous Assessment	4	7
١,٣	Midterm Exam	Lecture + Tutorial	Continuous Assessment	4	8
١,٣	Stealth Nanoparticles	Lecture + Tutorial	Continuous Assessment	4	9
١,٣	Virus-like nanoparticles for gene delivery	Lecture + Tutorial	Continuous Assessment	4	10
١,٣	Smart system	Lecture + Tutorial	Continuous Assessment	4	11
١,٣	APPLICATIONS OF CAD: Optimization Applications	Lecture + Tutorial	Continuous Assessment	4	12
١,٣	Types of smart drug delivery systems	Lecture + Tutorial	Continuous Assessment	4	13
١,٣	Rapid Types of smart drug delivery systems. -Targeted nano delivery systems	Lecture + Tutorial	Continuous Assessment	4	14
١,٣	Scaffolds -What are biosensors? -Classification of	Lecture + Tutorial	Continuous Assessment	4	15

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	biosensors. -Nanoparticles for Live Cell Dynamics				

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Lab	10%	9
Midterm Exam	20%	8
Final Exam	60%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Biomaterials Science: An Introduction to Materials in Medicine
Recommended Texts	Nanobiomaterials (edited by B. G. S. Kumar, 2021)

٦. MTE 4٢٦ -Engineering Project Management

Course Name	Engineering Project Management
Course Code	MTE 4٢٦
Year / Semester	Fourth Year / Semester٢
Language	English
Total Study Hours / ECTS	١٥ Hours / ١ ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture
Course Administrator	Musa Abd Shojjia

Course Objectives

- 1-To introduce the basic principles of complex engineering projects and project management methods.
- 2-To understand project organization and the difference between management skills and engineering skills.
- 3-To explore entrepreneurship, economic feasibility, and financial management of technology enterprises.
- 4-To study legal issues related to project engineering and management (PE&M).
- 5-To apply principles of pollution prevention and technology for energy conversion in project management.
- 6-To design and conduct industrial experiments and apply managerial communication for project managers

Course Learning Outcomes

Upon completion of this course, students will be able to:

- 1-Explain the basic principles of complex engineering projects and project management methods.
- 2-Organize engineering projects effectively using appropriate management and engineering skills.
- 3-Evaluate the economic feasibility and financial management of technology enterprises.
- 4-Identify legal issues related to project engineering and management.
- 5-Apply pollution prevention and energy conversion technologies in project management.
- 6-Design industrial experiments and apply managerial communication strategies for project managers.

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problem. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems. Case studies and project-based learning are also used to enhance understanding of real-world project management scenarios.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
١,٥,٦	The basic principles of complex engineering projects	Lecture	Continuous Assessment	١	1
١,٥,٦	Project management	Lecture	Continuous Assessment	١	2

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	methods, and project organization				
Γ,ο,λ	Management skills and engineering skills	Lecture	Continuous Assessment	1	3
Γ,ο,λ	Entrepreneurship and Economic Feasibility	Lecture	Continuous Assessment	1	4
Γ,ο,λ	Project and Engineering Management	Lecture	Continuous Assessment	1	5
Γ,ο,λ	Project and Engineering Management	Lecture	Midterm / Test	1	6
Γ,ο,λ	Legal Issues Related to PE&M	Lecture	Continuous Assessment	1	7
Γ,ο,λ	Midterm Exam	Lecture	Continuous Assessment	1	8
Γ,ο,λ	Financial Management of Tech Enterprises	Lecture	Continuous Assessment	1	9
Γ,ο,λ	Management, Economics, and Accounting	Lecture	Continuous Assessment	1	10
Γ,ο,λ	Pollution Prevention	Lecture	Continuous Assessment	1	11
Γ,ο,λ	Technology for Energy Conversion	Lecture	Continuous Assessment	1	12
Γ,ο,λ	Application and Design for Industrial Experiments	Lecture	Continuous Assessment	1	13
Γ,ο,λ	Application and Design for Industrial Experiments	Lecture	Continuous Assessment	1	14
Γ,ο,λ	Application and Design	Lecture	Continuous Assessment	1	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Midterm Exam	40%	8
Final Exam	60%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Engineering Project Management: A Hands-On Guide for Successful Engineering Projects (Neil G. Siegel, Wiley, 2nd Edition)

٧. MTE 4٢٧ - X-Ray Inspections

Course Name	X-Ray Inspections
Course Code	MTE 4٢٧
Year / Semester	Fourth Year / Semester ٢
Language	English
Total Study Hours / ECTS	٤٠ Hours / ٧ ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture + Tutorial
Course Administrator	Qahtan Adnan Youssef

Course Objectives

- 1-To introduce the fundamental principles of crystallography and the properties of X-rays.
- 2-To understand the geometry of crystals, symmetry (point group and space group), and interpretation of space group tables.
- 3-To study the principles of X-ray diffraction, including diffraction geometry, intensities, and real sample effects.
- 4-To explore diffraction measurement techniques and electron beam properties.
- 5-To understand elastic and inelastic scattering of electrons.
- 6-To study advanced characterization techniques: Single Crystal XRD, Powder Diffraction, Neutron Diffraction, and Electron Microscopy (SEM, TEM, STEM).
- 7-To introduce Energy Dispersive X-ray Analysis (EDAX) and X-ray Absorption Spectroscopy (XAFS, EXAFS, XANES)..

