نموذج وصف البرنامج الأكاديمي





اسم الجامعة: جامعة كلكامش

الكلية/ المعهد: كلية الهندسة

القسم العلمي: هندسة الإلكترونيك والاتصالات

اسم البرنامج الأكاديمي او المهني: بكالوريوس

اسم الشهادة النهائية: بكالوريوس في هندسة الإلكترونيك والاتصالات

النظام الدراسي: بولونيا

تاريخ اعداد الوصف:

التوقيع :

اسم رئيس القسم:

التاريخ :

التوقيع :

اسم المعاون العلمي:

التاريخ :



دقق الملف من قبل

شعبة ضمان الجودة والأداء الجامعي

اسم مدير شعبة ضمان الجودة والأداء الجامعي

التاريخ

التوقيع

مصادقة السيد العميد

أ.م.د. [illegible]

١. رؤية البرنامج

يطمح قسم هندسة الإلكترونيك والاتصالات إلى بناء كوادر هندسية متخصصة، تتمتع بمعرفة علمية وبحثية متقدمة، وقدرة عملية على الابتكار وتطبيق الحلول التقنية في مجالات الاتصالات والإلكترونيك الحديثة. يركز القسم على دمج أحدث التقنيات والأساليب التعليمية المبتكرة في برامج الدراسة، مع الالتزام بأعلى معايير الجودة الأكاديمية، بهدف تعزيز مكانته كمؤسسة تعليمية وبحثية رائدة على المستويين الوطني والدولي، والمساهمة الفاعلة في تطوير المجتمع والصناعة التكنولوجية.

٢. رسالة البرنامج

يسعى قسم هندسة الإلكترونيك والاتصالات في جامعة كلكامش إلى إنشاء بيئة تعليمية وبحثية محفزة، تعتمد على أفضل استخدام للموارد المتاحة. يركز القسم على تقديم برامج تعليمية متطورة في مجالات الإلكترونيك والاتصالات، مع تعزيز البحث العلمي والابتكار التقني. كما يهدف إلى إعداد مهندسين مؤهلين قادرين على تطبيق المعرفة الحديثة وحلول التقنية في المجتمع والصناعة، والمساهمة بفاعلية في التنمية المستدامة. ويولي القسم اهتمامًا بتعزيز التعاون مع القطاع الصناعي وتشجيع المشاريع البحثية التي تلبي احتياجات سوق العمل وتدعم نمو المجتمع.

٣. اهداف البرنامج

١. تخريج مهندسين متميزين: إعداد مهندسين ذوي كفاءة علمية وعملية عالية قادرين على التعامل مع التحديات الحديثة في مجالات الإلكترونيك والاتصالات والمساهمة في تلبية احتياجات المجتمع والصناعة.
٢. تعزيز البحث والابتكار: تشجيع الخريجين وأعضاء الهيئة التدريسية على الانخراط في البحث العلمي والتطوير التكنولوجي، وإيجاد حلول مبتكرة للمشكلات التقنية والعلمية المعاصرة.
٣. تطوير الكفاءات الأكاديمية والسلوكية: تنمية مهارات التفكير النقدي والسلوك المهني الإيجابي لدى الطلاب، وتأهيلهم لاستكمال الدراسات العليا والمساهمة في بناء قاعدة أكاديمية قوية تدعم القطاع التعليمي والبحثي.
٤. الشراكة مع المجتمع والصناعة: تعزيز التعاون مع المؤسسات الصناعية والمجتمعية لتطبيق المعرفة العلمية والتقنية في مشاريع عملية، وضمان جاهزية الخريجين لسوق العمل الحديث.

٤. الاعتماد البرامجي

في إطار سعي قسم هندسة الالكترونيك والاتصالات في كلية الهندسة جامعة كلكامش فإن القسم في طور استكمال المتطلبات للحصول على الاعتماد البرامجي

٥. المؤثرات الخارجية الأخرى

سوق العمل الزيارات العلمية والميدانية للدوائر الحكومية والشركات ذات العلاقة في تخصص كلية هندسة الالكترونيك والاتصالات.

٦. هيكلية البرنامج

هيكل البرنامج	عدد المقررات	وحدة دراسية	النسبة المئوية	ملاحظات *
متطلبات المؤسسة	٢	٤		مقرر أساسي
متطلبات الكلية	نعم			مقرر أساسي
متطلبات القسم	٥٢	١٣٣	٩٧%	
التدريب الصيفي				استيفاء
أخرى				

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

٧. وصف البرنامج

السنة / المستوى	رمز المقرر أو المساق	اسم المقرر أو المساق	الساعات المعتمدة	
			نظري	عملي
المرحلة الاولى كورس اول	GU131	الديموقراطية وحقوق الانسان	٢	
المرحلة الاولى كورس اول	ECE11302	تحليل دوائر التيار المستمر	٢	٢
المرحلة الاولى كورس اول	GU133	اللغة الإنجليزية ١	٢	
المرحلة الاولى كورس اول	ECE11301	الرياضيات ١	٣	
المرحلة الاولى كورس اول	ECE11303	تكنولوجيا المعلومات	٢	٣
المرحلة الاولى كورس اول	ECE11304	برمجة الحاسوب ١	٢	٣
المرحلة الاولى كورس اول	ECE11305	مختبر القياسات الإلكترونية	١	٢
المرحلة الاولى كورس ثاني	ECE12301	الرياضيات ٢	٣	
المرحلة الاولى كورس ثاني	ECE12302	الرسم الهندسي والتصميم	٣	٣
المرحلة الاولى كورس ثاني	ECE12303	فيزياء اشباه الموصلات	٢	
المرحلة الاولى كورس ثاني	ECE12304	تحليل دوائر التيار المتناوب	٢	٢
المرحلة الاولى كورس ثاني	ECE12305	برمجة الحاسوب ٢	٢	٣

المرحلة الاولى كورس ثاني	GU132	اللغة العربية ١	٢	
المرحلة الثانية كورس اول	ECE21301	الرياضيات ٣	٣	
المرحلة الثانية كورس اول	GU232	اللغة الإنجليزية ٢	٢	
المرحلة الثانية كورس اول	ECE21302	البحث والتفكير الإبداعي	١	
المرحلة الثانية كورس اول	ECE21303	الأجهزة والدوائر الإلكترونية الدقيقة ١	٢	٢
المرحلة الثانية كورس اول	ECE21304	برمجة الحاسوب ٣	٢	٣
المرحلة الثانية كورس اول	ECE21305	المجالات الكهرومغناطيسية ١	٢	
المرحلة الثانية كورس اول	GU234	جرائم نظام البعث في العراق	٢	
المرحلة الثانية كورس ثاني	ECE22301	الإشارات والأنظمة	٢	٢
المرحلة الثانية كورس ثاني	ECE22302	الأجهزة والدوائر الإلكترونية الدقيقة ٢	٢	٢
المرحلة الثانية كورس ثاني	ECE22303	الدوائر المنطقية التوافقية	١	٢
المرحلة الثانية كورس ثاني	ECE22304	عملية التصميم الهندسي	١	
المرحلة الثانية كورس ثاني	ECE22305	المجالات الكهرومغناطيسية ٢	٢	
المرحلة الثانية كورس ثاني	ECE22306	الاحتمالية والإحصاء	٢	
المرحلة الثانية كورس ثاني	ECE22307	مهارات الحاسوب		٢
المرحلة الثالثة كورس اول	ECE31301	انتشار الأمواج الكهرومغناطيسية	٢	١
المرحلة الثالثة كورس اول	ECE31302	الدوائر المنطقية المتسلسلة	٢	٢
المرحلة الثالثة كورس اول	ECE31303	أنظمة الاتصالات ١	٢	٢
المرحلة الثالثة كورس اول	ECE31304	الدوائر المتكاملة و تطبيقاتها	٢	٢
المرحلة الثالثة كورس اول	ECE31305	مختبر الدوائر الإلكترونية التماثلية	١	٢
المرحلة الثالثة كورس اول	GU331	اللغة الإنجليزية ٣	٢	
المرحلة الثالثة كورس ثاني	ECE32301	هندسة الهوائيات	٢	٢
المرحلة الثالثة كورس ثاني	ECE32302	أنظمة الاتصالات ٢	٢	٢
المرحلة الثالثة كورس ثاني	ECE32303	مختبر تصميم أنظمة الاتصالات بمساعدة الحاسوب	١	٢
المرحلة الثالثة كورس ثاني	ECE32304	مختبر تصميم الدوائر الالكترونية بمساعدة الحاسوب	١	٣

المرحلة الثالثة كورس ثاني	ECE32305	مختبر تصميم الأنظمة الرقمية	١	٢
المرحلة الثالثة كورس ثاني	ECE32306	الكترونيك القدرة	٢	٢
المرحلة الرابعة كورس اول	ECE41301	مشروع التخرج	١	٣
المرحلة الرابعة كورس اول	GU431	اللغة الإنجليزية ٤	٢	
المرحلة الرابعة كورس اول	ECE41302	الاتصالات الضوئية	٢	٢
المرحلة الرابعة كورس اول	ECE41303	هندسة التحكم	٢	٢
المرحلة الرابعة كورس اول	ECE41304	الإدارة الهندسية	٢	
المرحلة الرابعة كورس اول	ECE41305	شبكات الحاسوب	٢	٢
المرحلة الرابعة كورس ثاني	ECE42301	مشروع التخرج	١	٣
المرحلة الرابعة كورس ثاني	ECE42302	الاتصالات المتنقلة	٢	٢
المرحلة الرابعة كورس ثاني	ECE42303	الأخلاقيات الهندسية	٢	
المرحلة الرابعة كورس ثاني	ECE42304	مادة اختيارية ١	٢	٢
المرحلة الرابعة كورس ثاني	ECE42305	مادة اختيارية ٢	٢	٢
المرحلة الرابعة كورس ثاني	ECE42306	مادة اختيارية ٣	٢	٢

٨. مخرجات التعلم المتوقعة للبرنامج

المعرفة	
مخرجات التعلم ١	القدرة على تمييز وتحديد وتعريف وصياغة وحل المشكلات الهندسية من خلال تطبيق مبادئ الهندسة والعلوم والرياضيات
المهارات	
مخرجات التعلم ٢	القدرة على إنتاج تصاميم هندسية تلبي الاحتياجات المطلوبة ضمن قيود محددة، من خلال تطبيق عمليا ت التحليل في عملية التصميم الهندسي.
مخرجات التعلم ٣	القدرة على إنشاء وتنفيذ القياسات والاختبارات المناسب ة مع ضمان الجودة، وتحليل وتفسير النتائج، واستخدام الحكم الهندسي للوصول الى استنتاجات سليمة.
القيم	
مخرجات التعلم ٤	القدرة على التواصل الفعال شفهياً مع مجموعة م ن الناس، وتحريرياً مع مختلف المستويات الإدارية ولمختلف الأغراض
مخرجات التعلم ٥	القدرة على إدراك المسؤوليات الأخلاقية والمهنية في القضايا الهندسية، وإصدار أحكام سليمة تراعي ،العواقب المترتبة على المستوى المالي، والبيئي والمجتمعي والعالمي.

٩. استراتيجيات التعليم والتعلم

استراتجيات وطرائق التعليم والتعلم المعتمدة في تنفيذ البرنامج بشكل عام .

- 1 الامتحانات القائمة على النظرية
  - والصواب/الخطأ MCQsالاختبارات الموضوعية، بما في ذلك أسئلة الاختيار من متعدد
- التقييمات – الاختبارات العملية .
- التقييمات التي أجريت في إعدادات المختبر وال مشروع المهام القائمة على المحاكاة
- التقييمات القائمة المشاريع الصغيرة
- الامتحانات الشفوية
- الدفاع عن المشروع
- المقابلات المفاهيمية
- تقييم العمل الجماعي

الهيئة التدريسية

أعضاء هيئة التدريس

الرتبة العلمية	التخصص		المتطلبات/المهارات الخاصة (ان وجدت)		اعداد الهيئة التدريسية	
	عام	خاص			ملاك	محاضر
م.م براق كريم شبلي	هندسة حاسبات وبرامجيات	برمجيات-أمن سيبراني			√	
م.د. ضمياء حسام محمد	هندسة الكهرباء والالكترونيك	الذكاء الاصطناعي			√	
م.م جعفر علي جعفر	هندسة الاتصالات	هندسة نظم الاتصالات الضوئية				√
م.م حنين جمهور صبار	هندسة معلومات	هندسة شبكات				√
م.م حوراء احمد جاسم عربي	هندسة المعلومات	هندسة المعلومات والاتصالات			√	

م.م عائد محمد امير	هندسة الاتصالات	هندسة الاتصالات اللاسلكية				√		
م.م احمد عماد سليم	هندسة الالكترونيك والاتصالات	تطبيقات الليزر				√		
م.م حسن محمد خليل	هندسة الكهروميكانيكية	الملاحة والتوجيه				√		

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التطوير المهني

توجيه أعضاء هيئة التدريس الجدد

- دعم التدريس: تقديم التوجيه بشأن تخطيط المناهج الدراسية، وإدارة الفصول الدراسية، وتسهيل مراقبة الأقران للحصول على ردود الفعل
- الإرشاد البحثي: المساعدة في تحديد أهداف البحث، وتوجيه كتابة المنح، وتعزيز التعاون
- التطوير المهني :تقديم المشورة بشأن المشاركة في المؤتمرات والنشر والتخطيط المهني

التطوير المهني لأعضاء هيئة التدريس

- من الضروري إعطاء الأولوية للتطوير المهني لأعضاء هيئة التدريس في قسم الهندسة الكهربائية والحاسوبية للارتقاء بجودة التعليم العالي. وفيما يلي أهم المجالات والمبادرات التي يمكن أن تُسهم بشكل كبير في نموهم المهن ي التعليم والتدريب المستمر
- الدرجات العلمية المتقدمة: تشجيع أعضاء هيئة التدريس على متابعة الدرجات العلمية العليا مثل الدكتوراه والدراسات ما بعد الدكتوراه
- ورش العمل المتخصصة: المشاركة في ورش العمل التي تركز على التقنيات الناشئة، ومنهجيات التدريس والتقدم البحثي في مجال التعليم في مرحلة الطفولة المبكرة
- منح البحث: الوصول إلى التمويل البحثي والتقدم بطلب للحصول عليه من المصادر الحكومية والصناعية .
- فرص النشر: تشجيع نشر نتائج الأبحاث في المجلات والمؤتمرات ذات السمعة الطيبة
- البحث التعاوني: المشاركة في التعاون البحثي متعدد التخصصات والدولي
- المؤتمرات الأكاديمية: المشاركة في المؤتمرات الوطنية والدولية لعرض الأبحاث واكتساب رؤى حول الاتجاهات العالمية
- حضور وإلقاء المحاضرات والندوات للضيوف لتوسيع المعرفة والتواصل
- تطوير الفصول الدراسية عبر الإنترنت: تصميم وتقديم فصول دراسية عبر الإنترنت ودمجها في المنهج الدراسي تسهم هذه المبادرات مجتمعة ً في النمو المهني لقسم هندسة الاتصالات وتكنولوجيا المعلومات، مما يعزز جودة التعليم

العالي.

١١. معيار القبول

(وضع الأنظمة المتعلقة بالالتحاق بالكلية أو المعهد سواء قبول مركزي او أخرى تذكر)

١٢. أهم مصادر المعلومات عن البرنامج

الموقع الإلكتروني لقسم الهندسة الإلكترونية والاتصالات،

١٣. خطة تطوير البرنامج

تحدد خطة تطوير البرنامج لقسم الهندسة الإلكترونية والاتصالات

(ECE) عادةً الاستراتيجيات لتعزيز العروض الأكاديمية للقسم وقدرات البحث والخبرة الطالبية الشاملة.

- الرؤية والرسالة –

١.(ECE) ادةً ما تحدد خطة تطوير البرنامج لقسم الهندسة الإلكترونية والاتصالات

الرؤية: تحديد الأهداف طويلة المدى لقسم الهندسة الإلكترونية والاتصالات من حيث التميز التعليمي والابتكار البحثي

- . والتأثير المجتمعي

الرسالة: وصف الأهداف الأساسية للقسم، مثل إنتاج مهندسين ذوي مهارات عالية، وتطوير التكنولوجيا من خلال البحث،

- . والمساهمة في احتياجات المجتمع

تطوير المناهج الدراسية –

٢.مراجعة المناهج الدراسية: تقييم وتحديث المناهج الدراسية بانتظام لضمان توافقها مع معايير الصناعة والتقدم التكنولوجي

- ومتطلبات الاعتماد

دورات جديدة: تقديم دورات جديدة في المجالات الناشئة مثل الذكاء الاصطناعي والأمن السيبراني والطاقة المتجددة

البحث والابتكار –

٣.مجالات التركيز البحثي: تحديد مجالات البحث الرئيسية التي يهدف القسم إلى التعلم العميق والأنظمة المضمنة والاتصالات

مشاركة الطالب: تشجيع الطالب الجامعيين والخريجين على المشاركة في مشاريع البحث والتدريب الداخلي والتعاون الصناعي

- ترقيات المختبر –

١. محاضرات وورش عمل للضيوف: قم بدعوة خبراء الصناعة لمشاركة معارفهم وخبراتهم مع الطالب وأعضاء

دعم الطالب وتطويرهم

مخطط مهارات البرنامج

السنة / المستوى	رمز المقرر	اسم المقرر	اساسي أم اختياري	مخرجات التعلم المطلوبة من البرنامج											
				المعرفة				المهارات				القيم			
				أ١	أ٢	أ٣	أ٤	ب١	ب٢	ب٣	ب٤	ج١	ج٢	ج٣	ج٤
المرحلة الاولى كورس اول	GU131	الديموقراطية وحقوق الانسان	اساسي				•				•				•
المرحلة الاولى كورس اول	ECE11302	تحليل دوائر التيار المستمر	اساسي	•	•	•	•				•				•
المرحلة الاولى كورس اول	GU133	اللغة الإنجليزية ١	اساسي	•		•	•				•	•			•
المرحلة الاولى كورس اول	ECE11301	الرياضيات ١	اساسي				•		•	•				•	•
المرحلة الاولى كورس اول	ECE11303	تكنولوجيا المعلومات	اساسي	•	•	•	•				•				•
المرحلة الاولى كورس اول	ECE11304	برمجة الحاسوب ١	اساسي	•	•	•	•	•	•	•				•	•

المرحلة الاولى كورس اول	ECE11305	مختبر القياسات الإلكترونية	اساسي	•	•	•				•	•							
المرحلة الاولى كورس ثاني	ECE12301	الرياضيات ٢	اساسي	•	•	•	•	•	•	•	•	•					•	•
المرحلة الاولى كورس ثاني	ECE12302	الرسم الهندسي والتصميم	اساسي							•				•				•
المرحلة الاولى كورس ثاني	ECE12303	فيزياء اشباه الموصلات	اساسي	•	•	•	•	•	•	•	•	•		•	•	•		•
المرحلة الاولى كورس ثاني	ECE12304	تحليل دوائر التيار المتناوب	اساسي	•	•	•	•	•	•	•	•	•		•	•	•		•
المرحلة الاولى كورس ثاني	ECE12305	برمجة الحاسوب ٢	اساسي	•	•	•	•	•	•	•					•	•		•
المرحلة الاولى كورس ثاني	GU132	اللغة العربية ١	اساسي	•	•	•				•								
المرحلة الثانية كورس اول	ECE21301	الرياضيات ٣	اساسي			•	•			•				•	•			•
المرحلة الثانية كورس	GU232	اللغة الإنجليزية	اساسي		•	•	•	•		•	•	•		•	•			•

اول		٢																
المرحلة الثانية كورس اول	ECE21302	البحث والتفكير الإبداعي	اساسي	•		•	•		•	•	•	•	•	•	•		•	•
المرحلة الثانية كورس اول	ECE21303	الأجهزة والدوائر الإلكترونية الدقيقة ١	اساسي	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
المرحلة الثانية كورس اول	ECE21304	برمجة الحاسوب ٣	اساسي	•	•	•	•	•					•	•				•
المرحلة الثانية كورس اول	ECE21305	المجالات الكهرومغناطيسية ١	اساسي	•	•	•	•											
المرحلة الثانية كورس اول	GU234	جرائم نظام البعث في العراق	اساسي	•	•	•	•											•
المرحلة الثانية كورس ثاني	ECE22301	الإشارات والأنظمة	اساسي	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
المرحلة الثانية كورس ثاني	ECE22302	الأجهزة والدوائر الإلكترونية	اساسي			•	•						•	•	•	•	•	•

		الدقيقة ٢																
المرحلة الثانية كورس ثاني	ECE22303	الدوائر المنطقية التوافقية	اساسي		•	•	•	•		•	•	•	•	•	•	•	•	•
المرحلة الثانية كورس ثاني	ECE22304	عملية التصميم الهندسي	اساسي	•		•	•	•		•	•	•	•	•	•		•	•
المرحلة الثانية كورس ثاني	ECE22305	المجالات الكهرومغناطيسية ٢	اساسي	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
المرحلة الثانية كورس ثاني	ECE22306	الاحتمالية والإحصاء	اساسي	•	•	•	•	•			•	•	•	•				•
المرحلة الثانية كورس ثاني	ECE22307	مهارات الحاسوب	اساسي			•	•	•	•	•	•				•	•	•	
المرحلة الثالثة كورس اول	ECE31301	انتشار الأمواج الكهرومغناطيسية	اساسي			•	•					•					•	•
المرحلة الثالثة كورس اول	ECE31302	الدوائر المنطقية المتسلسلة	اساسي		•	•	•	•	•	•	•	•					•	•
المرحلة الثالثة كورس	ECE31303	أنظمة	اساسي	•	•	•	•				•	•	•					•

اول		الاتصالات ١															
المرحلة الثالثة كورس اول	ECE31304	الدوائر المتكاملة و تطبيقاتها	اساسي			•	•	•		•	•	•	•	•		•	
المرحلة الثالثة كورس اول	ECE31305	مختبر الدوائر الإلكترونية التماثلية	اساسي			•	•		•	•	•	•	•	•		•	
المرحلة الثالثة كورس اول	GU331	اللغة الإنجليزية ٣	اساسي	•	•	•	•		•	•				•		•	
المرحلة الثالثة كورس ثاني	ECE32301	هندسة الهوائيات	اساسي			•	•				•				•	•	
المرحلة الثالثة كورس ثاني	ECE32302	أنظمة الاتصالات ٢	اساسي		•	•	•	•	•	•	•	•			•	•	
المرحلة الثالثة كورس ثاني	ECE32303	مختبر تصميم أنظمة الاتصالات بمساعدة الحاسوب	اساسي	•	•	•	•		•	•	•	•	•				
المرحلة الثالثة كورس	ECE32304	مختبر تصميم الدوائر	اساسي	•	•	•	•	•	•	•		•	•		•		

ثاني		الالكترونية بمساعدة الحاسوب																
المرحلة الثالثة كورس ثاني	ECE32305	مختبر تصميم الأنظمة الرقمية	**اساسي**			•	•	•	•	•		•	•	•	•		•	
المرحلة الثالثة كورس ثاني	ECE32306	الكترونيك القدرة	**اساسي**	•	•	•	•		•	•	•	•	•	•				•
المرحلة الرابعة كورس اول	ECE41301	مشروع التخرج	**اساسي**															
المرحلة الرابعة كورس اول	GU431	اللغة الإنجليزية ٤	**اساسي**															
المرحلة الرابعة كورس اول	ECE41302	الاتصالات الضوئية	**اساسي**															
المرحلة الرابعة كورس اول	ECE41303	هندسة التحكم	**اساسي**															
المرحلة الرابعة كورس اول	ECE41304	الإدارة الهندسية	**اساسي**															
المرحلة الرابعة كورس	ECE41305	شبكات	**اساسي**															