Course Learning Outcomes

Upon completion of this course, students will be able to:

- 1-Explain the basic principles of crystallography and X-ray properties.
- 2-Describe crystal geometry, symmetry elements, and space group tables.
- 3-Apply X-ray diffraction principles to analyze crystal structures.
- 4-Analyze diffraction geometry, intensities, and real sample effects.
- 5-Compare different X-ray and electron-based characterization techniques (XRD, SEM, TEM, STEM, EDAX).
- 6-Interpret X-ray absorption spectroscopy data (EXAFS, XANES) for materials analysis.
- 7-Select appropriate inspection techniques for materials characterization and quality control.

Teaching and Learning Strategies

The learner's scientific and research skills are developed through teaching and learning activities of analyzing skills and solving specific problems that address engineering problem. Teaching starts from simple and familiar engineering concepts and is then developed further by sets of problems prepared by the instructor and given to small study groups. It is taught in the usual theoretical presentation method using the blackboard and relying on the method (how and why) to motivate the student to learn and know. The theoretical presentation method is also used with a data projector and direct discussions between the instructor and the students to solve practical problems. Practical lab sessions are used to demonstrate X-ray diffraction and electron microscopy techniques.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
1,3	Introduction To Crystallography, Properties Of X-Rays	Lecture + Tutorial	Continuous Assessment	3	1
1,3	Geometry Of Crystals	Lecture + Tutorial	Continuous Assessment	3	2
1,3	Symmetry – Point Group And Space Group,	Lecture + Tutorial	Continuous Assessment	3	3
1,3	X-Ray Diffraction.	Lecture + Tutorial	Continuous Assessment	3	4
1,3	Diffraction Measurements	Lecture + Tutorial	Continuous Assessment	3	5
1,3	Electrons As Source,	Lecture + Tutorial	Midterm / Test	3	6
1,3	Properties Of Electron Beam,	Lecture + Tutorial	Continuous Assessment	3	7
1,3	Midterm Exam	Lecture + Tutorial	Continuous Assessment	3	8
1,3	Single Crystal X-Ray Diffraction	Lecture + Tutorial	Continuous Assessment	3	9
1,3	Powder	Lecture + Tutorial	Continuous	3	10

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	Diffraction		Assessment		
1,3	Neutron Diffraction	Lecture + Tutorial	Continuous Assessment	3	11
1,3	Electron Microscopy	Lecture + Tutorial	Continuous Assessment	3	12
1,3	Scanning Electron Microscopy (Sem)	Lecture + Tutorial	Continuous Assessment	3	13
1,3	Extended X-Ray Absorption Fine Structure	Lecture + Tutorial	Continuous Assessment	3	14
1,3	Ray Absorption Spectroscopy	Lecture + Tutorial	Continuous Assessment	3	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Quizzes	10%	5, 10
Midterm Exam	20%	8
Final Exam	70%	15

Learning and Teaching Resources

Resource	Details
Required Texts	Scanning Electron Microscopy and X-Ray Microanalysis (Goldstein et al., Springer, 4th Edition, 2017)
Recommended Texts	X-Ray Absorption and X-Ray Emission Spectroscopy: Theory and Applications (Jeroen A. van Bokhoven & Carlo Lamberti, Wiley, 2016)

A. MTE 4Γ8 - English Language A

Course Name	English Language A
Course Code	MTE 4ΓA
Year / Semester	Fourth Year / Semester Γ
Language	English
Total Study Hours / ECTS	10 Hours / 1 ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture
Course Administrator	Shamam Kazem Mohammed

Course Objectives

- 1-Communicative and intercultural competences are overarching learning goals.
- 2-An integrated approach to the teaching of languages is expected, in which the skills of listening, reading, spoken interaction, spoken production and writing should all have their place.
- 3-In teaching and learning the target language should be used as much as possible.
- 4-A variety of teaching methods and approaches should be used

Course Learning Outcomes

1. Knowledge objective:

Demonstrate insight and profound understanding of the cultures of the target language: society current affairs, literature and its context.

Skills objective:

An in-depth and extensive knowledge of concrete and abstract vocabulary adapted for the majority of communicative situations as well as a knowledge of some of the key idiomatic words and phrases.

2- General and qualifying skills (Other skills related to employability and personal development):

Develop the ability to perform duties and deliver them on time

Improving the critical thinking for students.

Building the idea of group working to solve the problems

Teaching and Learning 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..

Teaching and Learning 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..

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
٤,٦	Unit 7: Getting on together	Lecture	Continuous Assessment	١	1
٤,٦	Unit 7: Getting on together	Lecture	Continuous Assessment	١	2
٤,٦	Unit 8: Going to extremes	Lecture	Continuous Assessment	١	3
٤,٦	Unit 8: Going to	Lecture	Continuous	١	4

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	extremes		Assessment		
٤,٦	Unit 9: Forever friends	Lecture	Continuous Assessment	١	5
٤,٦	Unit 9: Forever friends	Lecture	Midterm / Test	١	6
٤,٦	Unit 10: Risking life and limb	Lecture	Continuous Assessment	١	7
٤,٦	Midterm Exam	Lecture	Continuous Assessment	١	8
٤,٦	Unit 11: In your dreams	Lecture	Continuous Assessment	١	9
٤,٦	Unit 11: In your dreams	Lecture	Continuous Assessment	١	10
٤,٦	Unit 12: It's never too late	Lecture	Continuous Assessment	١	11
٤,٦	Unit 12: It's never too late	Lecture	Continuous Assessment	١	12
٤,٦	Review Units 7–9	Lecture	Continuous Assessment	١	13
٤,٦	Review Units 10–12	Lecture	Continuous Assessment	١	14
٤,٦	Final Exam (Units 7–12)	Lecture	Continuous Assessment	١	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Midterm Exam	٤0%	٨
Final Exam	٦0%	1٥

Learning and Teaching Resources

Resource	Details
Required Texts	Headway Upper intermediate Students book

٩. MTE 4٦٩ - Engineering Project

Course Name	Engineering Project
Course Code	MTE 4٦٩
Year / Semester	Fourth Year / Semester ٦
Language	English
Total Study Hours / ECTS	60 Hours / 2 ECTS
Module Type	Core learning activity
Attendance Forms	Tutorial + Laboratory + Seminar
Course Administrator	Department Teaching Assignment

Course Objectives

Engineering Project II is the capstone stage in which students integrate process synthesis, material and energy balances, equipment design, control and safety, economics, environmental considerations, and professional communication into Complete Materials Engineering project. The course culminates in a written report, engineering drawings/simulation files, and oral defense.

Course Learning Outcomes

- Integrate Materials-engineering knowledge to define and complete an open-ended design/project problem.
- Develop process flow diagrams, material and energy balances, and justified process specifications.
- Perform detailed design/sizing of selected process equipment using appropriate standards and software.
- Evaluate process safety, environmental impacts, controllability, and sustainability considerations.
- Prepare an economic evaluation and compare feasible design alternatives.
- Produce a professional technical report and defend engineering decisions orally.
- Work effectively in a project team, manage tasks and deadlines, and demonstrate professional and ethical responsibility.

Teaching and Learning Strategies

Project-based learning is used under faculty supervision. Teams hold scheduled design reviews, maintain project records, use process simulation and engineering design tools, consult standards and literature, and receive iterative feedback on technical calculations, drawings, safety, economics, sustainability, report writing, and presentation.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
١,٢,٣,٤,٦,٧	Project re-scoping, objectives, deliverables and responsibility matrix	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	1
١,٢,٣,٤,٦,٧	Process basis, design criteria and updated literature review	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	2
١,٢,٣,٤,٦,٧	Final process flow diagram and stream specifications	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	3
١,٢,٣,٤,٦,٧	Material balance verification and	Tutorial + Laboratory +	Continuous Assessment	4	4

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	simulation convergence	Seminar / Project Supervision			
١,٢,٣,٤,٦,٧	Energy balance and utility system definition	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	5
١,٢,٣,٤,٦,٧	Detailed design of major equipment I	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	6
١,٢,٣,٤,٦,٧	Midterm design review / oral progress presentation	Tutorial + Laboratory + Seminar / Project Supervision	Midterm / Test	2	7
١,٢,٣,٤,٦,٧	Detailed design of major equipment II	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	8
١,٢,٣,٤,٦,٧	Mechanical/material-selection considerations and equipment specifications	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	9
١,٢,٣,٤,٦,٧	P&ID development, instrumentation and control philosophy	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	10
١,٢,٣,٤,٦,٧	Process safety review: hazards, relief/containment and safeguards	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	11
١,٢,٣,٤,٦,٧	Environmental assessment, emissions/effluents and waste management	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	12
١,٢,٣,٤,٦,٧	Capital/operating	Tutorial +	Continuous	4	13