اول		الحاسوب																
المرحلة الرابعة كورس ثاني	ECE42301	مشروع التخرج	اساسي															
المرحلة الرابعة كورس ثاني	ECE42302	الاتصالات المتنقلة	اساسي	•	•	•	•	•					•	•	•	•	•	•
المرحلة الرابعة كورس ثاني	ECE42303	الأخلاقيات الهندسية	اساسي	•	•	•	•	•	•	•		•	•	•				•
المرحلة الرابعة كورس ثاني	ECE42304	مادة اختيارية ١	اساسي															
المرحلة الرابعة كورس ثاني	ECE42305	مادة اختيارية ٢	اساسي															
المرحلة الرابعة كورس ثاني	ECE42306	مادة اختيارية ٣	اساسي															

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

DC Circuit Analysis

Module Information معلومات المادة الدراسية					
Module Title	**DC Circuit Analysis**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE105a**				
ECTS Credits	**8**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ECE		**College**	Type College Code	
Module Leader	Hikmat.maad@gu.edu.com		**e-mail**	Hikmat.maad@gu.edu.com	
Module Leader's Acad. Title	Asst.Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Hikmat.maad@gu.edu.com		**e-mail**	Hikmat.maad@gu.edu.com	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	1-9-2025		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To provide students with a solid foundation in the fundamental concepts and techniques of electric circuits. 2. To develop students' ability to analyze and solve basic electric circuit problems. 3. To familiarize students with the properties and behavior of resistors, capacitors, and inductors. 4. To introduce students to network theorems and their applications in circuit analysis. 5. To enhance students' critical thinking and problem-solving skills in the context of electric circuit analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: 1. Understand and apply systems of units, charge, and current in electric circuits. 2. Calculate voltage, power, and energy in electric circuits. 3. Identify and analyze different circuit elements. 4. Apply Ohm's Law to solve circuit problems. 5. Apply Kirchhoff's laws (KVL and KCL) to analyze complex circuits. 6. Analyze series and parallel resistors and determine voltage and current division. 7. Perform wye-delta and delta-wye transformations. 8. Apply nodal analysis to solve circuits with multiple nodes. 9. Apply mesh analysis to solve circuits with multiple meshes. 10. Understand and apply the linearity property, superposition, and source transformation. 11. Apply Thevenin's theorem to simplify complex circuits and find Thevenin equivalent circuits. 12. Apply Norton's theorem to simplify complex circuits and find Norton equivalent circuits. 13. Understand and apply the maximum power transfer theorem. 14. Analyze series and parallel capacitors and calculate their equivalent capacitance. 15. Analyze series and parallel inductors and calculate their equivalent inductance.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following (**6 hours per week**) Week 1: Introduction - Systems of Units, Charge, and Current • Basic concepts of electric circuits • Introduction to systems of units • Understanding charge and current

	Week 2: Voltage, power and Energy, Circuit Elements • Voltage and its relation to electric fields • Power and energy in electric circuits • Overview of circuit elements: resistors, capacitors, and inductors Week 3: Ohm's Law, Nodes, Branches, and Loops • Ohm's Law and its Applications • Identifying nodes, branches, and loops in circuits Week 4: Kirchhoff's Laws: KVL, KCL • Kirchhoff's voltage law (KVL) • Kirchhoff's current law (KCL) • Applying KVL and KCL to analyze circuits Week 5: Series Resistors and Voltage Division, Parallel Resistors and Current Division • Analyzing series resistors and determining voltage division • Analyzing parallel resistors and determining the current division Week 6: Wye-Delta Transformations, Delta to Wye Conversion, Wye to Delta Conversion • Understanding wye-delta transformations • Converting delta networks to wye networks and vice versa Week 7: Mid-term Exam Week 8: Nodal Analysis, Nodal Analysis with Voltage Sources • Applying the nodal analysis to solve circuits with multiple nodes • Incorporating voltage sources in nodal analysis Week 9: Mesh Analysis, Mesh Analysis with Current Sources • Applying mesh analysis to solve circuits with multiple meshes • Incorporating current sources in mesh analysis Week 10: Linearity Property, Superposition, Source Transformation • Understanding the linearity property in circuits • Applying superposition to analyze circuits with multiple sources • Performing source transformation to simplify circuits Week 11: Thevenin's Theorem and its applications, Finding Thevenin equivalent circuits • Understanding Thevenin's theorem and its applications • Finding Thevenin equivalent circuits Week 12: Norton's Theorem and its applications, Finding Norton equivalent circuits

	• Understanding Norton's theorem and its applications • Finding Norton equivalent circuits Week 13: Maximum Power Transfer theorem, Calculating maximum power transfer. • Understanding the concept of maximum power transfer • Calculating the load resistance for maximum power transfer Week 14: Capacitors, Series, and Parallel Capacitors • Properties and behavior of capacitors • Analyzing series and parallel capacitors and calculating equivalent capacitance Week 15: Inductors, Series, and Parallel Inductors • Properties and behavior of inductors • Analyzing series and parallel inductors and calculating equivalent inductance

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. **Lectures**: Conduct interactive lectures to introduce and explain the key concepts, theories, and principles related to each topic. Use visual aids, examples, and real-world applications to enhance student understanding. 2. **Problem-solving Sessions**: Dedicate regular sessions to solving problems and exercises related to each topic. Encourage students to actively participate in problem-solving discussions and provide guidance and feedback during these sessions. 3. **Laboratory Sessions**: Conduct laboratory sessions where students can apply the learned theories and techniques to real-world circuit analysis. Provide hands-on experiments and projects to reinforce their understanding and enhance their practical skills. 4. **Group Discussions**: Assign group activities or case studies that require students to work collaboratively on analyzing and solving circuit problems. This fosters teamwork, critical thinking, and communication skills. 5. **Assessments**: Implement regular formative assessments, such as quizzes, assignments, and in-class exercises, to evaluate students' understanding and progress. Provide constructive feedback to guide their learning and address any misconceptions. 6. **Mid-term Exam**: Administer a mid-term exam to assess students' comprehension of the topics covered in the first half of the module. This exam can help identify areas that require further clarification or reinforcement. 7. **Final Exam**: Conduct a comprehensive final exam to assess students' overall understanding of the module's content. Design the exam to incorporate a

	variety of question formats, including theoretical concepts, problem-solving, and circuit analysis. 8. **Office Hours**: Offer dedicated office hours or consultations to provide individualized support and address students' questions or concerns. This facilitates personalized guidance and ensures students receive assistance when needed. 9. **Review Sessions**: Before exams or major assessments, conduct review sessions to summarize key concepts, address common challenges, and provide additional practice problems. This helps consolidate knowledge and reinforces understanding. 10. **Technology Integration**: Utilize appropriate software tools, simulation software, and circuit analysis software to reinforce theoretical concepts and enable students to analyze complex circuits efficiently. 11. **Continuous Feedback**: Provide ongoing feedback to students on their progress, performance, and problem-solving skills. Encourage self-reflection and self-assessment to foster a growth mindset and promote continuous improvement. 12. **Encourage Active Learning**: Incorporate active learning strategies such as think-pair-share, concept mapping, and problem-based learning. Engage students in discussions, encourage questions, and promote independent thinking to deepen their understanding. By employing these varied learning and teaching strategies, you can create an engaging and supportive environment that promotes active learning, critical thinking, and mastery of the DC circuit analysis concepts and techniques.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	98	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	2,6,10,14	LO #2, #4, #5, #8, #11 and #12
	Assignments	4	10% (10)	2 and 12	LO #3 to #12
	Project	1	10% (10)	13	LO #1 to #10

	Lab/reports	5	10% (10)	3,6,9,12,15	LO #1,#2, #7, #10, #13, #14 and #15
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	*Introduction - Systems of Units, Charge, and Current*
Week 2	*Voltage, power and Energy, Circuit Elements*
Week 3	*Ohm's Law, Nodes, Branches, and Loops*
Week 4	*Kirchhoff's Laws: Kirchhoff's voltage law (KVL), Kirchhoff's current law (KCL)*
Week 5	*Series Resistors and Voltage Division, Parallel Resistors, and Current Division*
Week 6	*Wye-Delta Transformations, Delta to Wye Conversion, Wye to Delta Conversion*
Week 7	*Mid-term Exam*
Week 8	*Nodal Analysis, Nodal Analysis with Voltage Sources*
Week 9	*Mesh Analysis, Mesh Analysis with Current Sources*
Week 10	*Linearity Property, Superposition, Source Transformation*
Week 11	*Thevenin's Theorem and its applications, Finding Thevenin equivalent circuits*
Week 12	*Norton's Theorem and its applications, Finding Norton equivalent circuits*
Week 13	*Maximum Power Transfer theorem, Calculating maximum power transfer*
Week 14	*Capacitors, Series and Parallel Capacitors*
Week 15	*Inductors, Series and Parallel Inductors*
Week 16	*A preparatory week before the Final Exam*

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: • Introduction to lab equipment and safety procedures • Measurement of resistance using multimeters • Verification of Ohm's Law through practical experiments

Week 2	Lab 2: • Measurement of voltage and current in series and parallel circuits • Verification of voltage division and current division principles
Week 3	Lab 3: • Measurement of resistance using Wheatstone bridge • Verification of Kirchhoff's laws through circuit experiments
Week 4	Lab 4: • Analysis of series and parallel resistor circuits using breadboards • Practical applications of voltage and current division in circuit construction
Week 5	Lab 5: • Wye-Delta transformation experiments using resistors. • Analysis of converted circuits and comparison with theoretical predictions
Week 6	Lab 6: • Measurement of current and voltage in circuits with capacitors • Verification of series and parallel capacitor behaviors
Week 7	Lab 7: • Mid-term Lab Exam (covering material up to Week 6)
Week 8	Lab 8: • Nodal analysis experiments • Analysis of circuits with multiple nodes and voltage sources
Week 9	Lab 9: • Mesh analysis experiments • Analysis of circuits with multiple meshes and current sources
Week 10	Lab 10: • Superposition experiments using practical circuit setups. • Verification of linearity property and source transformation
Week 11	Lab 11: • Thevenin's theorem experiments using practical circuits. • Determination of Thevenin equivalent circuits in real-world scenarios
Week 12	Lab 12: • Norton's theorem experiments using practical circuits

	• Determination of Norton equivalent circuits in real-world scenarios
Week 13	Lab 13: • Maximum power transfer experiments using practical circuits • Calculation and verification of maximum power transfer conditions
Week 14	Lab 14: • Measurement of capacitance using capacitors and an LCR meter • Analysis of series and parallel capacitor circuits
Week 15	Lab 15: • Measurement of inductance using inductors and an LCR meter • Analysis of series and parallel inductor circuits

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	Introductory Circuit Analysis Book by Robert Boylestad	Yes
Websites		

Grading Scheme
مخطط الدرجات

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

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

AC Circuit Analysis

Module Information معلومات المادة الدراسية					
Module Title	**AC Circuit Analysis**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE105b**				
ECTS Credits	**6**				
SWL (hr/sem)	**98**				
Module Level		1	**Semester of Delivery**		1
Administering Department		ECE	**College**	Engineering	
Module Leader	Hikmat.maad@gu.edu.com		**e-mail**	Hikmat.maad@gu.edu.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Jasim Oudah Khawwaf		**e-mail**	Hikmat.maad@gu.edu.com	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		1-9-2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The AC Circuit Analysis module aims to provide students with a comprehensive understanding of AC circuits and their analysis techniques. 1. The module aims to introduce students to the fundamental concepts of AC circuits, including sinusoids, phasors, impedance, and power calculations. 2. Students will learn various analysis methods, such as nodal analysis, mesh analysis, and superposition, to solve AC circuit problems. 3. The module also aims to familiarize students with important theorems like Thevenin's theorem, Norton's theorem, and the maximum power transfer theorem in the context of AC circuits. 4. Additionally, the module aims to develop student's skills in analyzing balanced and unbalanced three-phase systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the AC Circuit Analysis module, students will be able to: 1. Understand and analyze sinusoidal waveforms, phasors, and phasor relationships for circuit elements in AC circuits. 2. Apply Kirchhoff's laws in the frequency domain and analyze impedance combinations in AC circuits. 3. Apply nodal analysis and mesh analysis techniques to solve AC circuit problems, including circuits with voltage and current sources. 4. Apply superposition and source transformation methods to analyze AC circuits with multiple sources. 5. Apply Thevenin's theorem, Norton's theorem, and maximum power transfer theorem to simplify and optimize AC circuits. 6. Calculate instantaneous and average power, maximum average power transfer, and analyze power factor in AC circuits. 7. Understand and calculate effective or RMS value, apparent power, power factor, and complex power in AC circuits. 8. Understand and apply conservation of AC power principles and perform power factor correction. 9. Analyze balanced three-phase voltages and connections, including wye-wye, wye-delta, and delta-delta connections. 10. Analyze power in a balanced system and understand the basics of unbalanced three-phase systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following (**6 hours per week):** 1. Introduction to AC Circuit: Sinusoids, Phasors, Phasor Relationships for Circuit Elements, Impedance, and Admittance • Understanding sinusoidal waveforms and their properties • Introduction to phasors and their representation in AC circuits • Phasor relationships for circuit elements such as resistors, capacitors, and inductors • Introduction to impedance and admittance and their significance in AC circuits. 2. Kirchhoff's Laws in the Frequency Domain, Impedance Combinations

	• Applying Kirchhoff's laws (KVL and KCL) in the context of AC circuits • Analyzing impedance combinations, including series and parallel combinations • Simplifying complex impedance networks using series and parallel transformations. 3. Nodal Analysis, Nodal Analysis with Voltage Sources (AC) • Applying the nodal analysis method to solve AC circuits with multiple nodes • Considering the presence of voltage sources in nodal analysis • Analyzing circuits with dependent voltage sources using nodal analysis. 4. Mesh Analysis, Mesh Analysis with Current Sources (AC) • Applying mesh analysis technique to analyze AC circuits with multiple meshes • Incorporating current sources in mesh analysis • Analyzing circuits with dependent current sources using mesh analysis. 5. Superposition, Source Transformation (AC) • Applying the superposition principle to solve AC circuits with multiple sources • Performing source transformations to simplify complex circuits • Understanding the conditions for applying source transformation. 6. Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer (AC) • Understanding Thevenin's theorem and its application in simplifying complex AC circuits • Applying Norton's theorem to transform complex AC circuits into simpler equivalent circuits • Analyzing maximum power transfer conditions and calculating maximum power transfer in AC circuits 7. Instantaneous and Average Power, Maximum Average Power Transfer • Calculating instantaneous and average power in AC circuits • Understanding the concept of maximum average power transfer and its implications • Analyzing power dissipation and power losses in AC circuits 8. Effective or RMS Value, Apparent Power and Power Factor, Complex Power • Calculating the effective or RMS value of AC quantities • Understanding apparent power and power factor in AC circuits • Analyzing complex power and its components (active, reactive, and apparent power) 9. Conservation of AC Power, Power Factor Correction • Exploring the principles of conservation of AC power • Analyzing power factor and its significance in AC circuits • Studying power factor correction techniques and their implementation in circuits.

	10. Balanced Three-Phase Voltages, Balanced Wye-Wye Connection, Balanced Wye-Delta Connection, Balanced Delta-Delta Connection • Understanding balanced three-phase systems and their advantages • Analyzing balanced wye-wye, wye-delta, and delta-delta connections in three-phase circuits • Calculating line and phase voltages and currents in balanced systems 11. Balanced Delta-Wye Connection, Power in a Balanced System, Unbalanced Three-Phase Systems • Analyzing the balanced delta-wye connection in three-phase circuits • Calculating power in a balanced three-phase system • Introduction to unbalanced three-phase systems and their analysis techniques. 12. Unbalanced Three-Phase Systems (contd.): Analysis of unbalanced three-phase voltages and currents, determination of sequence components 13. Resonance in AC Circuits: Analysis of series and parallel resonance, calculation of resonant frequency and bandwidth 14. Power Factor Correction (contd.): Methods for power factor improvement, analysis of power factor correction circuits • Exploring different methods and techniques for power factor correction • Understanding the benefits and significance of power factor improvement • Analyzing power factor correction circuits, such as capacitor banks and active power factor correction

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. **Lectures**: Conduct interactive lectures to introduce and explain the key concepts, theories, and principles related to each topic. Use visual aids, examples, and real-world applications to enhance student understanding. 2. **Problem-solving Sessions**: Dedicate regular sessions to solving problems and exercises related to each topic. Encourage students to actively participate in problem-solving discussions and provide guidance and feedback during these sessions. 3. **Laboratory Sessions**: Conduct laboratory sessions where students can apply the learned theories and techniques to real-world circuit analysis. Provide hands-on experiments and projects to reinforce their understanding and enhance their practical skills. 4. **Group Discussions**: Assign group activities or case studies that require students to work collaboratively on analyzing and solving circuit problems. This fosters teamwork, critical thinking, and communication skills.

	5. **Assessments**: Implement regular formative assessments, such as quizzes, assignments, and in-class exercises, to evaluate students' understanding and progress. Provide constructive feedback to guide their learning and address any misconceptions. 6. **Mid-term Exam**: Administer a mid-term exam to assess students' comprehension of the topics covered in the first half of the module. This exam can help identify areas that require further clarification or reinforcement. 7. **Final Exam**: Conduct a comprehensive final exam to assess students' overall understanding of the module's content. Design the exam to incorporate a variety of question formats, including theoretical concepts, problem-solving, and circuit analysis. 8. **Office Hours**: Offer dedicated office hours or consultations to provide individualized support and address students' questions or concerns. This facilitates personalized guidance and ensures students receive assistance when needed. 9. **Review Sessions**: Before exams or major assessments, conduct review sessions to summarize key concepts, address common challenges, and provide additional practice problems. This helps consolidate knowledge and reinforces understanding. 10. **Technology Integration**: Utilize appropriate software tools, simulation software, and circuit analysis software to reinforce theoretical concepts and enable students to analyze complex circuits efficiently. 11. **Continuous Feedback**: Provide ongoing feedback to students on their progress, performance, and problem-solving skills. Encourage self-reflection and self-assessment to foster a growth mindset and promote continuous improvement. 12. **Encourage Active Learning**: Incorporate active learning strategies such as think-pair-share, concept mapping, and problem-based learning. Engage students in discussions, encourage questions, and promote independent thinking to deepen their understanding. By employing these varied learning and teaching strategies, you can create an engaging and supportive environment that promotes active learning, critical thinking, and mastery of the DC circuit analysis concepts and techniques.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	98	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	2,6,10,14	LO #2, #3, #4, #5, #7 and # 8
	Assignments	4	10% (10)	2 and 12	LO #3 to #10
	Project	1	10% (10)	13	LO #1- #8
	Lab/reports	5	10% (10)	3,6,9,12,15	LO #1,#2, #3, #6, #7 and # 8
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	*Introduction to AC Circuit: Sinusoids, Phasors, Phasor Relationships for Circuit Elements, Impedance and Admittance*
Week 2	*Introduction to AC Circuit (contd.)*
Week 3	*Kirchhoff's Laws in the Frequency Domain, Impedance Combinations*
Week 4	*Nodal Analysis, Nodal Analysis with Voltage Sources (AC)*
Week 5	*Mesh Analysis, Mesh Analysis with Current Sources (AC)*
Week 6	*Superposition, Source Transformation (AC)*
Week 7	*Mid-term Exam*
Week 8	*Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer (AC)*
Week 9	*Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer (AC) (contd.)*
Week 10	*Instantaneous and Average Power, Maximum Average Power Transfer*
Week 11	*Effective or RMS Value, Apparent Power and Power Factor, Complex Power*
Week 12	*Effective or RMS Value, Apparent Power and Power Factor, Complex Power (contd.)*
Week 13	*Conservation of AC Power, Power Factor Correction*
Week 14	*Balanced Three-Phase Voltages, Balanced Wye-Wye Connection, Balanced Wye-Delta Connection, Balanced Delta-Delta Connection*

Week 15	*Balanced Delta-Wye Connection, Power in a Balanced System, Unbalanced Three-Phase Systems*
Week 16	*Preparatory week before the final Exam*

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: • Lab Introduction and Safety Procedures • Familiarization with Lab Equipment and Measurement Tools • Measurement of AC Voltage and Current using Oscilloscope and Multimeter
Week 2	Lab 2: • Measurement of Phasor Relationships for Circuit Elements • Verification of Impedance Combinations in AC Circuits • Experiment: Analysis of Series and Parallel RLC Circuits
Week 3	Lab 3: • Nodal Analysis in AC Circuits: Measurement and Analysis • Measurement of Voltage Sources and their Impact on Nodal Analysis • Experiment: Nodal Analysis of AC Circuits with Voltage Sources
Week 4	Lab 4: • Mesh Analysis in AC Circuits: Measurement and Analysis • Measurement of Current Sources and their Impact on Mesh Analysis • Experiment: Mesh Analysis of AC Circuits with Current Sources
Week 5	Lab 5: • Superposition and Source Transformation: Measurement and Analysis • Experiment: Verification of Superposition and Source Transformation Principles in AC Circuits
Week 6	Lab 6: • Thevenin's Theorem: Measurement and Analysis • Experiment: Verification of Thevenin's Theorem in AC Circuits
Week 7	Lab 7:

	• Mid-term Lab Exam • Review and Discussion of Exam Results
Week 8	Lab 8: • Norton's Theorem: Measurement and Analysis • Experiment: Verification of Norton's Theorem in AC Circuits
Week 9	Lab 9: • Maximum Power Transfer: Measurement and Analysis • Experiment: Determination of Maximum Power Transfer in AC Circuits
Week 10	Lab 10: • Measurement of Instantaneous and Average Power in AC Circuits • Experiment: Analysis of Power Dissipation and Losses in AC Circuits
Week 11	Lab 11: • Measurement of Effective or RMS Value, Apparent Power, and Power Factor • Experiment: Calculation and Analysis of Power Factor in AC Circuits
Week 12	Lab 12: • Conservation of AC Power: Measurement and Analysis • Experiment: Verification of Power Conservation Principles in AC Circuits
Week 13	Lab 13: • Measurement and Analysis of Balanced Three-Phase Voltages and Connections • Experiment: Analysis of Balanced Wye-Wye, Wye-Delta, and Delta-Delta Connections
Week 14	Lab 14: • Measurement and Analysis of Power in a Balanced Three-Phase System • Experiment: Calculation of Power in Balanced Three-Phase Circuits
Week 15	Lab 15: • Measurement and Analysis of Unbalanced Three-Phase Voltages and Sequence Components • Experiment: Analysis of Unbalanced Three-Phase Systems

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	Introductory Circuit Analysis Book by Robert Boylestad	Yes
Websites		

Grading Scheme
مخطط الدرجات

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

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

Computer Programming I

Module Information معلومات المادة الدراسية					
Module Title	**Computer Programming I**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE109**				
ECTS Credits	**6**				
SWL (hr/sem)	150				
Module Level		1	**Semester of Delivery**		2
Administering Department		**ECE**	**College**	**Engineering**	
Module Leader	Hakim Adil Kadhim		**e-mail**	Hakima.kadhm@uokufa.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		MSc.
Module Tutor	Hakim Adil Kadhim		**e-mail**	Hakima.kadhm@uokufa.edu.iq	
Peer Reviewer Name		Hakim Adil Kadhim	**e-mail**	Hakima.kadhm@uokufa.edu.iq	
Scientific Committee Approval Date		05/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Information Technology ECE110	**Semester**	One
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Recall fundamental programming concepts and terminology. 2. Identify and remember basic syntax and data types in Python. 3. Memorize key programming principles and rules. 4. Comprehend the fundamental concepts of programming and their relevance. 5. Explain the principles behind Python programming language. 6. Interpret and understand Python code examples. 7. Utilize Python programming language to solve simple coding problems. 8. Apply programming techniques to implement algorithms and solutions.