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	cost estimation and economic evaluation	Laboratory + Seminar / Project Supervision	Assessment		
١,٢,٣,٤,٦,٧	Sustainability review, optimization and design reconciliation	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	14
١,٢,٣,٤,٦,٧	Final report, drawings, appendices and quality check	Tutorial + Laboratory + Seminar / Project Supervision	Continuous Assessment	4	15
١,٢,٣,٤,٦,٧	Final presentation / viva and submission of complete project	Tutorial + Laboratory + Seminar / Project Supervision	Final Examination / Review	2	16

Laboratory / Practical Weekly Plan

Week	Laboratory / Practical Content
1	Project simulation and stream-table verification
2	Equipment-sizing calculations and design spreadsheets
3	Process-flow-diagram / P&ID development
4	Safety and relief-system calculations / HAZOP-style review
5	Economic evaluation spreadsheet / cost estimation
6	Integrated process simulation and optimization
7	Final drawings, model files and technical-report compilation

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Supervisor Progress Reviews	15%	Continuous
Design Calculations and Technical Quality	20%	6, 10, 14
Simulation / Drawings / Project Artifacts	15%	Continuous
Safety, Environmental and Economic Evaluation	15%	11-14
Final Written Report	20%	15
Oral Presentation and Viva	15%	16
Written Midterm	0%	N/A
Written Final	0%	N/A

Learning and Teaching Resources

Resource	Details
Required Texts	Callister, W. D. and Rethwisch, D. G., Materials Science and Engineering: An Introduction, Wiley.
Recommended Texts	Ashby, M. F., Materials Selection in Mechanical Design, Butterworth-Heinemann. Kaw, A. K., Mechanics of Composite Materials, CRC Press
Websites / Electronic Resources	ASTM International standards; ASM International handbooks and resources; NIST material property databases.

10. MTE 400-Professional ethics

Course Name	Professional ethics
Course Code	MTE 400
Year / Semester	Fourth Year / Semester I
Language	English
Total Study Hours / ECTS	10 Hours / 1 ECTS
Module Type	Basic learning activity
Attendance Forms	Lecture
Course Administrator	Nadia Kazem

Course Objectives

The engineering ethics curriculum aims to introduce the student to the skills of the engineering ethics course, the field of applied ethics, and a system of ethical principles that apply to the practice of engineering. This field deals with the obligations of the engineer to society, to his clients, and to his profession, and as a scientific discipline, it is closely related to several topics such as philosophy of science, philosophy of engineering, and ethics of technology.

Course Learning Outcomes

A- Cognitive goals

During the academic year, the student learns the basics of engineering ethics.

Enabling the student to know the main principles of the most prominent ethics of the engineering profession, its sources and types, and the mechanisms used for its purpose.

Enabling the student to know all the basics that he uses in the scientific subject

b- Marathi goals related to the subject

Enable students to acquire the basic information necessary to free them from all violations

Their knowledge of the most important ethics and instilling a sense of responsibility towards their individual rights and public interests

Teaching and Learning 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 type of simple experiments involving some sampling activities that are interesting to the students.

Course Structure

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
١,٢,٦	Introduction	Lecture	Continuous Assessment	١	1
١,٢,٦	Why Professional Ethics	Lecture	Continuous Assessment	١	2
١,٢,٦	What Is A Profession	Lecture	Continuous Assessment	١	3
١,٢,٦	The Professional Mode	Lecture	Continuous Assessment	١	4
١,٢,٦	Types Of Ethics Or Morality	Lecture	Continuous Assessment	١	5
١,٢,٦	Responsibility in Engineering	Lecture	Midterm / Test	١	6
١,٢,٦	Engineering Standards	Lecture	Continuous Assessment	١	7
١,٢,٦	The Social and Value Dimensions of Technology	Lecture	Continuous Assessment	١	8
١,٢,٦	Trust and Reliability	Lecture	Continuous Assessment	١	9
١,٢,٦	Risk and Liability in Engineering	Lecture	Continuous Assessment	١	10
١,٢,٦	The Social and Value Dimensions of Technology	Lecture	Continuous Assessment	١	11
١,٢,٦	Engineers in Organizations	Lecture	Continuous Assessment	١	12
١,٢,٦	Trust and	Lecture	Continuous	١	13

Required Learning Outcomes	Unit / Subject Name	Learning Method	Evaluation Method	Hours	Week
	Reliability		Assessment		
٤,٥,٦	Engineers and the Environment	Lecture	Continuous Assessment	١	14
٤,٥,٦	Cases should be presented for use in conjunction with	Lecture	Continuous Assessment	١	15

Course Evaluation

Assessment Method	Weight	Week Due (if stated)
Midterm Exam	٤0%	٨
Final Exam	٦0%	1٥

Learning and Teaching Resources

Resource	Details
Required Texts	منهج وزارى - مدونة اخلاقيات المهنة الهندسية