	9. Design and create basic Python programs to perform specific tasks. 10. Apply problem-solving strategies and programming principles to real-world scenarios.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a foundational understanding of programming concepts and terminology, specifically in the context of Python. 2. Apply knowledge of Python syntax and data types to write basic programs. 3. Analyze and interpret Python code examples to understand their functionality. 4. Design and implement Python programs that utilize control flow, variables, and data structures effectively. 5. Solve simple coding problems using Python programming techniques and algorithms. 6. Apply problem-solving strategies to real-world scenarios by developing Python programs to address specific tasks. 7. Evaluate and debug Python code to identify and resolve errors or issues. 8. Communicate programming concepts and solutions effectively, both orally and in written form.
Indicative Contents المحتويات الإرشادية	**Fundamentals of Programming:** This section introduces the foundational concepts, principles, and techniques of programming. Students learn about the importance of programming, the role of programming languages, and the basic components of a program. They also explore problem-solving techniques and the process of designing and implementing algorithms. **Variables and Expressions:** This topic focuses on variables, their types, and characteristics. Students learn how to declare, assign values to variables, and manipulate them using expressions and operators. **Statements and Control Flow:** Students understand the building blocks of a program's logic and flow through statements. They explore different types of statements and conditional constructs to make decisions and control the program's execution. **Functions and Modularization:** This subject covers functions, their definition, and usage. Students learn about parameters, arguments, and how to create reusable code through function abstraction. They also explore the concept of return values and function design principles. **Recursion and Iteration:** This topic explores techniques for repetition and solving complex problems. Students learn about recursion, where a function calls itself, and iteration using loops. They discover different loop types and control statements for efficient program flow. **Data Structures:** This subject covers various data structures such as strings, lists, tuples, and dictionaries. Students learn about manipulating strings, storing multiple values in lists, immutability in tuples, and efficient data retrieval using dictionaries.

	Object-Oriented Programming: Students are introduced to object-oriented programming principles. They learn about classes, objects, and how to encapsulate data and behavior within them. The topic covers class constructors, instance variables, and methods for code organization and reusability. **Inheritance and Polymorphism:** This subject focuses on class hierarchies and relationships. Students explore inheritance, where classes inherit properties and behaviors from base classes. They also learn about polymorphism, enabling flexibility and code reuse through method overriding. **Advanced Class Concepts**: Building upon previous topics, students delve into advanced class concepts. They explore class methods and static methods for class-level operations. They also learn about operator overloading, special methods, and the principles of method chaining and fluent interfaces.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Think-Pair-Share:** Integrate think-pair-share activities where students individually think about a programming problem or concept, pair up with a classmate to discuss their ideas, and then share their thoughts with the larger class. This encourages critical thinking, collaboration, and active participation. Case-Based Learning: Present real-life case studies or scenarios that require students to analyze, design, and implement Python solutions. This promotes problem-solving skills, critical thinking, and the application of programming concepts to practical situations. **Code Review Sessions:** Conduct code review sessions where students present their code to the class, explaining their thought process and seeking feedback. This promotes critical thinking, analysis of code quality, and constructive feedback exchange. **Quizzes and Assessments:** Incorporate regular quizzes and assessments to assess students' understanding of Python concepts, syntax, and problem-solving skills. Use online platforms or interactive tools that provide immediate feedback to enhance engagement and promote self-assessment. **Group Projects**: Assign group projects that require students to collaborate on developing a Python application or solving a programming problem. This encourages teamwork, division of tasks, and coordination, while applying their programming skills. **Homework Assignments**: Assign regular programming exercises and projects as homework. Encourage students to actively apply the concepts learned in class to real-world scenarios. Provide constructive feedback on their submissions to promote improvement and reinforce learning.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	98	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to programming concepts and problem-solving techniques.
Week 2	Understanding variables, data types, expressions, and basic statements.
Week 3	Exploring functions, parameters, arguments, and return values.
Week 4	Understanding conditional statements, loops, and recursion
Week 5	Creating functions that return values and produce useful results
Week 6	Exploring different types of loops and iteration techniques.
Week 7	Mid-term Exam + Unit-Step Forcing, Forced Response, the RLC Circuit
Week 8	Working with strings, manipulating text, and string formatting.
Week 9	Introduction to lists, list operations, and list comprehensions.

Week 10	Understanding tuples, their creation, and working with immutable data.
Week 11	Exploring dictionaries, key-value pairs, and dictionary operations.
Week 12	Introduction to object-oriented programming, classes, and objects.
Week 13	Advanced topics in classes, functions, and inheritance.
Week 14	Exploring class methods, operator overloading, and method chaining.
Week 15	Understanding inheritance, class hierarchy, and polymorphism.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Lab 1:** Introduction to Python and Linux Environment • Set up the Linux environment. • Introduction to Python programming language and its syntax. • Basic Linux commands and navigation.
Week 2	**Lab 2:** Variables, Expressions, and Statements • Practice creating variables, working with expressions, and using different statements. • Write Python scripts to perform calculations and display results.
Week 3	**Lab 3:** Functions and Modularization • Explore the concept of functions and their usage in Python. • Create user-defined functions and modularize code for reusability. • Implement practical examples of functions in Raspberry Pi projects.
Week 4	**Lab 4:** Conditional Statements and Loops • Learn about conditional statements (if, else, elif) and loop structures (for, while). • Write Python scripts with conditional logic and iterative processes. • Apply these concepts to control Raspberry Pi components and sensors.
Week 5	**Lab 5:** Data Structures and File Handling • Work with different data structures like strings, lists, tuples, and dictionaries. • Manipulate data structures and perform operations on them. • Introduce file handling concepts and work with files in Python.
Week 6	**Lab 6:** Object-Oriented Programming and Inheritance • Introduction to object-oriented programming (OOP) concepts. • Learn about classes, objects, and encapsulation of data and behavior. • Explore inheritance and create class hierarchies for code organization. • Apply OOP principles in Raspberry Pi projects.
Week 7	**Lab 7:** Project Development and Presentations • Allocate this week for the final project development and implementation. • Students will work on their Raspberry Pi-based projects, applying the concepts learned throughout the course. • Conduct project presentations and demonstrations.
Week 8	**Lab8:** Introduction to Colab and Jupyter notebooks • Setting up the development environment
Week 9	**Lab9**: Introduction to pandas library for data manipulation and analysis • Loading, exploring, and cleaning data with pandas • Data wrangling and transformation techniques
Week 10	**Lab10:** Working with pandas DataFrames and Series • Data aggregation, filtering, and sorting • Handling missing data and dealing with outliers

Week 11	**Lab11:** Introduction to NumPy for numerical computing • Working with arrays and matrices in NumPy • Performing mathematical operations and array manipulation
Week 12	**Lab12:** Data visualization using matplotlib library • Creating various types of plots: line plots, scatter plots, bar plots, etc. • Customizing plot appearance and adding annotations
Week 13	**Lab13:** Exploratory data analysis (EDA) techniques with pandas and visualization • Statistical analysis using pandas and NumPy • Correlation analysis and data summarization
Week 14	**Lab14:** Project work and presentations • Applying the concepts learned throughout the course to a real-world dataset • Visualizing and analyzing data using pandas, NumPy, and matplotlib

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	How to Think Like a Computer Scientist, Learning with Python. **By Allen Downey, Jeffrey Elkner and Chris Meyers (Authors)**	Yes
Recommended Texts	Python Programming for Beginners: The Complete Guide to Mastering Python in 7 Days with Hands-On Exercises– Top Secret Coding Tips to Get an Unfair Advantage and Land Your Dream Job! **by Philip Robbins (Author)**	No
Websites	https://ocw.mit.edu/courses/6-189-a-gentle-introduction-to-programming-using-python-january-iap-2011/pages/readings/	

Grading Scheme
مخطط الدرجات

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

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

Information Technology

Module Information معلومات المادة الدراسية					
Module Title	**Information Technology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE110**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department			**College**	Engineering	
Module Leader	hasan.m.khalil@gu.edu.iq		**e-mail**	hasan.m.khalil@gu.edu.iq	
Module Leader's Acad. Title	Assistant lecturer		**Module Leader's Qualification**	master	
Module Tutor	Name (if available)		**e-mail**	hasan.m.khalil@gu.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	1-9-2025		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. This module encourages students to become effective and discerning users of IT. It helps them to develop a broad range of IT skills, knowledge and understanding. 2. To develop a broad knowledge of the use of IT in workplace situations and the potential risks. 3. Developing hands-on technical experience with installing, configuring, and administering Linux systems and Open-Source applications. 4. Developing an understanding of how Linux & Open-Source fit into enterprise IT environments, their strengths, and weaknesses. 5. To develop programming skills for students by using bash script. 6. Understand the need for backup and the appropriate backup methods for different systems. 7. Understand the fundamentals of virtualization.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe the main components of computers and how to use them to assemble a computer. 2. Explain the difference between BIOS and UEFI and use the appropriate setting for a particular computer. 3. Explain the differences between mobile, Windows, Linux, and macOS. 4. Illustrate the main features of different file systems and identity different types of file formats. 5. Use different functions and conditional formulae in spreadsheets. 6. Employ the necessary commands to deploy the necessary functions for different scripts. 7. Apply permissions for users and groups for different scenarios. 8. Employ different backup strategies for local and remote systems. 9. Recognize the use of different network services and topologies.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A –IT theory</u> Computers components –Explore different types of computers and OS, main OS. components of computer hardware, and how hardware's components interact with [12 hrs] Open-source OS –distributions of Linux OS, Ubuntu OS, virtualization, working with packages and repositories, bash script, managing users, groups, and permissions. [14 hrs] Backup strategies and networks –exploring different backup strategies for local and remote system. [4 hrs]

	Part B – Computer Assembly and scripting Hardware assembly and installing OS – PC assembly, working with POST, BIOS, CMOS, and UEFI, installing Windows and Linux OS. [12 hrs] OS- Exploring different features of Windows and Linux OS, creating accounts, dealing with hardware components, and add/remove software, backup and restore OS, and exploring different Microsoft office software features. [16 hrs] Command line and bash script – using shell features, dealing with help, bash and advanced bash script. [24 hrs] Backup strategies and Networking- installing different network services such as web server and file transfer and deploying different backup strategies. [8 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills through classes. Furthermore, different strategies will be adopted throughout the laboratory including working in a group of two or individually. In addition, the students will have the opportunity to work in a group of two for 8 weeks to finish their mini-project, project title will be confirmed by week three and the project must be submitted by week 13.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	98	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 13	LO #1 - #4 and #6 - #8
	Assignments	2	10% (10)	6 and 11	LO #5, #4 and #8, #10
	Lab.	14	10% (10)	Continuous	All
	Mini project	1	10% (10)	13	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	9	LO #1 - #8
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Information Technology, types of computers, and main components of PC.
Week 2	BIOS, UEFI, MBR, and GPT
Week 3	Introduction to OS, types of OS including Mobile, Linux, Windows, and MAC macOS.
Week 4	Windows OS, installation and upgrading, restore and recovery, and disk management
Week 5	Types of file system and file formats
Week 6	Linux background & history, Structure of the open-source OS, and major Linux distributions
Week 7	Starting a Command Line, regular expressions, extracting data, redirecting input and output
Week 8	Bash Shell Scripting
Week 9	**Mid-term Exam**
Week 10	Advanced bash Shell Scripting
Week 11	Understanding disk issues, managing drivers and displays, and handling USB devices
Week 12	Creating users and groups including creating, modifying, deleting, and managing accounts
Week 13	Ownership and Permissions
Week 14	System backup, different strategies of backup and examples
Week 15	Introduction to computer network, network concepts and services.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	PC Assembly: install the motherboard components, internal drives, adapter cards, and additional storage. Connect computer components with appropriate cables.
Week 2	Working practice on POST, BIOS, CMOS, and UEFI. BIOS/UEFI configuration and BIOS and UEFI Security.
Week 3	User Account creation and its features on Windows OS. Working in practice with restoring and recovering. Un/installing and of new hardware drivers using control panel.
Week 4	Working practice on Microsoft office including word processing and power point presentation.
Week 5	Working practice on Microsoft office including Excel and outlook.
Week 6	Working practice on VirtualBox (exploring features and creating a virtual machine), installing Ubuntu OS, and handling software packages.
Week 7	Starting with a command line, using shell features, running programs, and getting help using man and info.
Week 8	Creating scripts including using arguments and variables.
Week 9	Creating scripts including using conditional expression, and loops.
Week 10	Managing Hardware including understanding disk issues, handling USB devices, and managing displays and drivers.
Week 11	Creating/deleting/managing users and groups.
Week 12	Setting ownership and permission.
Week 13	Working on different backup techniques using crontab and remote server.
Week 14	Installing some server applications such as web server and file transfer
Week 15	Mini project assessment

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	IT Essentials Companion Guide v8 by Cisco Networking Academy, 2020.	No
Recommended Texts	Bresnahan, Christine, and Richard Blum. Linux Essentials. John Wiley & Sons, 2015.	Yes
Websites	Lecture Notes on Moodle	

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

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

Semiconductor Physics

Module Information معلومات المادة الدراسية					
Module Title	**Semiconductor Physics**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE112**				
ECTS Credits	**4**				
SWL (hr/sem)	**68**				
Module Level		1	**Semester of Delivery**		2
Administering Department		ECE	**College**	Engineering	
Module Leader	buraq.k.shebli@gu.edu.iq		**e-mail**	buraq.k.shebli@gu.edu.iq	
Module Leader's Acad. Title		Asst. lecturer	**Module Leader's Qualification**		master
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		1-9-2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The module is aimed at providing students with core knowledge and understanding of semiconductor physics. The module also allows students to develop professional and intellectual skills by analyzing and discussing key industrial aspects of semiconductor materials applications. Students will be able to: • Explain the structure of matter and properties of solids in terms of atomic and molecular bonding. • Discuss the interaction of charge carriers with external fields and the effect on the electronic and optical properties. • Analyze the behavior of semiconductor materials in terms of the properties and behavior of electrons and holes. • Discuss the common semiconductor materials, processing, devices, and application. • Discuss the operation of commercially important semiconductor devices and how these are described by semiconductor physics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe the relevance of the crystal structure and atomic bonds for the fundamental electronic properties. 2. List the fundamental mechanisms of atomic and molecular bonding that result in the various states of matter 3. Explain how this bonding leads to the observed behavior of solids with particular reference to the properties of semiconductor materials and the resulting behavior of electronic devices. 4. Summarize semiconductor materials, processing, and devices that have become the basis of electronic equipment and gadgets that are indispensable to modern life. 5. Identify and discuss the key features of *pn* junctions. 6. Identify, classify, and describe semiconductor devices using scientific principles, materials properties, and analytical methods. 7. Derive the diode equation and other key equations relating to semiconductor physics. 8. Indicate the operation of key devices such as Zener diode, tunnel diode, Photodiode, LED, and Lasers. 9. Apply quantitative and qualitative methods to solve physics problems. 10. Distinguish the main building blocks for the semiconductor-based devices discussed in this course. 11. List an application of these concepts and techniques for well-established and novel devices such as LCD, QLED, and OLED display technologies. 12. Using technical literature and other information sources.
Indicative Contents	Indicative content includes the following. <u>Part A - Revision of Band Structure Theory</u>

المحتويات الإرشادية	**Atomic models**- Thompson model, Rutherford Atomic Model, Bohr's model, The electromagnetic spectrum, Normal, Excited, and Ionized atom. **[4 hrs]** **Energy Bands in Solids**- The Dual Nature of Electron, Quantum Theory of Radiation, Photoelectric Effect, Energy bands, The Wave-Mechanics Model, Pauli Exclusion Principle. **[4 hrs]** Part B - Semiconductor Fundamentals **Semiconductor materials and properties**- Covalent bonds in the Semiconductors, Electrical Conductivity Mechanism in Semiconductors, Intrinsic and extrinsic semiconductors, Carrier concentration, Dependence of Fermi level on carrier concentration and temperature, Hall effect. **[10 hrs]** **P-N Junction Operation and Characteristics** – Carrier generation and recombination, Carrier transport: diffusion and drift, Direct and indirect bandgaps, p-n junction, V-I characteristics, Energy Band diagram, Biasing of a junction, Barrier Potential. **[10 hrs]** **Diodes and Diode circuits** – Diode characteristics and equations; Current-Voltage Characteristics, ideal vs real, Diode equivalent circuits, Diode Transition and Diffusion Capacitance, Diode Switching Times, Load Line Concept. **[12 hrs]** **Special Diodes**- Zener Diode, Schottky Diode; Varactor Diode (Varicap); Tunnel Diode; Photo Diode; Solar cells, Light-Emitting Diode (LED). Laser Diode. **[12 hrs]** **Display Technologies**: Evolution of Display Technology, Liquid Crystal Display (LCD), Characteristics of OLED and organic semiconductors, Quantum Dot Display (QLED). **[8 hrs]**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module is delivered in both lectures and tutorials providing the key academic support to the module. • The lectures will follow an integrated approach to learning with initial information dissemination, followed by a chance to practice the application of knowledge, using a problem-based learning approach, and research-based case studies. • Students will be instructed to read ahead in the notes and to use the reading lists for background reading. • Lectures may also provide a formative approach to assessment with integrated quizzes and problems to solve. • Seminars will be used to solve and discuss practical problems which are provided to students in advance. In addition, there are some support structures. The Moodle eLearning platform is used in the module to provide online access to the taught content along with links to both the reading list, relevant professional body-related websites, and other websites showing the relation of the theory to the industrial context of the module.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	68	**Structured SWL (h/w)**	4

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	20% (10)	3, 5, 9, 12, 14	LO #1- #2, LO #3- #4 LO #7- #8 LO #9- #11 and #12, #13
	Home PSETs	5	20% (10)	4, 6, 8, 10 and 13	LO #3, #4 and #6, #7
	Midterm Exam	2hr	10% (10)	7	LO #1 - #6
	Final Exam	3hr	50% (50)	16	All
Summative assessment	100% (100 Marks)				

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction - Revision of Band Structure Theory

Week 2	Energy Bands in Solids
Week 3	Semiconductor materials and properties.
Week 4	Intrinsic and extrinsic semiconductors, Carrier concentration, Dependence of Fermi level on carrier concentration and temperature, Hall effect.
Week 5	P-N Junction Operation and Characteristics –Carrier generation and recombination, Carrier transport: diffusion and drift, Direct and indirect bandgaps.
Week 6	V-I characteristics, Energy Band diagram, Biasing of a junction, Barrier Potential.
Week 7	Mid-term Exam
Week 8	Diodes and Diode circuits –Diode characteristics and equations; Current-Voltage Characteristics.
Week 9	Diode equivalent circuits, Diode Transition and Diffusion Capacitance, Diode Switching Times, Load Line Concept, Introduction to Heterojunctions.
Week 10	Junction Breakdown Mechanisms, Zener Breakdown, Avalanche Breakdown.
Week 11	Special Diodes- Zener Diode, Schottky Diode; Varactor Diode (Varicap); Tunnel Diode.
Week 12	Photovoltaic devices: Solar cells.
Week 13	Optoelectronic Devices: Photo Diode, Light-Emitting Diode (LED), Laser Diode.
Week 14	Display Technologies: Evolution of Display Technology, Liquid Crystal Display (LCD).
Week 15	Display Technologies: Characteristics of OLED and organic semiconductors, Quantum Dot Display (QLED).
Week 16	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	ELECTRONIC DEVICES AND CIRCUITS, J. MILLMAN, 3rd ed., 2020.	Yes
Recommended Texts	ELECTRONIC DEVICES AND CIRCUIT THEORY, BOYLESTAD, 11th ed., 2013.	Yes
Websites	https://www.coursera.org/specializations/semiconductor-devices	

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

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

Calculus I

Module Information معلومات المادة الدراسية					
Module Title	**Calculus I**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE 101**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ECE		**College**	Engineering	
Module Leader	hikmat.maad@gu.edu.iq		**e-mail**	hikmat.maad@gu.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	Ph.d	
Module Tutor			**e-mail**		
Peer Reviewer Name	Name		**e-mail**		
Scientific Committee Approval Date	1-9-2025		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	After completing this module, students should have developed a clear understanding of the fundamental concepts of single variable calculus and a range of skills allowing them to work effectively with the concepts The basic concepts are: 1. Derivatives as rates of change, computed as a limit of ratios. 2. Integrals as a "sum," computed as a limit of Riemann sums.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completing this module, students should demonstrate competency in the following skills: 1. Use both the limit definition and rules of differentiation to differentiate functions. 2. Sketch the graph of a function using asymptotes, critical points, the derivative test for increasing/decreasing functions, and concavity. 3. Apply differentiation to solve applied max/min problems. 4. Apply differentiation to solve related rate problems. 5. Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus. 6. Apply integration to compute arc lengths, volumes of revolution, and surface areas of revolution.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: This calculus module covers the differentiation and integration of functions of one variable and concludes with a brief discussion of infinite series. Calculus is fundamental to many scientific disciplines including physics, engineering, and economics. The basic concepts are： Derivatives as rates of change, computed as a limit of ratios, Integrals as a "sum," computed as a limit of Riemann sums, use both the limit definition and rules of differentiation to differentiate functions. Sketch the graph of a function using asymptotes, critical points, the derivative test for increasing/decreasing functions, and concavity. Apply differentiation to solve applied max/min problems. Apply differentiation to solve related rate problems. Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus. Apply integration to compute arc lengths, volumes of revolution, and surface areas of revolution.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module will be delivered through lectures and enhanced with tutorials where students will be divided into small groups. Active learning will be implemented via collaborative groups.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	98	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Matrix, definitions, determinant
Week 2	Matrix, inverse, solve the system of equations
Week 3	Graphing, derivatives, slope, velocity, rate of change.

Week 4	limits, continuity
Week 5	trigonometric limits
Week 6	derivatives of products, quotients, sine, cosine chain rule, higher derivatives
Week 7	*Implicit differentiation, inverses. Exponential and log*
Week 8	*logarithmic differentiation, hyperbolic functions*
Week 9	*Linear and quadratic approximations.* *curve sketching*
Week 10	*Min-max problems.*
Week 11	*Midterm exam*
Week 12	*Related rates.*
Week 13	*Differentials, antiderivatives.*
Week 14	*Differential equations, separation of variables.*
Week 15	*Definite integrals*
Week 16	*First fundamental theorem of calculus.* Second fundamental theorem of calculus

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Thomas, G. B. Jr. Maurice D., Joel R. Hass, & Frank R. Giordano. Thomas' Calculus, Single Variable, 12th edition, Pearson, 2009.	No
Recommended Texts	1. "Calculus", by Howard Anton, I. Bivens and S. Davis, 7th edition, 2002. 2. "Calculus" James Stewart 5th Edition	Yes
Websites	https://www.coursera.org/search?query=mathematics&=null&index=prod_all_launched_products_term_optimization	

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

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

Calculus II

Module Information معلومات المادة الدراسية					
Module Title	**Calculus II**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE 106**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ECE		**College**	Engineering	
Module Leader	Ahmed emad		**e-mail**	ahmed.e.saleem@gu.edu.iq	
Module Leader's Acad. Title	Asst.ecturer		**Module Leader's Qualification**	master	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	05/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**ECE 101**	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	After completing this module, students should have developed a clear understanding of the fundamental concepts of single variable calculus and a range of skills allowing them to work effectively with the concepts The basic concepts are: 1. Integrals as a "sum," computed as a limit of Riemann sums. 2. Method of integration else numerical and improper.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completing this module, students should demonstrate competency in the following skills: 1. Apply integration to compute arc lengths, volumes of revolution, and surface areas of revolution. 2. Evaluate integrals using advanced techniques of integration, such as inverse substitution, partial fractions, and integration by parts. 3. Use L'Hospital's rule to evaluate certain indefinite forms. 4. Determine convergence/divergence of improper integrals and evaluate convergent improper integrals. 5. Determine the convergence/divergence of an infinite series and find the Taylor series expansion of a function near a point.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: This calculus module covers the differentiation and integration of functions of one variable and concludes with a brief discussion of infinite series. Calculus is fundamental to many scientific disciplines including physics, engineering, and economics. The basic concepts are : Apply integration to compute arc lengths, volumes of revolution, and surface areas of revolution. Evaluate integrals using advanced techniques of integration, such as inverse substitution, partial fractions, and integration by parts. Use L'Hospital's rule to evaluate certain indefinite forms. Determine convergence/divergence of improper integrals and evaluate convergent improper integrals. Determine the convergence/divergence of an infinite series and find the Taylor series expansion of a function near a point.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module will be delivered through lectures and enhanced with tutorials where students will be divided into small groups. Active learning will be implemented via collaborative groups.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	98	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	*First fundamental theorem of calculus.* Second fundamental theorem of calculus,
Week 2	*Applications to logarithms and geometry.*
Week 3	*Volumes by disks, shells.*
Week 4	*Work, average value, probability.*
Week 5	*Numerical integration.*
Week 6	*Trigonometric integrals and substitutions.*
Week 7	*Integration by inverse substitution, completing the square*
Week 8	*Partial fractions*
Week 9	*Integration by parts, reduction formulas*
Week 10	***Midterm Exam***
Week 11	*Parametric equations, arclength, surface area.*

Week 12	*Polar coordinates, area in polar coordinates*
Week 13	*Indeterminate forms - L'Hôspital's rule.*
Week 14	*Improper integrals*
Week 15	*Infinite series and convergence tests*
Week 16	*Taylor's series*

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Thomas, G. B. Jr. Maurice D., Joel R. Hass, & Frank R. Giordano. Thomas' Calculus, Single Variable, 12th edition, Pearson, 2009.	No
Recommended Texts	1. "Calculus", by Haward Anton, I. Bivens and S. Davis, 7th edition, 2002. 2. "Calculus" James Stewart 5th Edition	Yes
Websites	https://www.coursera.org/search?query=mathematics&=null&index=prod_all_launched_products_term_optimization	

Grading Scheme
مخطط الدرجات

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

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

Engineering Drawing and Design

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Drawing and Design**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE107**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		1	**Semester of Delivery**		2
Administering Department		ECE	**College**		Engineering
Module Leader	Hikmat maad		**e-mail**		hikmat.maad@gu.edu.iq
Module Leader's Acad. Title		Assist. lecturer	**Module Leader's Qualification**		Ph.d
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		1-9-2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	To become a successful engineer, several skills need to be honed and developed. These include: applying creative problem-solving; working on teams; effectively communicating ideas; using best practice procedures and functional decomposition to manage complexity; and gaining mastery of knowledge related to the technical field of interest. This class introduces the fundamentals of engineering drawing, design, and CAD intending to present challenges that will help develop these skills. Successful students will have the opportunity to understand the topic by attempting and completing a set of carefully developed exercises and skills tests that will introduce the student to the fascinating world of engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Apply the requirements of modern graphic language through AutoCAD drafting techniques. 2- interpret professional language including abbreviations, specifications, and terminology associated with the development of working drawings. 3- Sketch orthographic projections, sectional views, and 3D drawings. 4- Create, edit, and plot AutoCAD drawings. 5- Generate, analyze, and refine the design of electro-mechanical devices while adhering to physical and mathematical models. 6- For typical electro-mechanical device elements, - Describe the function of the element, - List common uses in mechanical systems and give examples, - Analyze its performance and failure modes, - Describe how they are manufactured and the implications of the alternatives, - Select an element for a specific usage based on information such as those readily available in a manufacturer's catalog. 7- Apply experimentation and data analytic principles relevant to mechanical design. - Consider the effects of geometric variation on a design, - Analyze data from performance evaluations of a mechanical system, - Present data in appropriate graphical formats, - Plan an experimental investigation to refine a system. 8- Communicate a design and its analysis (written, oral, and graphical forms). - Read and interpret mechanical drawings of systems with moderate complexity, - Create correct mechanical drawings of simple elements and systems, - Create useful parametric solid models of simple elements and systems, - Make effective presentations in a design review format, - Respond effectively in real time to technical questioning by experts. 9- Apply physics to understand the factors that control the rate of production and influence the quality, cost, and flexibility of processes of the Additive Manufacturing Technology using 3D printing.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following:

	Part A - Engineering Drawing Theory The Graphic Language, Technical Sketching and Shape Description, Instruments and their Use, CAD Software and its Use, Geometrical Constructions, Elements of Descriptive Geometry, Theory of Projection, Orthographic Projections, Sections, Lettering and Dimensioning, Isometric, Assembly, Solid Modelling. [40 hrs.] Part B - Engineering Design for Manufacturing Materials Selection, Problem Definition, and Design, Reverse Engineering Design, Engineering Design Concept, Green Design, Additive Manufacturing Technology, 3D Printing, Optimizations. [35 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This course, Engineering Drawing and Design, exposes students to structured design, procedural methodologies, drafting and computer-aided design (CAD), and manufacturing, among other topics. In addition, the course material challenges students to think deeply, and it provides opportunities to develop skills useful in professional practice. This module will be delivered through a set of lectures and enhanced through hands on laboratories exercises.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	83	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Module introduction, Contents overview, the "Graphic Language," Problem definition and design, Technical sketching, Shape description, Freehand 2D and 3D drawing, Instruments and their use, Computer Aided Design (CAD) for Manufacturing.
Week 2	AutoCAD software and the use of its tools: Understanding coordinates systems, Drawing units and paper size standards.
Week 3	AutoCAD software and the use of its tools: Drawing tools.
Week 4	AutoCAD software and the use of its tools: Modifying tools.
Week 5	AutoCAD software and the use of its tools: 2D drawing.
Week 6	Lettering and dimensioning.
Week 7	AutoCAD software and the use of its tools: 3D drawing.
Week 8	AutoCAD software and the use of its tools: 3D drawing and 3D modeling.
Week 9	Theory of projection, Orthographic projections, Isometric, and Sections.
Week 10	Assembly, Exploded assembly, Materials, and Enhancing drawing.
Week 11	Engineering Design concept.
Week 12	Design of the most common engineering components, Integration of design.
Week 13	Additive Manufacturing Technology using 3D printing.
Week 14	Discrete Products Manufacturing: A case study.
Week 15	Professional Ethics.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction, Overview Lab Section Selection • Lab safety: 'Safety First.' Please read the Safety Policy and abide by the safety rules for your sake. If not, you may not be allowed into the lab. • Explore kit and contest. • AutoCAD setup.
Week 2	Lab 2: Introduction to AutoCAD, AutoCAD startup, Using AutoCAD and its menus and commands.
Week 3	Lab 3: Lab Exercises – 2D drawings.
Week 4	Lab 4: Lab Exercises – 2D drawings.
Week 5	Lab 5: Lab Exercises – 2D drawings.
Week 6	Lab 6: Lab Exercises – Detailed 2D drawings with lettering and dimensions.
Week 7	Lab 7: Lab Exercises – 3D drawings.
Week 8	Lab 8: Lab Exercises – 3D drawings and 3D modeling.
Week 9	Lab 9: Create engineering parts for a preliminary case study strategy.
Week 10	Lab 10: Mid exam.
Week 11	Lab 11: Design for Manufacturing.
Week 12	Lab 12: Design iteration and Reverse engineering.
Week 13	Lab 13: Modules fabrication.
Week 14	Lab 14: Modules fabrication and assembly.
Week 15	Lab 15: Project Submission, Presentation, and Discussion.
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Engineering Drawing with AutoCAD", Mahir Al-Baghdadi, DARF Pub. (DAR EL FERGIANI Pub.), 277 West End Lane, West Hampstead, NW6 1QS, London, UK. 2005. ISBN: 977-349-658-9.	Yes
Recommended Texts	"3D Printing with Autodesk 123D, Tinkercad, and MakerBot", Lydia Sloan and Sloan Cline, McGraw Hill TAB; 1st edition, 2014. ISBN: 978-0071833479.	No
Websites	AutoCAD for Design and Drafting Exam Prep https://www.coursera.org/learn/autodesk-autocad-design-drafting	

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

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

English Language I

Module Information معلومات المادة الدراسية					
Module Title	**English Language I**			**Module Delivery**	
Module Type	**Support or related learning activity**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE102**				
ECTS Credits	**3**				
SWL (hr/sem)	**38**				
Module Level		1	**Semester of Delivery**		1
Administering Department		ECE	**College**	Engineering	
Module Leader	Buraq karim		**e-mail**	Buraq.k.shebli@gu.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		1-9-2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To provide the students with language learning skills and improve students' English language skills. 2. To help students in reading comprehension. 3. To help students understand basic expressions and conversations and use them in real-life situations. 4. To develop students' general English through the skills of reading, writing, listening, and speaking 5. To help students write basic sentences leading to a paragraph using the vocabulary and grammar learned in the textbook. 6. To enhance students' basic knowledge of vocabulary and grammar through reading texts
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the course students should be able to: 1. Recognize various English terms used in topics related to different situations in public life and Engineering text. 2. Communicate clearly in various situations 3. Use the correct tense in sentences and write different formats of sentences with academic vocabulary 4. Listen to and understand a conversation and handle a conversation in English 5. Form simple sentences that enable them to communicate their ideas and knowledge. 6. Identify literary techniques and creative uses of language in literary texts
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. This module introduces new language concepts gradually and methodically, in measured amounts, and logical order. GRAMMAR Subject pronouns, Object pronouns, Possessive pronouns, Question words, Verb to be in negative and question forms. Possessive adjectives. Has/ have, Adjective + noun, Irregular Plurals, Present Simple tense with Question and negatives, Adverbs of frequency, Prepositions of time, Articles, This/ that, There is /are, Prepositions, Past simple tense with Questions and Negatives, Can / can't, Adverbs, Requests and offers, Some /any, Like and would like, Present continuous, Future plans [6 hrs] READING and LISTENING New language items are presented through texts, often dialogues, which students can read and listen to at the same time. This enables students to relate the spelling to the sounds of English and helps with pronunciation, as well as form and use. [8 hrs] WRITING Describing people, Describing things, routine and procedure, Describing food and drink, Describing our lives, comparing data, Describing buildings, formal letters, emails, notes, and summaries, Describing statistics [8 hrs]

	VOCABULARY The vocabulary syllabus focuses on high-frequency survival terms related to the following topics: Numbers, A set of cities and countries, Adjectives, Nouns, Jobs, Personal information, Social expressions, The family, Describing a friend, The lexical set of sports/food/drinks. Languages and nationalities. Days of the week and Seasons, Words that go together, Opposite adjectives, Places, Rooms and furniture, In and out of town, (Have, do, go)+nouns, Weekend activities, Sports and leisure (Play or go), Colors, Clothes, Transport. [4 hrs] SPEAKING It contains a mix of language work and many practice materials that help learners to consolidate their knowledge of key points before proceeding further with focusing somewhat on basic communication among engineers. [10 hrs] Revision problem classes [4 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining their academic skills, reading, and writing. This will be achieved through classroom lectures. The lecture material will be reinforced and expanded on through recitation sessions, homework, and a 1000 words research paper.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	38	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.53
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	25% (25)	2 and 14	LO #4, #5 and #6, #7 and #8, #9 and #11, #12 and #13, #14
	Assignments	3	15% (15)	2 and 12	LO #3, #4 and #5, #6 and #7, #8, # 9
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO #1 - #10
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	The verb to be, Subject pronouns**,** Plurals, Adjectives, Where / what/ how questions (speaking) learn vocabularies (countries)
Week 2	Negatives and questions, Possessive adjectives, Have/has, Personal information, learn vocabularies (jobs/ family and relatives)
Week 3	Reading and writing skills (Describing people, routine, and procedure) with vocabulary development in CH1 and CH2 of headway academic skills- level 1
Week 4	present simple tense, articles, languages and nationalities, numbers and prices (speaking), learn vocabularies (sport/food/drink)/ Days of the week, Adverbs of frequency, Use how often / routines, Words that go together
Week 5	Object pronouns, Question words (wh-question), Demonstrative adjectives, Requests, and offers, There is /are, Prepositions, learn vocabularies (room and furniture), Directions (speaking)
Week 6	Reading and writing skills (Describing our lives, Describing buildings) with vocabulary development in CH3 and CH4 of headway academic skills- level 1
Week 7	There was/were, saying years, (have, do, go)+ nouns, when is your birthday (speaking)
Week 8	Past simple tense, Question, and negatives in past simple tense, learn vocabularies (Sport and leisure), Going sightseeing (speaking)
Week 9	Reading and writing skills (formal letters and emails, Describing things) with vocabulary development in CH5 and CH6 of headway academic skills- level 1
Week 10	Mid-term Exam
Week 11	Can / can't to express (un)ability, Adverbs, adjective +noun, Like and would like, Some /any, learn vocabularies (in a restaurant), everyday problems and signs (speaking)
Week 12	Reading and writing skills (Describing food and drink, comparing data) with vocabulary development in CH7 and CH8 of headway academic skills- level 1
Week 13	Colors and clothes, present continuous, opposite verbs, and social expressions .what's the matter? (speaking), Future plans, grammar revision, vocabulary revision

Week 14	Reading and writing skills(notes and summaries, Describing statistics) with vocabulary development in CH9 and CH10 of headway academic skills- level 1
Week 15	**Preparatory week before the final Exam**

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• New Headway Plus, Beginner, Student's Book, new edition, John and Liz Soars, Oxford University Press • Headway. Academic Skills. Reading, Writing, and Study Skills. LEVEL 1	Yes
Recommended Texts	• New Headway Plus, Beginner, workbook Book, new edition, John and Liz Soars, Oxford University Press	yes
Websites	https://ocw.mit.edu/courses/21g-222-expository-writing-for-bilingual-students-fall-2002/pages/study-materials/ https://elt.oup.com/student/headway/beg/?cc=global&selLanguage=en	

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

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

Electronic Measurements Lab

Module Information معلومات المادة الدراسية					
Module Title	**Electronic Measurements Lab**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE 103**				
ECTS Credits	**6**				
SWL (hr/sem)	**98**				
Module Level		1	**Semester of Delivery**		1
Administering Department		ECE	**College**	Engineering	
Module Leader	Buraq karim		**e-mail**	buraq.k.shebli@gu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		M.Sc.
Module Tutor	Mohammed Abdul Zahra		**e-mail**	Mohammeda.aldualimi@uokufa.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		1-9-2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course has two main aims or Objectives : • To master the use of modern electronic equipment like DMMs, Oscilloscopes, function generators and programmable power supplies. • Gain confidence in describing the basic components of electronic circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The students will be familiar with using the benchtop power supply Rigol DP832, and Fluke 87V digital multimeter. Then they will construct simple electrical circuits and develop a good understanding of how to read resistance values using different methods. 2. The students will learn how to test diodes and transistors using your Fluke 87V DMM. In addition, you will construct a simple transistor switch circuit to power ON an LED. 3. The students will learn how to test capacitors, some of their usage in electronics, and how to use an oscilloscope to measure various quantities related to capacitor circuits. 4. The students will be taught the soldering techniques to be able to construct any circuit by soldering the electronic components on a board. 5. They will learn about how to use diodes as rectifiers and the role of capacitors as filters. Then students will be taught the theoretical background of filter circuits and consolidate that with hands-on experiments. 6. The students will learn how to design a simple low power constant voltage supply using diodes, capacitors, and zeners .
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Fundamentals • DC circuits – Current and voltage definitions, Passive sign convention and circuit elements, Combining resistive elements in series and parallel. Kirchhoff's laws and Ohm's law. Basic analog and digital circuits and theory of operation are covered. The labs allow the students to master the use of electronic instruments. The labs also reinforce the concepts discussed in class with a hands-on approach and allow the students to gain significant experience with electrical instruments such as function generators, digital multimeters, oscilloscopes, logic analyzers and power supplies [30 hrs] • Soldering techniques, Time dependent signals, average and RMS values. Capacitance and inductance, energy storage elements, their transient response as well as the steady state response. [20 hrs] RC circuits –Display the Frequency response of RC circuits on Oscilloscope , explaining and practicing Low pass filter and High pass filter as an example of RC circuit in the lab.

	While the band-pass circuits will be asked as assignment by students , use of Bode plots, Introduction to second order circuits. [25 hrs] Non-linear Devices like Transistors, Diodes and Diode circuits– Diode characteristics and equations, ideal vs real. Signal conditioning, clamping and clipping, rectification and peak detection, photodiodes, LEDs, Zener diodes, voltage stabilization, voltage reference, power supplies. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the practical part involvement, to solidify what have been taught through. while at the same time refining and expanding their critical thinking skills. This will be achieved through lectures, labs and interactive questionings and by considering types of relevant experiments which motivates the predicable sense .Also there will be other different learning strategy like think pair share will be exploited as well.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	98	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Lab sheets**	10	10% (10)	Continuous	All
	Report/ Quiz	1	10		
	(Mini-Project)	2	20% (10)	13	LO #8 and #13

Summative assessment	**Midterm Exam**	2hr	10% (10)	12	LO #14
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

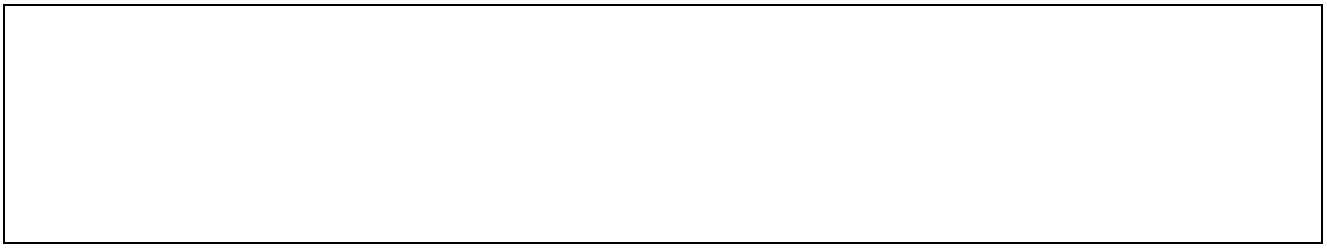
Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Demonstrating the necessity and importance of the precaution procedures of the Safety in the Lab.
Week 2	Introduction to the electrical basic concepts, System units, common Acronyms, EE symbols and RMS voltage.
Week 3	Introduction to Lab Instruments and Electronic components (resistors, capacitors, inductors, LEDs, diodes, bipolar junction transistors, MOSFETs, optical isolators, op amps)
Week 4	Evaluating of the Resistance and Resistivity by the Resistor color code method and comparing their values with the measured ones by DMM.
Week 5	Use of multimeters (DMM) and oscilloscopes Construction and debugging of simple electronic circuits on bread broad
Week 6	Demonstrating Soldering techniques and showing differences of Solder types , the proper way of cleaning the tips , how to choose and set the appropriate temperatures .
Week 7	Review of Inductor and Capacitor as Circuit Elements, Source-free RL and RC Circuits, Transient Response as well as Steady state response then an Introduction to second order circuits.
Week 8	1st mini project for example building a simple power supply
Week 9	Introduction to the Non-linear Devices (Diodes and BJTs)
Week 10	Illustrating the Diode Circuits measures and taking half and full bridge rectifier as an application
Week 11	Showing other types of diodes like LED, Zener as a regulated power supply design
Week 12	RC circuits –showing the effect of Frequency response of RC circuits and how to determine the cut off frequency also how to utilize the Oscilloscope to display, Designing Low pass filter and High pass filter, and how to apply Sweep signal by Function generator. utilizing of Bode plots for frequency response.
Week 13	2nd mini project passive filter design (Band pass filter)
Week 14	Mid-term exam.
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	The precaution procedures of the Safety and an Introduction to Electronics instruments Lab.
Week 2	DMM and Function Generators and Oscilloscopes I
Week 3	Function Generators and Oscilloscopes II
Week 4	Resistors and construction of a simple circuit on Proto bread.
Week 5	Types of soldering irons, Soldering stations and
Week 6	Building up a simple circuit by soldering.
Week 7	Capacitor circuits and Inductor circuits
Week 8	1st Mini Project
Week 9	Diodes and BJTs
Week 10	Half and Full bridge rectifier
Week 11	Zener Voltage Regulator
Week 12	Frequency response of Passive filters with oscilloscope and Bode plots
Week 13	The second mini project passive filter design
Week 14	Mid-term exam.
Week 15	**Preparatory week before the final Exam**

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

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

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



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Signals and Systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE22301**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		UGII	**Semester of Delivery**		Four
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Haneen Jumhoor sabbar		**e-mail**	haneen.g.sabbar@gu.edu.iq	
Module Leader's Acad. Title		A.lecturer	**Module Leader's Qualification**		MSc
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE202	**Semester**	three
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The educational objectives of studying the Signals and Systems Module include: 1- Understanding Signals: Students are introduced to the concept of signals, different types of signals, the properties of each signal, mathematical operation on signals, and computing energy, power, power spectral density, and power spectral density of signals. 2- Classification of Signals: Students learn how to classify signals using techniques such as even and odd signals, periodic and aperiodic signals, and energy or power signals. 3- Representation of the signals: Students learn how to represent signals using techniques such as the Fourier series and the aim of this representation. 4- Understanding Systems: Students are introduced to the concept of systems, different types of systems, the properties of each system, how to test the stability of the system, and the representation of the systems in the time and frequency domains. 5- Dealing with Linear and Time-Invariant Systems: Students are familiarized with linear and time-invariant systems and their effects on signals, as well as how to represent and analyze these systems using various tools and techniques. 6- Signal Transformations: Important signal transformations such as Fourier transformations and Laplace transformations are studied, along with their applications in signal analysis and system design. 7- Practical Applications: Students are exposed to the practical applications of Signals and Systems in fields such as wireless communications, audio processing, and automatic control systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define the concept of signal and give an example. 2. Discuss the mathematical operation that took place on certain signal by comparing it with the original signal. 3. Compare between even and odd signals. 4. Calculate the PSD and ESD of signal. 5. Use the mathematical formula to compute the even and odd parts of signal. 6. List and sketch five basic signals. 7. Test the stability of the system. 8. Discuss the concept of the impulse response of the system and its relation with input and output signals. 9. Compute the exponential Fourier series coefficients of the signal. 10. Distinguish between the Fourier series and Fourier Transformer. 11. Use the table to express the signal in the frequency domain. 12. list two Applications of the Fourier Transform. 13. Apply the inverse mathematical formula for Fourier transformers. 14. Compare Laplace and Fourier transformers. 15. Use the table to transfer the signal to the s-domain. 16. Compute the transfer function of the system by using a Laplace transformer.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – introduction to signals:</u>

	This chapter cover, the concept of signals, their types, and the characteristics of each type are identified, with knowledge of the mechanism of classification of signals and the mathematical formula for calculating a number of concepts such as (power, energy, power spectral density, and energy spectral density). Part B – introduction to systems: This chapter cover, the concept of systems, their types, and the classification of systems. the mathematical formula used to represent the systems (impulse response) and Convolution. Part C – Fourier series: This chapter cover, the concept of the Fourier series, their types, and the mathematical formula used to compute the coefficients for each type. Part D – Fourier Transformer: This chapter cover, the concept of the Fourier transformer and the mathematical formula used to transfer the signal from the time domain to the frequency domain or Vice versa, the properties of the Fourier transformer, and the Direct conversion table. Part E – Laplace Transformer: This chapter cover, the concept of the Laplace transformer and the mathematical formula used to transfer the signal from the time domain to the S- domain or Vice versa, the properties of the Laplace transformer, and the Direct conversion table.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module will be delivered through lectures and enhanced with tutorials where students will be divided into small groups. Active learning will be implemented via collaborative groups.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	98	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem)	**150**		

الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 -14	
	Assignments	2	10% (10)	7 - 15	
	Reports / Lab.	14	10% (10)	Continuous	All
	Project or seminar	1	10% (10)	16	All
Summative assessment	Midterm Exam	2hr	10% (10)	10	LO #1 - #9
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Signals, Basic Operations on Signal.
Week 2	Even and Odd Signal, Periodic and Non-Periodic Signal.
Week 3	Area, Average Value, Energy, Power, PSD, ESD of Signal.
Week 4	Energy Signal, Power Signal and Neither Energy Nor Power Signal.
Week 5	Important Signal (Unit Impulse, Unit Step, ... and Orthogonal Signal).
Week 6	Introduction to Systems, Classification of Systems.
Week 7	Linear Time Invariant (LTI) System.
Week 8	Convolution.
Week 9	Fourier Series (Trigonometric FS, Exponential FS).
Week 10	Mid exam
Week 11	Fourier Transformer by using integration, and inverse of FT.
Week 12	Fourier Transformer by using table, properties of FT
Week 13	Applications of Fourier Transformer.
Week 14	Laplace Transformer by using integration and by using table.
Week 15	Properties and applications of Laplace Transformer.

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

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1 . . **Week 14**	Lab 1-14: Apply the theoretical concepts ((Material Covered)) for each week using MATLAB.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Signals and Systems, 2nd edition, (Alan V. Oppenheim, Alan S. Willsky with S. Hamid Nawab).	Yes
Recommended Texts	Linear Systems and Signals ,3rd edition, (B.P. Lathi and Roger Green).	No
Websites	**https://ocw.mit.edu/courses/6-003-signals-and-systems-fall-2011/**	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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Module Information

معلومات المادة الدراسية

Module Title	**Embedded systems programming**	**Module Delivery**	
Module Type	**Lab**	☐ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE212**		
ECTS Credits	**2**		
SWL (hr/sem)	**33**		
Module Level	1	**Semester of Delivery**	1
Administering Department	ECE	**College**	Type College Code
Module Leader	Buraq karim	**e-mail**	Buraq.k.shebli@gu.edu.iq
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	M.Sc.
Module Tutor	Buraq karim	**e-mail**	Buraq.k.shebli@gu.edu.iq
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	1-9-2025	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Introduce students to the fundamentals of embedded systems with a focus on the Arduino platform, including architecture, pin configuration, and interfacing basics. 2. Enable students to develop embedded programs using the Arduino IDE, covering core programming concepts such as digital and analog I/O, conditionals, loops, functions, and interrupt handling. 3. Familiarize students with real-world sensor and actuator integration, including temperature sensors, motion detectors, light sensors, motors, and displays through hands-on lab sessions. 4. Equip students with the skills to implement serial and wireless communication protocols (e.g., UART, I2C, SPI, Bluetooth, Wi-Fi) to enable data exchange between Arduino boards and other devices. 5. Guide students through the development of IoT-oriented projects using Arduino and Wi-Fi modules (e.g., ESP8266/ESP32), enabling data monitoring and control through basic web servers and cloud platforms. 6. Promote good practices in embedded system design, including code modularity, power management, and basic security concepts such as safe handling of user inputs and data integrity.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: 1. **Explain the core concepts of embedded systems and microcontroller architecture**, with emphasis on Arduino and related development environments. 2. **Write, compile, and debug embedded C/C++ programs using the Arduino IDE**, applying control structures, functions, and interrupt handling techniques. 3. **Interface Arduino boards with common sensors and actuators**, such as LEDs, motors, temperature/humidity sensors, and ultrasonic range finders. 4. **Demonstrate proficiency in using communication protocols** like UART, I2C, SPI, and basic wireless (Bluetooth/Wi-Fi) to exchange data between devices. 5. **Develop embedded applications that sense, process, and respond to real-world data**, with practical examples drawn from home automation, environmental monitoring, and smart devices. 6. **Apply good design practices in embedded system development**, including code modularity, low-power techniques, and basic safety and reliability considerations. 7. **Create simple IoT projects using Arduino and Wi-Fi-enabled modules (e.g., ESP8266/ESP32)** to send data to web servers or cloud dashboards. 8. **Collaborate effectively in lab-based problem-solving tasks**, interpreting circuit schematics and integrating hardware and software components.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following (**2 hours per week**) **Week 1: Introduction to Embedded Systems and Arduino** • Definition and key features of embedded systems • Arduino platform overview: board types, IDE setup • First hands-on: Blinking LED (hardware "Hello World") **Week 2: Arduino Programming Basics** • Control structures: conditionals, loops, and functions • Practical coding exercises on control logic • Lab: Traffic light control using control statements **Week 3: I/O Operations and Serial Communication** • Digital I/O: buttons, LEDs, and buzzers • Analog I/O and PWM: sensors, dimming LEDs, motor control • Serial communication basics and debugging with Serial Monitor • Lab: Temperature-controlled fan with serial output **Week 4: Working with Sensors** • Using common sensors: temperature, light, ultrasonic • Sensor calibration and data acquisition • Lab: Distance-measuring device or temperature logger **Week 5: LCD Integration with Arduino** • Overview of Liquid Crystal Displays (LCDs) • Displaying text and sensor values on LCDs • Lab: Sensor data output on 16x2 LCD **Week 6: Midterm Practical Assessment** • Covers I/O operations, sensors, and displays • Hands-on evaluation of core skills learned **Week 7: Servo Motor Basics** • Introduction to servo motors and control techniques • PWM and angle positioning • Lab: Controlling servo with potentiometer **Week 8: Actuators and Output Devices** • Working with relays, buzzers, motors, and fans • Integration of input and output devices • Lab: Smart fan or door lock system **Week 9: I2C and SPI Communication** • Understanding I2C and SPI protocols • Interfacing external modules (OLED, RTC) • Lab: Display sensor data on an OLED screen **Week 10: Wireless Communication (Bluetooth & Wi-Fi)** • Introduction to HC-05, ESP8266/ESP32 modules • Lab: Remote control of devices via mobile app **Week 11: IoT Applications with Arduino** • Basics of IoT: cloud platforms (ThingSpeak, Blynk) • Sending sensor data online • Lab: Build an online temperature monitoring system **Week 12: Power Management in Embedded Systems** • Battery management, sleep modes, watchdog timers • Designing energy-efficient embedded systems • Lab: Battery-powered sensor with sleep mode

	Week 13: Mini Project – Planning & Development • Idea selection, circuit design, component selection • Begin coding and assembling project prototype **Week 14: Mini Project – Completion & Demonstration** • Final implementation, testing, debugging • Project presentations and peer feedback **Week 15: Final Exam and Course Wrap-Up** • Written or practical final exam • Course review, feedback, and outlook on embedded systems and IoT

Learning and Teaching Strategies اس رتاتيجيات التعلم والتعليم	
Strategies	1. **Interactive Lectures and Demonstrations** Lectures will be used to introduce key embedded systems concepts such as microcontroller architecture, programming fundamentals, I/O operations, and communication protocols. Live coding and hardware demos will illustrate real-time behavior and spark student curiosity. 2. **Hands-on Lab Sessions (Core Strategy)** Weekly lab sessions are central to the course, enabling students to apply theory directly on Arduino boards. Labs include programming tasks, circuit assembly, sensor integration, and communication experiments to reinforce learning through practical implementation. 3. **Mini Projects and Prototyping Tasks** Students will complete individual or group mini-projects that require them to design, build, and demonstrate embedded systems. These projects emphasize critical thinking, system design, hardware/software integration, and iterative testing. 4. **Simulation Tools and Pre-Hardware Practice** Before using real hardware, students may practice circuit design and code testing using simulation tools like Tinkercad, Proteus, or Arduino simulators to safely prototype and debug their ideas. 5. **Flipped Classroom and Pre-Class Tutorials** Selected topics may be delivered via short pre-recorded videos or readings. In-class time can then focus on applying concepts, troubleshooting code, and hands-on demonstrations, maximizing engagement. 6. **Peer Learning and Collaborative Coding** Students will collaborate during lab sessions and projects, learning from each other through code reviews, teamwork, and discussions. Peer assistance promotes mutual learning and problem-solving. 7. **Guest Talks and Maker Community Exposure** Guest sessions with embedded engineers, IoT hobbyists, or developers can expose students to real-world applications, career insights, and DIY/maker culture within the embedded systems domain. 8. **Formative Assessment and Feedback** Frequent low-stakes assessments (e.g., quizzes, lab check-ins, code reviews) will provide feedback loops. Students receive timely insights into their progress, helping them correct misconceptions and strengthen weak areas. 9. **Online Resources and Support Forums** Supplementary tutorials, datasheets, GitHub code examples, Arduino documentation, and curated YouTube playlists will support autonomous learning. Online Q&A forums will facilitate continued peer and instructor interaction.

10. **Showcase and Reflection Activities**
Students will present their final projects in a class-wide showcase, promoting confidence and communication skills. Reflection sessions will allow students to evaluate their learning journey and articulate takeaways.

Rubric

The following is the rubric assessment for the programming of embedded systems module based on the graduate outcomes. This rubric can be using for assessing students' performance throughout the course.

Graduate Outcome	Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Unsatisfactory (1)
1. Engineering Problem Solving	Ability to analyze and solve embedded system problems using Arduino.	Demonstrates strong analytical skills; effectively solves complex embedded problems with optimal solutions.	Demonstrates sound problem-solving skills; solves most problems with correct approaches.	Shows some problem-solving skills; struggles with code logic or hardware integration.	Limited ability to analyze or solve embedded problems.
2. Design	Creativity and effectiveness in designing embedded solutions.	Develops innovative, efficient, and well-documented embedded system designs that exceed requirements.	Produces functional and well-organized designs meeting core requirements.	Provides basic design with partial functionality and limited innovation.	Design is incomplete, non-functional, or lacks coherence.
3.Conducting Practical Experiments	Performance and documentation of lab work and implementation.	Completes labs with precision, optimized code, and thorough, well-structured documentation.	Performs labs with minor issues; documentation is mostly clear and logical.	Labs completed but with multiple errors; documentation lacks detail.	Struggles with lab execution; documentation is missing or unclear.
4. Oral and Written Communication	Clarity in presenting project outcomes and documenting lab results.	Communicates concepts and outcomes clearly; reports and presentations are engaging and professional.	Communicates well with minor clarity issues; reports meet academic standards.	Communicates basic ideas, but lacks clarity, organization, or completeness.	Ineffective communication; ideas are difficult to understand.
5. Professional Ethics	Application of ethics in system design (e.g., safe use, privacy, reliability).	Consistently demonstrates ethical awareness; designs systems with safety and responsibility in mind.	Shows understanding of ethical implications with minor lapses.	Basic ethical awareness; does not fully apply principles in design.	Lacks awareness or application of ethical considerations.

	6. Lifelong Learning	Engagement with new tools (e.g., sensors, protocols, platforms).	Actively explores and applies new technologies beyond the curriculum; shows strong initiative.	Shows willingness to learn and apply new skills/tools as needed.	Attempts to learn but relies heavily on provided resources; limited initiative.	Reluctant to engage with new information or skills.
	7. Working in Multidisciplinary Teams	Teamwork and collaboration in labs or projects.	Takes leadership roles, fosters collaboration, and significantly enhances team outcomes.	Collaborates effectively, contributes reliably to team activities.	Participates in teamwork but contributions are inconsistent or passive.	Does not collaborate effectively; hinders team progress.

Student Workload (SWL)

الحمل الدرا يس للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدرا يس المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدرا يس المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدرا يس غ رت المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدرا يس غ رت المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدرا يس الك يل للطالب خلال الفصل	**50**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	2,6,10,14	LO #2, #4, #5, #8, #11 and #12
	Assignments	2	10% (10)	2 and 12	LO #3 to #12
	Project	1	10% (10)	13	LO #1 to #10
	Lab/reports	3	10% (10)	3,5,9	LO #1,#2, #7, #10, #13, #14 and #15
Summative assessment	**Midterm Exam**	2hr	10% (10)	6	LO #1 - #5
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبو يع النظري	
	Material Covered
Week 1	**Introduction to Embedded Systems and Arduino**
Week 2	**Control structure in Arduino Programming**
Week 3	**Digital I/O, Analog I/O, PWM, Serial Communication and Debugging**
Week 4	**Working with Sensors using Arduino**
Week 5	**Liquid Crystal Displays with Arduino**
Week 6	**Midterm Exam**
Week 7	**Servo Motor Basics with Arduino**
Week 8	**Actuators and Output Devices**
Week 9	**I2C and SPI Communication Protocols**
Week 10	**Bluetooth and Wi-Fi Communication**
Week 11	**IoT Basics with Arduino**
Week 12	**Power Management in Embedded Systems**
Week 13	**Mini Project Planning and Development (Part 1)**
Week 14	**Mini Project Finalization and Presentation (Part 2)**
Week 15	**Final Exam and Course Review**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- **"Arduino Projects Book"** by Scott Fitzgerald and Michael Shiloh 2- **"Programming Arduino: Getting Started with Sketches"** by Simon Monk	Yes
Recommended Texts	**"Arduino Cookbook"** by Michael Margolis	Yes
Websites	• https://www.arduino.cc – Official Arduino documentation, tutorials, and libraries • https://www.tinkercad.com – Online Arduino simulator and circuit designer	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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Microelectronic Devices and Circuits 2

Module Information معلومات المادة الدراسية					
Module Title	**Microelectronic Devices and Circuits 2**			**Module Delivery**	
Module Type	**Basic**			☒**Theory** ☒**Lecture** ☐ **Lab** ☒ **Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**ECE112**				
ECTS Credits	**4**				
SWL (hr/sem)	**68**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	ECE		**College**	Engineering	
Module Leader	Buraq karim		**e-mail**	buraq.k.shebli@gu.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**	E-mail:buraq.k.shebli@gu.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail: buraq.k.shebli@gu.edu.iq	
Scientific Committee Approval Date	9/2024		**Version Number**	1.0	

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

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

Module Objectives أهداف المادة الدراسية	modeling of microelectronic devices, basic microelectronic circuit analysis and design, physical electronics of semiconductor junction and metal-on-silicon (MOS) devices, relation of electrical behavior to internal physical processes, development of circuit models, and understanding the uses and limitations of various models. The course uses incremental and large-signal techniques to analyze and design bipolar and field effect transistor circuits, with examples chosen from digital circuits, single-ended and differential linear amplifiers, and other integrated circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Ability to understand kinds of semiconductors 2. Ability to choose the right material for designing semiconductor devices 3. Ability to understand the current generation in semiconductor 4. Ability to understand the PN junction and its biasing 5. Ability to understand the structure of MOS FET and BJT transistors 6. Ability to know to design and analyze transistors 7. Ability to use semiconductor devices for real-life applications 8. Ability to design electronic circuits to facilitate many tasks in our life 9. Ability to design electronic circuits to facilitate many tasks in our life 10. Ability to use electronic circuits (semiconductor) as a logic gate and its digital application
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Revision of Band Structure Theory **Atomic models**- Thompson model, Rutherford Atomic Model, Bohr's model, The electromagnetic spectrum, Normal, Excited, and Ionized atom. **[4 hrs]** **Energy Bands in Solids**- The Dual Nature of Electron, Quantum Theory of Radiation, Photoelectric Effect, Energy bands, The Wave-Mechanics Model, Pauli Exclusion Principle. **[4 hrs]** Part B - Semiconductor Fundamentals **Semiconductor materials and properties**- Covalent bonds in the Semiconductors, Electrical Conductivity Mechanism in Semiconductors, Intrinsic and extrinsic semiconductors, Carrier concentration, Dependence of Fermi level on carrier concentration and temperature, Hall effect. **[10 hrs]** **P-N Junction Operation and Characteristics** – Carrier generation and recombination, Carrier transport: diffusion and drift, Direct and indirect bandgaps, p-n junction, V-I characteristics, Energy Band diagram, Biasing of a junction, Barrier Potential. **[10 hrs]** **Diodes and Diode circuits** – Diode characteristics and equations**;** Current-Voltage Characteristics, ideal vs real**,** Diode equivalent circuits, Diode Transition and Diffusion Capacitance, Diode Switching Times, Load Line Concept. **[12 hrs]** **Special Diodes**- Zener Diode, Schottky Diode; Varactor Diode (Varicap); Tunnel Diode; Photo Diode; Solar cells, Light-Emitting Diode (LED). Laser Diode. **[12 hrs]** **Display Technologies**: Evolution of Display Technology, Liquid Crystal Display (LCD), Characteristics of OLED and organic semiconductors, Quantum Dot Display (QLED). **[8 hrs]**

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The module is delivered in both lectures and tutorials providing the key academic support to the module. • The lectures will follow an integrated approach to learning with initial information dissemination, followed by a chance to practice the application of knowledge, using a problem-based learning approach, and research-based case studies. • Students will be instructed to read ahead in the notes and to use the reading lists for background reading. • Lectures may also provide a formative approach to assessment with integrated quizzes and problems to solve. • Seminars will be used to solve and discuss practical problems which are provided to students in advance. In addition, there are some support structures. The Moodle eLearning platform is used in the module to provide online access to the taught content along with links to both the reading list, relevant professional body-related websites, and other websites showing the relation of the theory to the industrial context of the module.

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	25	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	90		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	20% (10)	3, 5, 9, 12, 14	LO #1- #2, LO #3- #4 LO #7- #8 LO #9- #11 and #12, #13
	Home PSETs	5	20% (10)	4, 6, 8, 10 and 13	LO #3, #4 and #6, #7
	Midterm Exam	2hr	10% (10)	7	LO #1 - #6

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Overview of semiconductor applications, silicon integrated circuit technology, Intrinsic semiconductors, electrons and holes, bond model,
Week 2	generation recombination and thermal equilibrium; doping, donors, acceptors, compensation
Week 3	Carrier ttransport, drift velocity, drift current density, diffusion current density The p-n junction
Week 4	Carrier transport, drift velocity, drift current density, diffusion current density The p-n junction
Week 5	P-N Junction Operation and Characteristics – Carrier generation and recombination, Carrier transport: diffusion and drift, Direct and indirect bandgaps.
Week 6	MOS capacitor under applied bias; accumulation, depletion, and inversion regions, MOSFET physical structure, circuit symbol and terminal characteristics, MOS transistor characteristics
Week 7	Mid-term Exam
Week 8	MOS transistor, backgate effect, MOSFET in saturation
Week 9	Digital logic concepts, inverter characteristics, logic levels and noise margins, transient characteristics,
Week 10	inverter circuits, NMOS/resistor loads, NMOS/current source load, CMOS inverter, static analysis
Week 11	ntroduction of bipolar junction transistor, terminal characteristics
Week 12	forward active bias, current gain, Reverse active mode and saturation, the Ebers Moll model
Week 13	DC analyses of Common base/gate amplifier, common collector/drain
Week 14	Biasing

Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Neamen, Donald. Microelectronic Circuit Analysis and Design. 3rd ed. New York, NY: McGraw-Hill, 2006. ISBN: 9780073285962. ELECTRONIC DEVICES AND CIRCUITS, J. MILLMAN, 3rd ed., 2020.	Yes
Recommended Texts	1- Howe, Roger, and Charles Sodini. Microelectronics: An Integrated Approach. Upper Saddle River, NJ: Prentice Hall, 1996. ISBN: 9780135885185. 2. Follow up on the latest developments in scientific research re 3. Updating the course by following the vocabulary of the SP curricula. 4. Take into account the needs of the labor market and seek curriculum vocabulary, Sedra, Adel, and Kenneth Smith. Microelectronic	Yes
Websites	http://ocw.mit.edu/courses/electrical engineering-and-computer-science/6-012 microelectronic-devices-and-circuits-spring-2009 (Accessed 1 Mar 2014). License: Creative Commons BY NC-SA	

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

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

نموذج وصف المقرر

المستوى الاول (الفصل الاول)

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Programming 3**			**Module Delivery**	
Module Type	**ECE**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE12305**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**First Level**	**Semester of Delivery**		5
Administering Department		**Computer Engineering**	**College**	Of Engineering	
Module Leader	**Hawraa Ahmed Jasiem**		**e-mail**	Hawraa.a.jasiem@gu.edu.iq	
Module Leader's Acad. Title		**Assist. Lecturer**	**Module Leader's Qualification**		M.Sc
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		1/3/2026	**Version Number**		

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Understand the basic environment of MATLAB 2. Write and execute simple MATLAB scripts 3. Use variables, data types, and basic operations 4. Apply mathematical and matrix operations 5. Create and manipulate arrays and matrices 6. Use built-in functions for calculations 7. Develop programs using conditional statements and loops 8. Plot graphs and visualize data 9. Solve basic engineering and mathematical problems using MATLAB
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Identify and use MATLAB environment and basic commands 2. Develop simple MATLAB scripts and programs 3. Apply mathematical and matrix operations effectively 4. Construct programs using conditional statements and loops 5. Analyze data and generate plots using MATLAB tools 6. Use built-in functions to solve engineering and scientific problems 7. Interpret graphical results and data visualization outputs 8. Debug and improve MATLAB programs
Indicative Contents المحتويات الإرشادية	**1. Introduction to MATLAB** • **Overview of MATLAB and its applications** • **MATLAB environment (Command Window, Workspace, Editor)** • **Basic commands and interface navigation** **2. MATLAB Basics** • **Variables and assignment** • **Data types in MATLAB** • **Writing simple scripts** • **Comments and help commands** **3. Mathematical Operations** • **Arithmetic operations** • **Built-in mathematical functions** • **Order of operations** **4. Matrices and Arrays** • **Creating vectors and matrices** • **Matrix operations (addition, multiplication, transpose)** • **Indexing and slicing** • **Special matrices (zeros, ones, identity)** **5. Input and Output** • **Displaying output using disp() and fprintf()** • **Taking user input** • **Formatting output** **6. Conditional Statements** • **if statement** • **if-else statement** • **nested conditions** **7. Loops**

	• **for loop** • **while loop** • **loop control statements** **8. Functions** • **Built-in functions** • **Creating user-defined functions** • **Function inputs and outputs** **9. Plotting and Data Visualization** • **2D plots (plot, xlabel, ylabel, title)** • **Multiple plots** • **Basic graph customization** **10. File Handling** • **Script files (.m files)** • **Saving and loading data** **11. Applications** • **Solving mathematical equations** • **Simple engineering problems** • **Data analysis examples**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching and learning in this module will be delivered through lectures, demonstrations using MATLAB software, and hands-on lab sessions. Students will practice writing scripts, solving mathematical problems, and creating plots. Learning is supported through assignments, quizzes, and problem-solving activities, along with group discussions and self-learning to strengthen practical skills.

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل			

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)		
	Assignments	2	5% (5)		
	Projects / Lab.	1	15% (15)		
	Report	1	10% (10)		
Summative assessment	**Midterm Exam**	2hr	10% (10)		
	Final Exam	3hr	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to MATLAB and its Applications
Week 2	MATLAB Environment and Basic Commands

Week 3	Variables, Data Types, and Basic Syntax
Week 4	Mathematical Operations and Built-in Functions
Week 5	Vectors and Matrices
Week 6	Matrix Operations and Indexing
Week 7	Input and Output Functions
Week 8	Conditional Statements (if, else)
Week 9	Loops (for, while)
Week 10	Functions in MATLAB
Week 11	Plotting and Data Visualization
Week 12	Applications and Revision

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to MATLAB environment and basic commands
Week 2	Writing simple scripts and using variables
Week 3	Practice on mathematical operations and functions
Week 4	Creating and manipulating vectors and matrices

Week 5	Matrix operations and indexing exercises
Week 6	Input and output commands practice
Week 7	Conditional statements exercises
Week 8	Loop exercises (for, while)
Week 9	Writing and using functions
Week 10	Plotting graphs and data visualization
Week 11	Solving simple engineering problems
Week 12	Revision and practical test

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Moore, H. (2020). *MATLAB for Engineers*. Pearson. Pratap, R. (2010). *Getting Started with MATLAB*. Oxford University Press.	
Recommended Texts		
Websites		

Grading Scheme
مخطط الدرجات

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

Electromagnetic Fields-I

المجالات الكهرومغناطيسية-1

Module Information معلومات المادة الدراسية					
Module Title	**Electromagnetic Fields-I**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐ **Lecture** ☐ **Lab** ☒**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	ECE210a				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	ECE		**College**	Engineering	
Module Leader	Haneen Jumhoor sabbar		**e-mail**	haneen.g.sabbar@gu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Saif Hasan Abdulnabi		**e-mail**	haneen.g.sabbar@gu.edu.iq	
Peer Reviewer Name	Name		**e-mail**	haneen.g.sabbar@gu.edu.iq	
Scientific Committee Approval Date	12/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The objectives of this module are to tease out the laws of electromagnetism from our everyday experience by specific examples of how electromagnetic phenomena manifest themselves. We want to be able to: • Describe, in words, the ways in which various concepts in electromagnetism come into play in particular situations. • Represent these electromagnetic phenomena and fields mathematically in those situations. The overall goal is to use the scientific method to come to understand the enormous variety of electromagnetic phenomena in terms of a few relatively simple laws and Maxwell's equations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To have detailed knowledge of the physical background and terminology of the electromagnetic field theory for electronic and communications engineering problems 2. To understand the electromagnetic field behavior 3. To select and use appropriate theoretical models for analysis, problem solving and finding solutions related to the electrostatic and electromagnetic fields 4. To understand how laws of electromagnetism can be applied to problems arising in engineering.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A - Vector Analysis</u> This unit covers the basic framework of vector analysis. This unit includes: Rectangular Coordinate Systems (RCS), Cylindrical Coordinate Systems (CCS), and Spherical Coordinate Systems (SCS). <u>Part B – Vector Representation</u> This unit covers the representation of vectors. This unit includes: Vector Components and Unit Vectors, and Vector Algebra. <u>Part C – Operations on Vector</u> This unit covers operations on vector. This unit includes: Del Operator and Divergence. <u>Part D – Multiple Integration</u> This unit covers single and multiple integration. This unit includes: Line Integral, Surface Integral, and Volume Integral. <u>Part E - Electrostatics</u> This unit covers the Electrostatics (The First Maxwell's Equation). This unit includes: Coulomb's Law, Electric Fields and Electric Flux Density, Gauss's Law and its Applications, and First Maxwell's Equation and its Applications.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module will be delivered through lectures and enhanced with tutorials where students will be divided into small groups. Active learning will be implemented via collaborative groups.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	83	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction to Electromagnetic Fields and their applications and Significance**
Week 2	**Vector Analysis: Part I:** - Rectangular Coordinate Systems (RCS)
Week 3	**Vector Analysis: Part I:** - Cylindrical Coordinate Systems (CCS)
Week 4	**Vector Analysis: Part I:** - Spherical Coordinate Systems (SCS)
Week 5	**Vector Analysis: Part II:** - Vector Components and Unit Vectors - Vector Algebra - Vector Operations
Week 6	**Quiz 1** **Vector Analysis: Part III:** - Differential Calculus - "Ordinary" Derivatives
Week 7	**Vector Analysis: Part III:** - The Del Operator - The Divergence
Week 8	**Vector Analysis: Part V:** - Line Integrations - Surface Integrations
Week 9	**Vector Analysis: Part V:** - Volume Integration
Week 10	**Quiz 2** **Electrostatics: Part I:** - Coulomb's Law and Field Intensity
Week 11	**Electrostatics: Part II:** - Electric Fields Due to Continuous Charge Distributions. - Electric Flux Density
Week 12	**Midterm Exam**
Week 13	**Electrostatics: Part III:** - Gauss's Law - Applications of Gauss' Law
Week 14	**Electrostatics: Part V:** - First Maxwell's Equation - Applications of First Maxwell's Equation
Week 15	**Seminars**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Matthew N. O. Sadiku. *Elements of Electromagnetics.* 7th ed., Oxford university press, 2018.	No
Recommended Texts	William H. Hayt, Jr. and John A. Buck. *Engineering Electromagnetics*. 9th ed., Mc-Graw Hill Education, 2018	Yes
Websites	https://web.mit.edu/8.02t/www/802TEAL3D/visualizations/coursenotes/index.htm	

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

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

Microelectronic Devices and Circuits

Module Information معلومات المادة الدراسية					
Module Title	**Microelectronic Devices and Circuits**			**Module Delivery**	
Module Type	**core**			☒**Theory** ☒**Lecture** ☒ **Lab** ☐ **Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**ECE204a**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	ECE		**College**	Engineering	
Module Leader	Buraq karim		**e-mail**	buraq.k.shebli@gu.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**	E-mail:buraq.k.shebli@gu.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail: buraq.k.shebli@gu.edu.iq	
Scientific Committee Approval Date	9/2024		**Version Number**	1.0	

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

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

Module Objectives أهداف المادة الدراسية	modeling of microelectronic devices, basic microelectronic circuit analysis and design, physical electronics of semiconductor junction and metal-on-silicon (MOS) devices, relation of electrical behavior to internal physical processes, development of circuit models, and understanding the uses and limitations of various models. The course uses incremental and large-signal techniques to analyze and design bipolar and field effect transistor circuits, with examples chosen from digital circuits, single-ended and differential linear amplifiers, and other integrated circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Ability to understand kinds of semiconductors 2. Ability to choose the right material for designing semiconductor devices 3. Ability to understand the current generation in semiconductor 4. Ability to understand the PN junction and its biasing 5. Ability to understand the structure of MOS FET and BJT transistors 6. Ability to know to design and analyze transistors 7. Ability to use semiconductor devices for real-life applications 8. Ability to design electronic circuits to facilitate many tasks in our life 9. Ability to design electronic circuits to facilitate many tasks in our life 10. Ability to use electronic circuits (semiconductor) as a logic gate and its digital application
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Revision of Band Structure Theory **Atomic models**- Thompson model, Rutherford Atomic Model, Bohr's model, The electromagnetic spectrum, Normal, Excited, and Ionized atom. **[4 hrs]** **Energy Bands in Solids**- The Dual Nature of Electron, Quantum Theory of Radiation, Photoelectric Effect, Energy bands, The Wave-Mechanics Model, Pauli Exclusion Principle. **[4 hrs]** Part B - Semiconductor Fundamentals **Semiconductor materials and properties**- Covalent bonds in the Semiconductors, Electrical Conductivity Mechanism in Semiconductors, Intrinsic and extrinsic semiconductors, Carrier concentration, Dependence of Fermi level on carrier concentration and temperature, Hall effect. **[10 hrs]** **P-N Junction Operation and Characteristics** – Carrier generation and recombination, Carrier transport: diffusion and drift, Direct and indirect bandgaps, p-n junction, V-I characteristics, Energy Band diagram, Biasing of a junction, Barrier Potential. **[10 hrs]** **Diodes and Diode circuits** – Diode characteristics and equations**;** Current-Voltage Characteristics, ideal vs real**,** Diode equivalent circuits, Diode Transition and Diffusion Capacitance, Diode Switching Times, Load Line Concept. **[12 hrs]** **Special Diodes**- Zener Diode, Schottky Diode; Varactor Diode (Varicap); Tunnel Diode; Photo Diode; Solar cells, Light-Emitting Diode (LED). Laser Diode. **[12 hrs]** **Display Technologies**: Evolution of Display Technology, Liquid Crystal Display (LCD), Characteristics of OLED and organic semiconductors, Quantum Dot Display (QLED). **[8 hrs]**

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The module is delivered in both lectures and tutorials providing the key academic support to the module. • The lectures will follow an integrated approach to learning with initial information dissemination, followed by a chance to practice the application of knowledge, using a problem-based learning approach, and research-based case studies. • Students will be instructed to read ahead in the notes and to use the reading lists for background reading. • Lectures may also provide a formative approach to assessment with integrated quizzes and problems to solve. • Seminars will be used to solve and discuss practical problems which are provided to students in advance. In addition, there are some support structures. The Moodle eLearning platform is used in the module to provide online access to the taught content along with links to both the reading list, relevant professional body-related websites, and other websites showing the relation of the theory to the industrial context of the module.

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	25	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	90		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	20% (10)	3, 5, 9, 12, 14	LO #1- #2, LO #3- #4 LO #7- #8 LO #9- #11 and #12, #13
	Home PSETs	5	20% (10)	4, 6, 8, 10 and 13	LO #3, #4 and #6, #7
	Midterm Exam	2hr	10% (10)	7	LO #1 - #6

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Overview of semiconductor applications, silicon integrated circuit technology, Intrinsic semiconductors, electrons and holes, bond model,
Week 2	generation recombination and thermal equilibrium; doping, donors, acceptors, compensation
Week 3	Carrier ttransport, drift velocity, drift current density, diffusion current density The p-n junction
Week 4	Carrier transport, drift velocity, drift current density, diffusion current density The p-n junction
Week 5	P-N Junction Operation and Characteristics – Carrier generation and recombination, Carrier transport: diffusion and drift, Direct and indirect bandgaps.
Week 6	MOS capacitor under applied bias; accumulation, depletion, and inversion regions, MOSFET physical structure, circuit symbol and terminal characteristics, MOS transistor characteristics
Week 7	Mid-term Exam
Week 8	MOS transistor, backgate effect, MOSFET in saturation
Week 9	Digital logic concepts, inverter characteristics, logic levels and noise margins, transient characteristics,
Week 10	inverter circuits, NMOS/resistor loads, NMOS/current source load, CMOS inverter, static analysis
Week 11	ntroduction of bipolar junction transistor, terminal characteristics
Week 12	forward active bias, current gain, Reverse active mode and saturation, the Ebers Moll model
Week 13	DC analyses of Common base/gate amplifier, common collector/drain
Week 14	Biasing

Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Neamen, Donald. Microelectronic Circuit Analysis and Design. 3rd ed. New York, NY: McGraw-Hill, 2006. ISBN: 9780073285962. ELECTRONIC DEVICES AND CIRCUITS, J. MILLMAN, 3rd ed., 2020.	Yes
Recommended Texts	1- Howe, Roger, and Charles Sodini. Microelectronics: An Integrated Approach. Upper Saddle River, NJ: Prentice Hall, 1996. ISBN: 9780135885185. 2. Follow up on the latest developments in scientific research re 3. Updating the course by following the vocabulary of the SP curricula. 4. Take into account the needs of the labor market and seek curriculum vocabulary, Sedra, Adel, and Kenneth Smith. Microelectronic	Yes
Websites	http://ocw.mit.edu/courses/electrical engineering-and-computer-science/6-012 microelectronic-devices-and-circuits-spring-2009 (Accessed 1 Mar 2014). License: Creative Commons BY NC-SA	

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

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

Microelectronic Devices and Circuits

Module Information معلومات المادة الدراسية					
Module Title	**Microelectronic Devices and Circuits**			**Module Delivery**	
Module Type	**core**			☒**Theory** ☒**Lecture** ☒ **Lab** ☐ **Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**ECE204a**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	ECE		**College**	Engineering	
Module Leader	Buraq karim		**e-mail**	buraq.k.shebli@gu.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**	E-mail:buraq.k.shebli@gu.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail: buraq.k.shebli@gu.edu.iq	
Scientific Committee Approval Date	9/2024		**Version Number**	1.0	

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

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

Module Objectives أهداف المادة الدراسية	modeling of microelectronic devices, basic microelectronic circuit analysis and design, physical electronics of semiconductor junction and metal-on-silicon (MOS) devices, relation of electrical behavior to internal physical processes, development of circuit models, and understanding the uses and limitations of various models. The course uses incremental and large-signal techniques to analyze and design bipolar and field effect transistor circuits, with examples chosen from digital circuits, single-ended and differential linear amplifiers, and other integrated circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Ability to understand kinds of semiconductors 2. Ability to choose the right material for designing semiconductor devices 3. Ability to understand the current generation in semiconductor 4. Ability to understand the PN junction and its biasing 5. Ability to understand the structure of MOS FET and BJT transistors 6. Ability to know to design and analyze transistors 7. Ability to use semiconductor devices for real-life applications 8. Ability to design electronic circuits to facilitate many tasks in our life 9. Ability to design electronic circuits to facilitate many tasks in our life 10. Ability to use electronic circuits (semiconductor) as a logic gate and its digital application
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Revision of Band Structure Theory **Atomic models**- Thompson model, Rutherford Atomic Model, Bohr's model, The electromagnetic spectrum, Normal, Excited, and Ionized atom. **[4 hrs]** **Energy Bands in Solids**- The Dual Nature of Electron, Quantum Theory of Radiation, Photoelectric Effect, Energy bands, The Wave-Mechanics Model, Pauli Exclusion Principle. **[4 hrs]** Part B - Semiconductor Fundamentals **Semiconductor materials and properties**- Covalent bonds in the Semiconductors, Electrical Conductivity Mechanism in Semiconductors, Intrinsic and extrinsic semiconductors, Carrier concentration, Dependence of Fermi level on carrier concentration and temperature, Hall effect. **[10 hrs]** **P-N Junction Operation and Characteristics** – Carrier generation and recombination, Carrier transport: diffusion and drift, Direct and indirect bandgaps, p-n junction, V-I characteristics, Energy Band diagram, Biasing of a junction, Barrier Potential. **[10 hrs]** **Diodes and Diode circuits** – Diode characteristics and equations**;** Current-Voltage Characteristics, ideal vs real**,** Diode equivalent circuits, Diode Transition and Diffusion Capacitance, Diode Switching Times, Load Line Concept. **[12 hrs]** **Special Diodes**- Zener Diode, Schottky Diode; Varactor Diode (Varicap); Tunnel Diode; Photo Diode; Solar cells, Light-Emitting Diode (LED). Laser Diode. **[12 hrs]** **Display Technologies**: Evolution of Display Technology, Liquid Crystal Display (LCD), Characteristics of OLED and organic semiconductors, Quantum Dot Display (QLED). **[8 hrs]**

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The module is delivered in both lectures and tutorials providing the key academic support to the module. • The lectures will follow an integrated approach to learning with initial information dissemination, followed by a chance to practice the application of knowledge, using a problem-based learning approach, and research-based case studies. • Students will be instructed to read ahead in the notes and to use the reading lists for background reading. • Lectures may also provide a formative approach to assessment with integrated quizzes and problems to solve. • Seminars will be used to solve and discuss practical problems which are provided to students in advance. In addition, there are some support structures. The Moodle eLearning platform is used in the module to provide online access to the taught content along with links to both the reading list, relevant professional body-related websites, and other websites showing the relation of the theory to the industrial context of the module.

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	25	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	90		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	20% (10)	3, 5, 9, 12, 14	LO #1- #2, LO #3- #4 LO #7- #8 LO #9- #11 and #12, #13
	Home PSETs	5	20% (10)	4, 6, 8, 10 and 13	LO #3, #4 and #6, #7
	Midterm Exam	2hr	10% (10)	7	LO #1 - #6

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Overview of semiconductor applications, silicon integrated circuit technology, Intrinsic semiconductors, electrons and holes, bond model,
Week 2	generation recombination and thermal equilibrium; doping, donors, acceptors, compensation
Week 3	Carrier ttransport, drift velocity, drift current density, diffusion current density The p-n junction
Week 4	Carrier transport, drift velocity, drift current density, diffusion current density The p-n junction
Week 5	P-N Junction Operation and Characteristics – Carrier generation and recombination, Carrier transport: diffusion and drift, Direct and indirect bandgaps.
Week 6	MOS capacitor under applied bias; accumulation, depletion, and inversion regions, MOSFET physical structure, circuit symbol and terminal characteristics, MOS transistor characteristics
Week 7	Mid-term Exam
Week 8	MOS transistor, backgate effect, MOSFET in saturation
Week 9	Digital logic concepts, inverter characteristics, logic levels and noise margins, transient characteristics,
Week 10	inverter circuits, NMOS/resistor loads, NMOS/current source load, CMOS inverter, static analysis
Week 11	ntroduction of bipolar junction transistor, terminal characteristics
Week 12	forward active bias, current gain, Reverse active mode and saturation, the Ebers Moll model
Week 13	DC analyses of Common base/gate amplifier, common collector/drain
Week 14	Biasing

Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
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Required Texts	Neamen, Donald. Microelectronic Circuit Analysis and Design. 3rd ed. New York, NY: McGraw-Hill, 2006. ISBN: 9780073285962. ELECTRONIC DEVICES AND CIRCUITS, J. MILLMAN, 3rd ed., 2020.	Yes
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Grading Scheme مخطط الدرجات				
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	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work is required but credit awarded
	F – Fail	راسب	(0-44)	A considerable amount of work required

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نموذج وصف المقرر

المستوى الاول (الفصل الاول)

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics 3**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE21301**				
ECTS Credits	**6**				
SWL (hr/sem)	**100**				
Module Level	UGII		**Semester of Delivery**	3	
Administering Department	Electronic and Communications Engineering		**College**	College of engineering	
Module Leader	Hasan Mohammed Kalil		**e-mail**	hasan.m.khalil@gu.edu.iq	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**		
Module Tutor			**e-mail**	hasan.m.khalil@gu.edu.iq	
Peer Reviewer Name			**e-mail**	hasan.m.khalil@gu.edu.iq	
Scientific Committee Approval Date	01/10/2025		**Version Number**	1.0	

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

Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Partial derivatives are useful in analyzing surfaces for maximum and minimum points and give rise to partial differential equations in next stage. 2. Learn basics of vectors for many engineering quantities, such as forces, displacements, velocities, and accelerations, will need to be represented as vectors for analysis. 3. The major applications of multiple integrals in engineering is the determination of properties of plane, and whenever an area or a volume under a 2D curve (a surface) needs to be measured 4. Build a mathematical toolkit: The course introduces various mathematical tools and techniques necessary for engineering analysis. This includes • impart the knowledge of sequences and summation of series • Represent functions as Taylor and Maclaurin series. 5. Understand their engineering application
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To evaluate partial derivatives and can implement to estimate maxima and minima of multivariable function 2. Understand the formula for the chain rule 3. Use the chain rule to find derivatives of composite functions 4. Apply the chain rule to a composition of three or more functions 5. View vectors geometrically 6. Find magnitude and direction 7. Perform vector addition and scalar multiplication 8. Find the component form of a vector 9. Find the unit vector in the direction of v 10. Perform operations with vectors in terms of i and j 11. Find the dot product of two vectors 24. Finding the equations of a line and of a plane 12. Evaluate a double integral 13. Setting up triple integrals for a region 14. Understanding the definition of a sequence 15. define what it means for a series to converge or diverge 16. Classifying a sequence as finite or infinite 17. Classifying a sequence as geometric, or neither 18. Learn to represent functions as Taylor and Maclaurin series.

Indicative Contents المحتويات الإرشادية	• PARTIAL DERIVATIVES Functions of Two or More Variables the Chain Rule Directional Derivatives and Gradients Tangent Planes and Normal Vectors Local Maxima and Minima of Functions of Two Variables • VECTORS Dot Product Cross Product Planes in Space • VECTOR-VALUED FUNCTIONS Introduction to Vector-Valued Functions • MULTIPLE INTEGRALS Double Integrals Double Integrals in Polar Coordinates Triple Integrals • Sequences Infinite Series Geometric Series Convergence Tests the Comparison, Ratio, and Root Tests Maclaurin and Taylor Series

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Giving theoretical lectures 2- Solve many problems 3- Using illustration methods such as drawing 4- Direct discussion by asking questions and opening dialogue and interaction with students. 5- Giving video lecture if need

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

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	Continuous	All
	Assignments	2	5% (5)	Continuous	All
	Projects / Lab.		15% (15)		
	Report	1	10% (10)	11,12	LO #13 , LO #14
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Fourier series - introduction.
Week 2	Half range Fourier series

Week 3	Partial derivatives
Week 4	**Chain rule**
Week 5	**Maxima, minima, and saddle points**
Week 6	Vectors: Introduction
Week 7	Vectors: properties, dot product
Week 8	**Vectors: cross product**
Week 9	(Mid-term Exam)
Week 10	Equations of lines and planes in space
Week 11	Vector function

Week 12	Multiple Integrals: Double Integrals
Week 13	Double Integrals using polar coordinate
Week 14	Triple integrals

Week 15	**Taylor and Maclaurin series**
Week16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Calculus By Thomas	yes
Recommended Texts	CALCULUS EARLY TRANSCENDENTALS, By HOWARD ANTON, IRL BIVENS, STEPHEN DAVIS	yes
Websites		

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**English Language 2**			**Module Delivery**	
Module Type	**S**			☒ **Theory**	
Module Code	ENLA102			☐**Lecture**	
ECTS Credits	**2**			☐**Lab**	
SWL (hr/sem)	**50**			☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Level	1		**Semester of Delivery**	1	
Administering Department			**College**	Engineering	
Module Leader	Buraq karim		**e-mail**	Buraq.k.shebli@gu.edu.iq	
Module Leader's Acad. Title	Asst.lec		**Module Leader's Qualification**	mc.s	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	1-9-2025		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Language Proficiency: English language materials aim to enhance learners' proficiency in the language by developing their skills in reading, writing, listening, and speaking. The materials provide opportunities for learners to practice and improve their grammar, vocabulary, pronunciation, and comprehension abilities. 2. Communication Skills: English language materials focus on developing learners' ability to communicate effectively in various contexts. This includes practicing conversation skills, giving presentations, writing emails and reports, and engaging in discussions and debates. 3. Cultural Understanding: English language materials often incorporate cultural content to provide learners with insights into English-speaking countries' cultures, traditions, and societal norms. This helps learners understand and navigate cross-cultural interactions. 4. Exam Preparation: Many English language materials are designed to prepare learners for standardized tests like TOEFL, IELTS, or Cambridge English exams. These materials provide test-taking strategies, practice exercises, and sample questions to familiarize learners with the exam format and improve their performance. 5. Professional and Academic Skills: Some English language materials cater to learners who require English proficiency for specific professional or academic purposes. These materials focus on developing specialized vocabulary, writing research papers, delivering professional presentations, and enhancing critical thinking and analytical skills. 6. Self-Study and Autonomy: English language materials often aim to empower learners to become independent and autonomous language learners. They provide self-study resources, interactive exercises, and feedback mechanisms that allow learners to track their progress and take control of their learning journey.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Language Proficiency: By engaging with English language materials, learners should demonstrate improved language proficiency across various skills such as reading, writing, listening, and speaking. They should be able to comprehend and produce English texts with increased accuracy, fluency, and complexity. 2. Effective Communication: Learners should develop the ability to communicate effectively in English, both orally and in writing. They should be able to express ideas, opinions, and information clearly and coherently, adapting their language to different contexts and audiences. 3. Cultural Awareness: Engaging with English language materials should foster cultural awareness and sensitivity. Learners should gain an understanding of cultural practices, perspectives, and norms of English-speaking countries, enabling them to engage in cross-cultural communication with respect and understanding. 4. Critical Thinking and Analysis: English language materials often aim to develop learners' critical thinking and analytical skills. They should be able to

	analyze and evaluate information, identify main ideas, make connections, and draw conclusions from English texts. 5. Exam Readiness: If the materials are geared towards exam preparation, the learning outcomes may include achieving a specific score or level in standardized English proficiency tests such as TOEFL, IELTS, or Cambridge exams. Learners should demonstrate the necessary skills and strategies to succeed in these exams. 6. Independent Learning: English language materials often aim to promote independent learning skills. Learners should become self-directed and motivated language learners who can set goals, manage their learning process, and use resources effectively to continue improving their English proficiency beyond the module. 7. Academic or Professional Skills: Depending on the module's focus, the learning outcomes may include specific academic or professional skills. These may include academic writing, research skills, presentation skills, business communication, or specific English language skills required in a professional field.
Indicative Contents المحتويات الإرشادية	1. Vocabulary: English language materials often include vocabulary lessons and exercises to expand learners' word knowledge. This may involve learning new words, idioms, phrasal verbs, and collocations, as well as practicing their usage in context. 2. Grammar: English language materials typically cover various grammar topics and rules. They provide explanations, examples, and exercises to help learners understand and apply grammatical structures correctly. This may include topics like tenses, articles, prepositions, verb forms, and sentence structure. 3. Reading Comprehension: English language materials incorporate reading passages of different genres, such as fiction, non-fiction, news articles, and academic texts. Learners engage in activities like reading for gist, scanning for specific information, and comprehending main ideas, supporting details, and inference. 4. Writing Skills: English language materials focus on developing learners' writing skills, including sentence construction, paragraph development, essay structure, and formal writing styles. They may cover various types of writing, such as descriptive, narrative, argumentative, and persuasive writing. 5. Listening Comprehension: English language materials include listening activities to improve learners' listening skills and comprehension. These may involve listening to dialogues, conversations, lectures, interviews, and audio recordings, followed by tasks to assess understanding, inference, and note-taking. 6. Speaking Skills: English language materials provide opportunities for learners to practice speaking and develop their oral communication skills. This may include role-plays, discussions, presentations, and speaking tasks that simulate real-life situations and promote fluency, pronunciation, and accuracy. 7. Pronunciation and Intonation: English language materials often address pronunciation and intonation patterns to improve learners' spoken English. They may include exercises for practicing individual sounds, stress patterns,

	rhythm, and intonation to enhance clarity and naturalness in speaking. 8. Cultural and Societal Context: English language materials may incorporate cultural content to provide learners with insights into English-speaking countries' cultures, customs, and societal norms. This helps learners understand cultural context and improve their intercultural communication skills. 9. Test Preparation: If the materials are designed for exam preparation, they may include sections dedicated to practicing test-taking strategies, familiarizing learners with the format and types of questions in standardized English proficiency exams, and providing sample tests for practice. 10. Authentic Materials: English language materials often include authentic materials like newspaper articles, blogs, videos, and audio recordings to expose learners to real-life language usage and promote their understanding of English in authentic contexts.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. English language materials often follow a structured progression, starting with simpler concepts and gradually increasing the complexity. This scaffolding approach helps learners build upon their existing knowledge and skills, ensuring a smooth and gradual learning curve. 2. English language materials provide contextualized examples and practice exercises to help learners understand how language is used in real-life situations. By presenting language in meaningful contexts, learners can grasp its practical application and improve their comprehension and usage. 3. English language materials incorporate interactive activities like group discussions, role-plays, pair work, and language games to foster active participation and engagement. These activities promote communication, collaboration, and the application of language skills in authentic situations. 4. English language materials aim to integrate the four language skills (reading, writing, listening, and speaking) to promote holistic language development. By connecting these skills, learners can enhance their overall language proficiency and ability to communicate effectively. 5. English language materials provide a variety of practice exercises that gradually increase in difficulty. This progressive practice allows learners to reinforce their understanding, practice new language features, and build confidence in their language abilities.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered

Week 1	**Grammer (1)** (tenses :present , past , future) , question , questions word , **Everyday English** (social expression)
Week 2	**Grammer (2)** :Present tenses(present simpl , present continuous (have and have got) **Everyday English** (Making conversation)
Week 3	**Grammer(3)** Past tenses (past simple , past continuous) **Vocabulary** (Regular and Irregular verbs) , Adverbs **Everyday English** (Saying when)
Week 4	**Grammer (4):** Quantity , articles **Everyday English** (Can you came for dinner , Requests
Week 5	**Grammer (5) :** Verbs patterns , future forms **Vocabulary** : Phrasal verb (literal , Idiomatic) **Everyday English** (Expressing doubt and certainty)
Week 6	**Grammer**(6) :what like , Comparative and superlative adjective **Everyday English** : What's on
Week 7	**Grammer(7)** : Present perfect , Indefinite past , ever and never **Everyday English** : Agree with me , word with two meaning , go together, prepositions.
Week 8	**Vocabulary** (right word , wrong word , verbs with similar meaning , adjective and noun that go together , Synonyms , Antonyms
Week 9	Writing practice: narrative or descriptive essays
Week 10	Midterm Exam
Week 11	**Speaking**: speaking a technical report , a seminar , **Team work activities** (discussion and conversation) **Seminar skills**
Week 12	Grammar review: passive voice and relative clauses.
Week 13	Error analysis and correction exercises

Week 14	**Translation** : a technical report from English to Arabic and from Arabic to English Computer engineering terms .
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Textbooks	1. New Headway for Beginner / Student book 4th edition 2. New Headway Elementary / Student book 4th edition	Yes
Recommended Texts	New Headway of Oxford / Pre- Intermediate / Student's Book Fourth edition	-
Websites		

Grading Scheme

مخطط الدرجات

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

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

Module Information
معلومات المادة الدراسية

Module Title	Combinatorial Logic Circuits		**Module Delivery**	
Module Type			☒**Theory** ☐ **Lecture** ☒**Lab** ☒ **Tutorial** ☐**Practical** ☐**Seminar**	
Module Code				
ECTS Credits				
SWL (hr/sem)	**175**			
Module Level		**Semester of Delivery**	1	
Administering Department	Electronics and communication	**College**	College of Engineering	
Module Leader		**e-mail**		
Module Leader's Acad. Title	Dr.Dhamyaa Husam	**Module Leader's Qualification**		
Module Tutor	-	**e-mail**	Dhamyaa.husam@gu.edu.iq	
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	01/2/2026	**Version Number**	1.0	

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Understanding of basic Number Systems: Students should gain a solid understanding of various number systems and Codes such as decimal, binary, octal, hexadecimal, Binary Coded Decimal (BCD).and Gray system. 2. Analysis of LOGIC Gates: Students should be able to analyze and solve LOGIC Gates using tables for each circuit such as and, or, and other gates. 3. Boolean algebra and Logic Simplification: Students should learn about various rules and theorem of Boolean algebra and DeMorgan's Theorems. They should be able to calculate the equivalent expression of logic circuits by using Karnaugh map and SOP. 4. Combinational Logic Analysis: Students should be familiar with basic combinational circuit, they should be able to apply the pulse waveform inputs to the Combinational Logic gates and calculate the observed outputs.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Recognize various number system and codes. 2- Use the various way to convert from system to another ones and vice versa. 3- Understand and apply the arithmetic operation for some of the system like sum, subtract, division and multiplication. 4- Apply some of arithmetic operation in logical circuit. 5- Describe logical gates like (and, or, not, nor, nand and ex-or). 6- Define the operation of each gate. 7- Identify the Boolean algebra and DeMorgan's theorems. 8- Apply Boolean algebra and DeMorgan's theorems to simplify the expressions. 9- Apply Karnaugh map and SOP to simplify the expression. 10- Explain the basic combinational logic circuit. 11- Apply the rules and use only (nand and nor gates) in connected circuit. 12- Identify the pulse waveform and applying it in the combinational logic circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Digital Systems and Binary Numbers • Digital Systems 1 • Binary Numbers • Number-Base Conversions • Octal and Hexadecimal Numbers • Complements of Numbers • Signed Binary Numbers • Binary Codes • Binary Storage and Registers • Binary Logic. 2- Boolean Algebra and Logic Gates [18 Hours] • Basic Definitions • Axiomatic Definition of Boolean Algebra • Basic Theorems and Properties of Boolean Algebra • Canonical and Standard Forms • Other Logic Operations

	• Digital Logic Gates • Integrated Circuits 3- Gate-Level Minimization • Introduction • The Map Method • Four-Variable K-Map • Product-of-Sums Simplification • Don't-Care Conditions • NAND and NOR Implementation • Other Two-Level Implementations • Exclusive-OR Function Hardware Description Language 4- Combinational Logic • Combinational Circuits • Analysis Procedure • Design Procedure • Binary Adder–Subtractor2.6 Decimal Adder • Binary Multiplier • Magnitude Comparator • Decoders • 4.9 Encoders • Multiplexers • HDL Models of Combinational Circuits

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The primary approach for implementing this module will involve promoting active student engagement in exercises, as well as enhancing their ability to think critically. This goal will be accomplished through a combination of classroom sessions, interactive tutorials, and the incorporation of intriguing sampling-based experiments.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	96	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	
Formative assessment	**Quizzes**	2	10% (10)	6 and 12	
	Assignments	2	10% (10)	7 and 13	
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	
	Final Exam	3hr	50% (50)	16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Logic Gates
Week 2	Introduction to Boolean Algebra
Week 3	Simplification Techniques (Karnaugh Maps)
Week 4	Simplification Techniques (Boolean Simplification)
Week 5	Combinational Logic Circuit Analysis & Design
Week 6	Combinational Logic Circuit Analysis & Design
Week 7	Mid Exam
Week 8	Arithmetic Circuits (Adders, Subtractors, Multipliers, Comparators)
Week 9	Arithmetic Circuits (Adders, Subtractors, Multipliers, Comparators)
Week 10	Multiplexers, Demultiplexers, Encoders, Decoders
Week 11	Multiplexers, Demultiplexers, Encoders, Decoders
Week 12	Programmable Logic Devices (PLDs), ROM, PAL, PLA
Week 13	Design Case Studies & Mini- Project
Week 14	Course Revision & Final Project Demonstrations
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: logic gates
Week 2	Lab 2: logic gates
Week 3	Lab 3: Basic Combinational Logic Circuits
Week 4	Lab 4: Implementing Combinational Logic.
Week 5	Lab 5: Combinational Logic NOR Gates
Week 6	Lab 6: Combinational Logic Using NAND gates
Week 7	Exam
Week 8	Lab 7: adders
Week 9	Lab 8: Comparator
Week 10	Lab 9: Decoders
Week 11	Lab 10: Encoders
Week 12	Lab 11: Multiplexers
Week 13	Lab 12: Demultiplexers
Week 14	Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	M. Morris Mano, Michael D., Digital Design, 4th edition, Ciletti Prentice Hall	Yes
Recommended Texts	Thomas L. Floyd, Digital Fundamentals, 11th Edition, Pearson Prentice Hall	Yes
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**probability, random process, and statics**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE22306**				
ECTS Credits	**2.0**				
SWL (hr/sem)	**50**				
Module Level	UGII		**Semester of Delivery**	4	
Administering Department	Electronics and Communications Engineering		**College**	The College of Engineering	
Module Leader	Hasan Muhammed		**e-mail**	Hasan.m.khalil@gu.edu.iq	
Module Leader's Acad. Title	Assist Lecturer		**Module Leader's Qualification**		
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	N.A.		**e-mail**	N.A.	
Scientific Committee Approval Date	7/2/2025		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	this course helps the student to understand the following: • Knowing the main statistical concept • understand the basics of probability calculations • Knowing the value and importance of the course and explain the possibility of applying it in their specialty.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of this course the student should be able to: • Knowing how the statistical concept calculates and apply. • use probability models for some random experiments (applying them in practical lif • Knowing the value and importance of the course and explain the possibility of applying it in their specialty.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – definition the statistic concept and explain the role of probability Define the statistic and explain types of variable, how to summarize and analyze Them. Calculate the cumulative frequency distribution and practice to draw the freque distribution graph. Calculate the measures of central tendency and calculate the measu of variation Part B – probability Knowing the basic interpretations of probability classical probability empirical or relative frequency probability subjective probability how to measure them. Understand the concept of sample space, event, complement of event using addition role of probability. find the value of probability.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Using modern study methods • Adopting the method of discussion and dialogue .

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	50	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 9	LO #3, #4 and #6, #7
	Lab.		0%(0)		
	Projects	1	10% (10)	13	LO #10
Summative assessment	**Midterm Exam**	2hr	20% (10)	12	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction on the main concept
Week 2	Calculate the frequency distribution
Week 3	the cumulative frequency distribution, the frequency distribution graph
Week 4	the measures of central tendency
Week 5	the measures of variation
Week 6	the basic interpretations of probability. the concept of sample space, event, complement of event.

Week 7	the addition role of probability.
Week 8	The multiplication role of probability, dependent and independent event.
Week 9	Condition probability
Week 10	Bayes rule
Week 11	Permutation and Combination
Week 12	Midterm Exam
Week 13	Statistical probability distribution
Week 14	Continues distributions
Week 15	Give the marks to the students
Week 16	Preparatory week before the final Exam

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Elementary statistics : a step by step approach / Allan Bluman. — 8th ed. Probability, statistics, and random processes for electrical engineering / Alberto Leon-Garcia. -- 3rd ed	Yes
Recommended Texts	N.A.	N.A.
Websites	https://www.studysmarter.co.uk/explanations/math/probability-and-statistics/	

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

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Research and Creative Thinking

Module Information معلومات المادة الدراسية					
Module Title	**Research and Creative Thinking**			**Module Delivery**	
Module Type	**Support**			☒Theory ☐ Lecture ☐Lab ☒Tutorial ☐Practical ☒Seminar	
Module Code	**ECE21302**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	UGII		**Semester of Delivery**	3	
Administering Department	ECE		**College**	Engineering	
Module Leader	Hikmat maad		**e-mail**	Hikmat.maad@gu.edu.iq	
Module Leader's Acad. Title	Assist. Lec.		**Module Leader's Qualification**	MSc	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This module aims to provide students with a solid understanding of the scientific method, enabling them to identify pseudoscience in its various forms, such as paranormal phenomena, free-energy devices, alternative medicine, intelligent design/creationism, denial of human-induced climate change, propaganda, denial of science-based medicine, misuse of data and statistics, and many others.

	1- understanding of thinking processes and an ability to manage and apply these intentionally 2- skills and learning dispositions that support logical, strategic, flexible and adventurous thinking 3- confidence in evaluating thinking and thinking processes across a range of familiar and unfamiliar contexts 4- Students will be able to differentiate between credible sources of information and misinformation, becoming intelligent consumers of information.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Understand the importance of research ethics and integrate research ethics into the research process. 2- Students' writing will improve 3- Be able to assess and critique a published journal article that uses one of the primary research methods in the field. 4- Be able to construct an effective questionnaire that employs several types of survey questions. 5- Students will be able to distinguish credible sources of information 6- Understand research terminology 7- be aware of the ethical principles of research, ethical challenges and approval processes 8- Critically analyze published research 9- Develop an ability to apply effective, creative and innovative solutions to research problems 10- Develop teamwork, and interpersonal skills in negotiating research programs via use of problem solving and critical thinking exercises in research case studies 11- Critically evaluate the efficacy of virtual means of delivering or developing research strategies 12- Identify the components of a literature review process
Indicative Contents المحتويات الإرشادية	1. Introduction to research and creative thinking: - Understanding the nature and importance of research - Exploring the role of creative thinking in the research process - Developing a growth mindset and embracing curiosity 2. Research methodologies and processes: - Overview of qualitative and quantitative research methods - Formulating research questions and hypotheses - Conducting literature reviews and identifying gaps in existing research 3. Critical thinking skills: - Evaluating and analyzing sources critically - Recognizing bias, fallacies, and logical reasoning errors - Applying critical thinking to problem-solving and decision-making 4. Creative thinking techniques: - Brainstorming and ideation strategies - Design thinking principles and approaches - Overcoming creative blocks and fostering innovative thinking

	5. Information literacy and research skills: - Effective information retrieval from various sources - Assessing the reliability and credibility of information - Ethical considerations in research and information use 6. Data collection and analysis: - Qualitative data collection methods (interviews, surveys, observations) - Quantitative data analysis techniques (descriptive statistics, inferential statistics) - Data visualization and interpretation 7. Writing and presenting research findings: - Organizing research papers and reports - Academic writing conventions and citation styles - Effective oral presentation skills and visual aids usage 8. Collaboration and teamwork in research: - Team dynamics and effective communication - Collaborative research project management - Resolving conflicts and leveraging diverse perspectives 9. Ethical considerations in research: - Research ethics and integrity - Informed consent and participant protection - Addressing ethical challenges in research design and implementation 10. Interdisciplinary research and cross-disciplinary thinking: - Exploring connections between different fields of study - Integrating knowledge from multiple disciplines - Encouraging interdisciplinary collaboration and innovation 11. Creativity in problem-solving and decision-making: - Applying creative thinking to real-world challenges - Designing innovative solutions to complex problems - Evaluating the effectiveness and impact of creative solutions

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Inquiry-based learning: Encourage students to ask questions, explore topics of interest, and formulate their own research inquiries. Provide opportunities for students to investigate and discover knowledge independently. 2. Problem-solving activities: Design activities that require students to analyze complex problems, think critically, and develop creative solutions. This could involve case studies, group projects, or real-world scenarios. 3. Research projects: Assign individual or group research projects that allow students to delve deep into a particular topic or issue. Teach them research methodologies, information literacy skills, and how to critically evaluate sources. 4. Collaborative learning: Facilitate group discussions, peer review sessions, and teamwork activities that promote knowledge sharing, diverse perspectives, and collaborative problem-solving. Encourage students to learn from each other's experiences and viewpoints. 5. Brainstorming and ideation: Employ techniques like brainstorming sessions, mind mapping, or design thinking exercises to stimulate creative thinking and generate innovative ideas. Provide a supportive environment that encourages students to explore unconventional solutions. 6. Reflective exercises: Incorporate reflection activities such as self-assessment, or group discussions to help students deepen their understanding, identify their strengths and areas for improvement, and connect their learning to real-life experiences. 7. Use of technology and multimedia: Incorporate multimedia resources, online databases, and digital tools that enhance research and creative thinking skills. Encourage students to use technology for information gathering, analysis, and presentation of their findings. 8. Guest speakers and field trips: Invite guest speakers, industry professionals, or researchers to share their experiences and expertise. Organize field trips to relevant locations, such as museums, research institutions, or innovative companies, to expose students to real-world applications of research and creative thinking. 9. Feedback and assessment: Provide timely and constructive feedback on students' research projects, creative work, and critical thinking exercises. Assess their ability to formulate research questions, gather evidence, analyze data, and present logical arguments.

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

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (5)	6 and 9	LO #1 - #7
	Writing a Paper	1	10% (10)	Continuous	All
	Prepare a Poster	1	10% (10)	Continuous	All
	Presentation	1	10% (10)	13	LO #12
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO #1 - #9
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Course Overview: What is research?, The Scientific Method?, Critical & Creative Thinking?
Week 2	Introduction to Scientific Research and the Research Process.
Week 3	Literature Reviews and Data Base Searches. Researching a topic, evaluating information, and Literature survey.
Week 4	Communicating Research Outcomes.
Week 5	The Structure of a Scientific Paper.
Week 6	Research Analysis.
Week 7	Writing an Academic Scientific Paper.

Week 8	Referencing and Academic Integrity.
Week 9	Mid exam
Week 10	Research Ethics and Engaging Cultures.
Week 11	Reviewing and Scientific Assessment.
Week 12	Presentation Skills and Presentation Evaluations.
Week 13	Academic Poster Style.
Week 14	Artificial Intelligence in engineering education.
Week 15	Paper and Poster Submission and Presentation.
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Writing Up Research, by Robert Weissberg and Suzanne Buker. ISBN: 0139708316	Yes
Recommended Texts	Science Research Writing. A Guide for Non Native Speakers of English, by Hilary Glasman-Deal. 2002, ISBN: 9781848163096. RESEARCH METHODS - THE BASICS., by Nicholas Walliman. 2011, ISBN 0203836073.	Yes
Websites	Professor John L. Cotton, Professor Randall J. Scalise, and Professor Stephen Sekula. The Scientific Method - Critical and Creative Thinking (Debunking Pseudoscience). (accessed 01.04.2014) http://www.physics.smu.edu/pseudo/	

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

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

نموذج وصف المقرر

المستوى الاول (الفصل الاول)

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**ANALOG ELECTRONICS DESIGNE LAB**			**Module Delivery**	
Module Type	**CORE**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE31305				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level			**Semester of Delivery**		
Administering Department			**College**	Engineering	
Module Leader	BURAQ KARIM		**e-mail**	buraq.k.shebli@gu.edu.iq	
Module Leader's Acad. Title	Asst.lecturer		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**	buraq.k.shebli@gu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	• To provide hands-on experience in designing and building analog electronic circuits. • To master the use of laboratory instruments such as Oscilloscopes, Function Generators, and DC Power Supplies. • To introduce circuit simulation tools (like Multisim or PSpice) for verifying designs before physical implementation. • To develop troubleshooting skills for identifying and fixing faults in analog hardware. • To train students on documenting technical results through formal engineering lab reports.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• **LO #1:** Design and implement diode-based circuits (Rectifiers, Clippers, and Clampers). • **LO #2:** Configure and test BJT and FET biasing circuits to achieve specific operating points. • **LO #3:** Measure the voltage gain, input impedance, and output impedance of single and multi-stage amplifiers. • **LO #4:** Analyze the frequency response of analog circuits using Bode plots generated from experimental data. • **LO #5:** Design practical applications using Operational Amplifiers (Op-Amps) such as comparators and active filters. • **LO #6:** Compare simulation results with physical measurements to identify tolerance and non-ideal effects. 1.

Indicative Contents المحتويات الإرشادية	**1. Diode Circuit Design** • **Design of Half-wave and Full-wave Bridge Rectifiers.** • **Capacitor Filter selection for ripple reduction.** • **Implementation of Clipping and Clamping circuits for signal conditioning.** **2. Transistor Biasing & Amplification (BJT & FET)** • **Practical design of Voltage Divider Bias for Q-point stability.** • **Building Common Emitter (CE) and Common Collector (CC) amplifiers.** • **Measurement of Voltage Gain (A_v), Input Impedance (Z_{in}), and Output Impedance (Z_{out}).** **3. Multistage & Frequency Response** • **Cascading two amplifier stages using RC coupling.** • **Experimental determination of Low and High-cutoff frequencies.** • **Plotting the Bandwidth and observing the effect of bypass capacitors.** **4. Operational Amplifiers (Op-Amp) Applications** • **Design of Inverting and Non-Inverting configurations.** • **Implementation of Mathematical circuits: Summing, Integrator, and Differentiator.** • **Design of Active Low-pass and High-pass Filters.** **5. Troubleshooting & Measurement** • **Mastering the use of Digital Multimeters, Oscilloscopes, and Power Supplies.** • **Techniques for identifying faulty components or open/short circuits in a design.**

	6. Feedback & Oscillators • **Negative Feedback: Practical implementation to improve gain stability and bandwidth.** • **Oscillator Circuits: Design of RC Phase Shift or Wein Bridge oscillators to generate sine waves.** **7. Power Amplifiers** • **Class A & Class B: Design and efficiency measurement of power stages.** • **Crossover Distortion: Observation and correction in Push-Pull amplifiers.** **8. Simulation & Verification** • **Software Integration: Comparing "Theoretical" calculations with "Simulated" results and "Measured" hardware data.** • **Error Analysis: Calculating the percentage of error between practical results and ideal values.**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• **Practical Lab Sessions:** Conducting hands-on experiments to design and test analog circuits using breadboards and electronic components. • **Circuit Simulation:** Using software tools like NI Multisim or Proteus to verify circuit designs before physical implementation. • **Problem-Based Learning:** Assigning design challenges where students must calculate component values (e.g., resistors for a specific gain). • **Technical Reporting:** Training students to analyze experimental data, draw waveforms, and write professional engineering reports.

	• **Demonstration & Illustration:** Using oscilloscopes and function generators to visualize real-time signal behavior.

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

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	5	10% (10)	continuous	
	Assignments	5	5% (5)	continuous	
	Projects / Lab.	8	15% (15)	Weekly	
	Report	8	10% (10)	Weekly	
Summative assessment	Midterm Exam	1	10% (10)		
	Final Exam	1	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Design and Testing of Full-Wave Bridge Rectifiers with Capacitive Filtering.
Week 2	Common Emitter (CE) Amplifier: Measuring Gain and Phase Shift.

Week 3	Implementation of Diode Clipping and Clamping Circuits for Signal Shaping Zener Diode Voltage Regulator: Design under varying load conditions.
Week 4	Introduction to Simulation BJT Fixed Bias and Voltage Divider Bias: Design and Q-point Measurement.
Week 5	Emitter Follower (Common Collector) Circuit: Impedance Matching.
Week 6	JFET Biasing and Small Signal Amplifier Design.
Week 7	**Mid-term Exam (Practical Task)**
Week 8	Design of Two-Stage RC Coupled Amplifiers: Cascading
Week 9	Frequency Response Measurement: Determining Lower and Upper Cutoff Frequencies
Week 10	Introduction to Op-Amps: Designing Inverting and Non-Inverting Amplifiers.
Week 11	Op-Amp Applications: Summing Amplifier and Differential Amplifier design.

Week 12	Design and implementation of an Analog Active Low-Pass Filter.
Week 13	Final Project: Design of a complete Analog System (e.g., Small Audio Pre-amp).
Week 14	Final Project: Design of a complete Analog System (e.g., Small Audio Pre-amp).

Week 15	**Final exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab Safety, Component Identification, and Introduction to Simulation Software.
Week 2	Design and Testing of Full-Wave Bridge Rectifiers with Capacitive Filtering.
Week 3	Implementation of Diode Clipping and Clamping Circuits for Signal Shaping.
Week 4	Zener Diode Voltage Regulator: Design under varying load conditions.
Week 5	BJT Fixed Bias and Voltage Divider Bias: Design and Q-point Measurement.
Week 6	Common Emitter (CE) Amplifier: Measuring Gain and Phase Shift.
Week 7	**Mid-term Exam (Practical Task)**
Week 8	**Emitter Follower (Common Collector) Circuit: Impedance Matching**
Week 9	JFET Biasing and Small Signal Amplifier Design
Week 10	Design of Two-Stage RC Coupled Amplifiers: Cascading effects.
Week 11	Introduction to Op-Amps: Designing Inverting and Non-Inverting Amplifiers.
Week 12	Op-Amp Applications: Summing Amplifier and Differential Amplifier design.

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

Required Texts	*Laboratory Manual for Electronic Devices and Circuit Theory* by Robert Boylestad. • **Software:** NI Multisim or Proteus for circuit simulation	
Recommended Texts	*Foundations of Analog and Digital Electronic Circuits* by Agarwal & Lang.	
Websites		

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Integrated Circuits and Application			**Module Delivery**	
Module Type	core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code					
ECTS Credits					
SWL (hr/sem)	125				
Module Level	UGII		**Semester of Delivery**	4	
Administering Department	Electronics and communication		**College**	College of engineering	
Module Leader			**e-mail**		
Module Leader's Acad. Title	Dr.Dhamyaa husam		**Module Leader's Qualification**		
Module Tutor			**e-mail**	Dhamyaa.husam@gu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	1/10/2025		**Version Number**	1	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Electronics fundamental	**Semester**	3
Co-requisites module	-	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	This course aims to: 1. Understand the basic principles of integrated circuits (ICs) and their applications. 2. Learn the processes involved in the fabrication of ICs. 3. Study the design and operation of both analog and digital integrated circuits. 4. Analyze and apply operational amplifiers (op- amps) in various circuits. 5. Design simple integrated circuits using CMOS and other technologies. 6. Explore real-world applications of ICs in electronics and communication systems. 7. Evaluate the performance of ICs in different applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	- Understand the fundamentals and applications of integrated circuits. - Explain IC fabrication processes. - Analyze analog and digital IC operation. - Apply op-amps in circuit design. - Design simple CMOS-based ICs. - Relate ICs to real-world electronic systems. - Evaluate IC performance in applications.
Indicative Contents المحتويات الإرشادية	- Explain amplification using operational amplifier integrated circuits. - Analyze and measure performance of op-amp based amplifier circuits. - Calculate key parameters of op-amp equivalent models. - Describe cascaded op-amp amplifier configurations. Determine performance parameters of cascaded op-amp circuits. -

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	• lectures. • Tutorials • Project-Based Learning • Assignments and Project • simulations and Software Tools.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	20% (30)	3,5,12	
	Assignments	2	10% (10)	2,12	
Summative	**Midterm Exam**	2 hr	20% (10)	10	

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Integrated circuits basics, Operational Amplifiers: Introduction to ideal and practical Op. amps, Characteristics, Modes of operation
Week 2	Applications of Op. amp: Adder, Subtractor, Integrator, Differentiator, Instrumentation amplifier
Week 3	Problem Solving: Problems based on applications of Op. amp.
Week 4	Active filters: Lowpass, Highpass, Bandpass and Band reject filters
Week 5	Sine wave Oscillators: RC phase shift, Wien bridge Oscillators
Week 6	Non-linear applications of Op. amp: Comparators, Zero crossing detectors and Schmitt trigger, waveform generator
Week 7	**exam**
Week 8	555 Timer: Operation, Mon stable and Stable modes
Week 9	IC 565 PLL: Operation and applications
Week 10	IC 78xx/79xx Voltage regulators: Features, three terminal voltage regulators
Week 11	CMOS inverter, CMOS combinational and sequential circuits
Week 12	Digital to Analog Converters: Weighted resistor DAC and R-2R ladder DAC
Week 13	Analog to Digital Converters: Flash type, counter type, successive approximation type and dual slope integrating type
Week 14	**Tutorial**
Week 15	**review**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Op-amp applications: Adder and subtractor using op-amp.
Week 2	Lab 2: Integrator and differentiator using op-amp.
Week 3	Lab 3: Active filters (LPF / HPF / BPF).
Week 4	Lab 4: RC phase shift or Wien bridge oscillator.
Week 5	Lab 5: Comparator and Schmitt trigger circuits.
Week 6	Lab 6: 555 timer in monostable mode
Week 7	Lab 6: 555 timer in astable mode

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Electronic Devices & Circuit Theory", By R. Boylestad, 11th ed. . D.Roy Choudhry, Shail Jain, -Linear Integrated Circuits, New Age International Pvt. Ltd., 2018, Fifth Edition.	yes
Recommended Texts	" Electronic Devices", By Floyd. 9th ed.	yes
Websites		

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

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

Sequential Logic Circuits

Module Information معلومات المادة الدراسية					
Module Title	Sequential Logic Circuits			**Module Delivery**	
Module Type	Core			☒ **Theory**	
Module Code	ECE304			☐ **Lecture**	
ECTS Credits	6			☒ **Lab**	
SWL (hr/sem)	150			☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Level	3		**Semester of Delivery**	1	
Administering Department	ECE		**College**	Type College Code	
Module Leader	**Wahhab Razzaq Mousa**		**e-mail**	wahhab.albazrqa@uokufa.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Muhiialdin Mohamad Alguraify		**e-mail**	muhiialdinm.alguraify@uokufa.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE206 Combinantional Logic Circuits	**Semester**	2
Co-requisites module	None	**Semester**	

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

Module Objectives أهداف المادة الدراسية	1. To provide students with a solid foundation in the fundamental concepts, methods, and principles for sequential logic circuits design. 2. To develop students' ability to analyze and design basic concept of synchronous and asynchronous sequential circuits electronic circuits problems. 3. To familiarize students with the properties and behavior of principle sequential logical components of electronic circuits, including but not limited to: Flip Flops, counters, registers, clock-dividers, memory and programmable logic. 4. To introduce students to state machine analysis for sequential circuits, theorems and their applications in circuit analysis. 5. To enhance students' critical thinking and problem-solving skills in the context of logic-design of sequential circuit analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Recognize logical construction of sequential circuits. 2. Utilize various analysis techniques to design sequential circuits. 3. Realize basic similarities and differences between combinational and sequential circuit. 4. Understand basics of flip flops. 5. Describe circuit state diagram, state table, and equations of a sequential circuit. 6. Identify basic elements of a sequential circuit. 7. Discuss operations and performance of various sequential circuits. 8. Understand various properties of flip-flops, counters, and registers. 9. Understand operations of principle components of sequential logic circuits, like: flip-flops, counters, registers, memory, and programmable logic circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Sequential Logic Circuit Theory</u> Sequential Logic Circuits – Definitions of essential elements: Flip Flops, SR-Latches, and D-Latches. [15 hrs] Registers: Definitions of registers, shift-registers. Digital Systems including, Binary, Octal, Decimal, and Hexadecimal systems. This also includes the basic arithmetic operations on these systems, such addition, subtraction, multiplication, and division. [15 hrs] Counters: Asynchronous and Synchronous Counters. This includes the design of principle components of a sequential logic circuit, such as D-Type Flip Flop, JK-Type Flip Flop, and T-Type Flip Flops. [10 hrs] Advanced design techniques by utilizing principle components to design more complex sequential logic circuit. [15 hrs] Revision problem classes [6 hrs] <u>Part B – Sequential Circuits</u> Fundamentals Principle components of a sequential circuit, which includes: D-type flip flop, JK-Type flip flop, and T-type flip flop. [15 hrs]

	State machine analysis of sequential circuits, which includes state diagram, state table, reduction of state table, and construction of sequential circuit based on state table. [7 hrs] Revision problem classes. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. **Lectures**: Conduct interactive lectures to introduce and explain the key concepts, theories, and principles related to each topic. Use visual aids, examples, and real-world applications to enhance student understanding. 2. **Problem-solving Sessions**: Dedicate regular sessions to solving problems and exercises related to each topic. Encourage students to actively participate in problem-solving discussions and provide guidance and feedback during these sessions. 3. **Laboratory Sessions**: Conduct laboratory sessions where students can apply the learned theories and techniques to real-world circuit analysis. Provide hands-on experiments and projects to reinforce their understanding and enhance their practical skills. 4. **Group Discussions**: Assign group activities or case studies that require students to work collaboratively on analyzing and solving circuit problems. This fosters teamwork, critical thinking, and communication skills. 5. **Assessments**: Implement regular formative assessments, such as quizzes, assignments, and in-class exercises, to evaluate students' understanding and progress. Provide constructive feedback to guide their learning and address any misconceptions. 6. **Mid-term Exam**: Administer a mid-term exam to assess students' comprehension of the topics covered in the first half of the module. This exam can help identify areas that require further clarification or reinforcement. 7. **Final Exam**: Conduct a comprehensive final exam to assess students' overall understanding of the module's content. Design the exam to incorporate a variety of question formats, including theoretical concepts, problem-solving, and circuit analysis. 8. **Office Hours**: Offer dedicated office hours or consultations to provide individualized support and address students' questions or concerns. This facilitates personalized guidance and ensures students receive assistance when needed. 9. **Review Sessions**: Before exams or major assessments, conduct review sessions to summarize key concepts, address common challenges, and provide additional practice problems. This helps consolidate knowledge and reinforces understanding. 10. **Technology Integration**: Utilize appropriate software tools, simulation software, and circuit analysis software to reinforce theoretical concepts and enable students to analyze complex circuits efficiently. 11. **Continuous Feedback**: Provide ongoing feedback to students on their progress, performance, and problem-solving skills. Encourage self-reflection and self-assessment to foster a growth mindset and promote continuous improvement.

12. **Encourage Active Learning**: Incorporate active learning strategies such as think-pair-share, concept mapping, and problem-based learning. Engage students in discussions, encourage questions, and promote independent thinking to deepen their understanding.

By employing these varied learning and teaching strategies, you can create an engaging and supportive environment that promotes active learning, critical thinking, and mastery of the combinational logic circuits analysis concepts and techniques.

Rubric

The following is the rubric assessment in the combinational logic circuits that provides a clear breakdown of the assessment criteria and weightings for each type.

Criteria	Excellent (A)	V. Good (B)	Good (C)	Satisfactory (D)	Fail (
Final Exam Content Mastery	Demonstrates comprehensive understanding and mastery of all module concepts and principles, applying them accurately and effectively to solve complex problems.	Demonstrates strong understanding and mastery of most module concepts and principles, applying them appropriately to solve a variety of problems.	Demonstrates satisfactory understanding and mastery of many module concepts and principles, applying them adequately to solve standard problems.	Demonstrates limited understanding and mastery of some module concepts and principles, with inconsistent or inaccurate application in problem-solving.	Demonstrat little to no understandi mastery of module con and principl with signific errors in pr solving atte
Mid-term Exam Conceptual Understanding	Demonstrates a thorough grasp of key concepts and theories covered in the first half of the module, providing clear explanations and accurate application in problem-solving	Demonstrates a solid grasp of most key concepts and theories covered in the first half of the module, providing coherent explanations and generally accurate application in problem-solving.	Demonstrates a satisfactory grasp of many key concepts and theories covered in the first half of the module, providing adequate explanations and generally correct application in problem-solving.	Demonstrates a limited grasp of some key concepts and theories covered in the first half of the module, with occasional inconsistencies or errors in explanations and problem-solving.	Demonstrat little to no g of key conce and theorie covered in t first half of t module, wit significant inaccuracies misunderst s in explana and problen solving atte
Lab Exam Practical Understanding	Successfully applies theoretical knowledge to practical experiments and projects in laboratory sessions, demonstrating proficiency in practical skills and accurate data analysis.	Applies theoretical knowledge to most practical experiments and projects in laboratory sessions, demonstrating solid proficiency in practical skills and generally accurate data analysis.	Applies theoretical knowledge to some practical experiments and projects in laboratory sessions, demonstrating adequate proficiency in practical skills and generally correct data analysis.	Applies theoretical knowledge to few practical experiments and projects in laboratory sessions, with limited proficiency in practical skills and occasional errors in data analysis.	Fails to appl theoretical knowledge effectively t practical experiment projects in laboratory sessions, demonstrat little to no proficiency practical ski significant e in data anal
Assignments Quality and Genuine Content	Consistently submits assignments of exceptional quality, demonstrating	Typically submits assignments of good quality, demonstrating solid	Occasionally submits assignments of satisfactory quality, demonstrating	Often submits assignments of poor quality, indicating limited understanding, superficial analysis,	Consistently submits assignment very poor q reflecting lit no understa

		thorough understanding, critical analysis, and creative problem-solving.	understanding, clear analysis, and effective problem-solving.	adequate understanding, coherent analysis, and acceptable problem-solving.	and ineffective problem-solving	unclear analysis, and ineffective problem-solving.
	In-class Participation Actively Attending and Engaging	Actively participates in in-class exercises, contributing valuable insights, collaborating effectively with peers, and demonstrating a strong grasp of the material.	Generally participates in in-class exercises, offering relevant contributions, engaging with peers, and demonstrating a satisfactory grasp of the material.	Occasionally participates in in-class exercises, providing limited contributions, interacting with peers, and demonstrating a basic grasp of the material.	Rarely participates in in-class exercises, offering minimal contributions, lacking interaction with peers, and demonstrating a weak grasp of the material.	Consistently fails to participate in in-class exercises, providing no contributions, avoiding interaction with peers, and demonstrating no grasp of the material.
	Quizzes Progress Feedback	Consistently achieves high scores on quizzes, demonstrating deep understanding and significant progress in mastering module concepts and techniques.	Typically achieves satisfactory scores on quizzes, demonstrating solid understanding and steady progress in mastering module concepts and techniques.	Occasionally achieves satisfactory scores on quizzes, demonstrating adequate understanding and progress in mastering module concepts and techniques.	Often achieves low scores on quizzes, indicating limited understanding and inconsistent progress in mastering module concepts and techniques.	Consistently achieves low scores on quizzes, reflecting little to no understanding and minimal progress in mastering module concepts and techniques.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	98	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10% (10)	2,6,10,14	LO #2, #4, #5, #8, #11 and #12
	Assignments	4	5% (10)	2 and 12	LO #3 to #12
	Attendance	1	5% (10)	13	LO #1 to #10
	Lab/reports	5	10% (10)	3,6,9,12,15	LO #1,#2, #7, #10, #13, #14 and #15
Summative assessment	Midterm Exam	2hr	20% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Combinational Circuits vs. Sequential Circuits
Week 2	Introduction to Sequential Logic Circuits
Week 3	Elements of a Sequential Logic Circuits: Latches and Flip Flops
Week 4	Introduction Registers and Counters
Week 5	Synchronous and Asynchronous Counters
Week 6	Shift Registers
Week 7	Sequential Circuit Design Procedure
Week 8	Sequential Circuit Design Procedure: State Diagram, State Table
Week 9	Midterm Exam
Week 10	Memory and Programmable Logic
Week 11	Random Access Memory
Week 12	Read Only Memory
Week 13	Programmable Logic Array
Week 14	Programmable Array Logic
Week 15	Error Detection and Correction
Week 16	A preparatory week before the Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: SR Latch and D Latch
Week 2	Lab 2: JK Flip Flop
Week 3	Lab 3: System Design Using Sequential Logic Gates
Week 4	Lab 4: Shift Registers
Week 5	Lab 5: Application of Shift Registers
Week 6	Lab 6: Asynchronous Counters
Week 7	Lab 7: Synchronous Counters
Week 8	Lab 8: Traffic Light Controller System

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Digital Design with an Introduction to the Verilog HDL, 5th Ed. M. Morris Mano, Michael D. Ciletti, Pearson Education	Yes
Recommended Texts		
Websites		

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

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

Electromagnetic Fields-I
المجالات الكهرومغناطيسية-1

Module Information معلومات المادة الدراسية					
Module Title	**Electromagnetic Fields-I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	ECE210a				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		UGx11 2	**Semester of Delivery**		3
Administering Department		ECE	**College**	Engineering	
Module Leader	Haneen Jumhoor sabbar		**e-mail**	haneen.g.sabbar@gu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Saif Hasan Abdulnabi		**e-mail**	haneen.g.sabbar@gu.edu.iq	
Peer Reviewer Name		Name	**e-mail**	haneen.g.sabbar@gu.edu.iq	
Scientific Committee Approval Date		12/06/2023	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The objectives of this module are to tease out the laws of electromagnetism from our everyday experience by specific examples of how electromagnetic phenomena manifest themselves. We want to be able to: • Describe, in words, the ways in which various concepts in electromagnetism come into play in particular situations. • Represent these electromagnetic phenomena and fields mathematically in those situations. The overall goal is to use the scientific method to come to understand the enormous variety of electromagnetic phenomena in terms of a few relatively simple laws and Maxwell's equations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To have detailed knowledge of the physical background and terminology of the electromagnetic field theory for electronic and communications engineering problems 2. To understand the electromagnetic field behavior 3. To select and use appropriate theoretical models for analysis, problem

	solving and finding solutions related to the electrostatic and electromagnetic fields 4. To understand how laws of electromagnetism can be applied to problems arising in engineering.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Vector Analysis This unit covers the basic framework of vector analysis. This unit includes: Rectangular Coordinate Systems (RCS), Cylindrical Coordinate Systems (CCS), and Spherical Coordinate Systems (SCS). Part B – Vector Representation This unit covers the representation of vectors. This unit includes: Vector Components and Unit Vectors, and Vector Algebra. Part C – Operations on Vector This unit covers operations on vector. This unit includes: Del Operator and Divergence. Part D – Multiple Integration This unit covers single and multiple integration. This unit includes: Line Integral, Surface Integral, and Volume Integral. Part E - Electrostatics This unit covers the Electrostatics (The First Maxwell's Equation). This unit includes: Coulomb's Law, Electric Fields and Electric Flux Density, Gauss's Law and its Applications, and First Maxwell's Equation and its Applications.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module will be delivered through lectures and enhanced with tutorials where students will be divided into small groups. Active learning will be implemented via collaborative groups.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	83	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation
تقييم المادة الدراسية

As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	6 and 10	LO #1, #2
	H. W.	1	10% (10)	4 and 8	LO #1, #2, #3
	Report	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	LO #3, #4
Summative assessment	**Midterm Exam**	2hr	10% (10)	12	LO #1, #2, #3
	Final Exam	3hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	**Introduction to Electromagnetic Fields and their applications and Significance**
Week 2	**Vector Analysis: Part I:** - Rectangular Coordinate Systems (RCS)
Week 3	**Vector Analysis: Part I:** - Cylindrical Coordinate Systems (CCS)
Week 4	**Vector Analysis: Part I:** - Spherical Coordinate Systems (SCS)
Week 5	**Vector Analysis: Part II:** - Vector Components and Unit Vectors - Vector Algebra - Vector Operations
Week 6	**Quiz 1** **Vector Analysis: Part III:** - Differential Calculus - "Ordinary" Derivatives
Week 7	**Vector Analysis: Part III:** - The Del Operator - The Divergence
Week 8	**Vector Analysis: Part V:** - Line Integrations - Surface Integrations
Week 9	**Vector Analysis: Part V:** - Volume Integration
Week 10	**Quiz 2** **Electrostatics: Part I:** - Coulomb's Law and Field Intensity
Week 11	**Electrostatics: Part II:** - Electric Fields Due to Continuous Charge Distributions. - Electric Flux Density
Week 12	**Midterm Exam**
Week 13	**Electrostatics: Part III:** - Gauss's Law - Applications of Gauss' Law
Week 14	**Electrostatics: Part V:** - First Maxwell's Equation - Applications of First Maxwell's Equation
Week 15	**Seminars**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Matthew N. O. Sadiku. *Elements of Electromagnetics.* 7th ed., Oxford university press, 2018.	No
Recommended Texts	William H. Hayt, Jr. and John A. Buck. *Engineering Electromagnetics*. 9th ed., Mc-Graw Hill Education, 2018	Yes
Websites	https://web.mit.edu/8.02t/www/802TEAL3D/visualizations/coursenotes/index.htm	

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

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

Module Information
معلومات المادة الدراسية

Module Title	**Electromagnetic Wave Propagation**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE313				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		2	**Semester of Delivery**		3
Administering Department		ECE	**College**	Engineering	
Module Leader	Haneen Jumhoor sabbar		**e-mail**	haneen.g.sabbar@gu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**	haneen.g.sabbar@gu.edu.iq	
Peer Reviewer Name		Name	**e-mail**	haneen.g.sabbar@gu.edu.iq	
Scientific Committee Approval Date		12/06/2023	**Version Number**		1.0

Relation with other Modules
العلاقة مع المواد الدراسية الأخرى

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

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

Module Objectives أهداف المادة الدراسية	This course aims to provide students with a solid theoretical and practical understanding of electromagnetic wave behavior in different propagation environments. It focuses on fundamental electromagnetic theory, propagation

	mechanisms, and engineering applications in wireless communication systems, radar, satellite communication, and optical systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this course, students will be able to: 1. Explain Maxwell's equations and their role in the generation and propagation of electromagnetic waves. 2. Analyze wave propagation in free space, dielectric, and conducting media. 3. Understand reflection, refraction, diffraction, absorption, and attenuation mechanisms. 4. Analyze propagation through transmission lines and waveguides. 5. Describe radiation and propagation mechanisms related to antennas. 6. Apply propagation principles to wireless communication, radar, satellite, and optical fiber systems. 7. Solve theoretical and practical problems using analytical and simulation-based approaches.
Indicative Contents المحتويات الإرشادية	• Introduction to electromagnetic waves • Maxwell's equations and wave equation formulation • Plane waves and polarization • Wave propagation in free space • Propagation in dielectric and conducting media • Reflection and refraction (Snell's Law) • Attenuation, power loss, multipath propagation • Transmission Lines fundamentals • Waveguides and field distribution • Antenna radiation and free-space propagation • Introduction to wave propagation in optical fibers • Engineering applications and case studies

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This course adopts a **student-centered learning approach** in accordance with the Bologna Process, combining theoretical understanding with practical application to ensure the achievement of learning outcomes

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	83	**Structured SWL (h/w)**	5

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	6 and 10	LO #1, #2
	H. W.	1	10% (10)	4 and 8	LO #1, #2, #3
	Report	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	LO #3, #4
Summative assessment	**Midterm Exam**	2hr	10% (10)	12	LO #1, #2, #3
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Electromagnetic Waves – Basic Concepts, Wave Nature of EM Fields
Week 2	Review of Maxwell's Equations and Physical Meaning
Week 3	Derivation of Electromagnetic Wave Equation – General Wave Solutions
Week 4	Plane Waves in Free Space – Wave Parameters, Wavelength, Phase Velocity
Week 5	Wave Propagation in Perfect Dielectrics
Week 6	Wave Propagation in Conducting Media – Skin Depth, Attenuation
Week 7	Reflection and Refraction at Media Boundaries – Snell's Law
Week 8	Normal and Oblique Incidence – Parallel and Perpendicular Polarization Cases

Week 9	Power Transmission and Absorption – Poynting Vector
Week 10	Introduction to Transmission Lines and Basic Propagation Concepts
Week 11	Wave Propagation in Waveguides – Modes and Cut-off Frequency
Week 12	**Midterm Exam**
Week 13	Free-Space Propagation and Antenna Link Concepts
Week 14	Introduction to EM Propagation in Optical Fibers / Selected Applications
Week 15	**Seminars**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Laboratory Introduction – Safety, software overview (CST)
Week 2	Vector Fields and Basic EM Quantities – Practical exercises
Week 3	Plane Wave Propagation in Free Space – Simulation and parameter study
Week 4	Polarization Experiments – Linear and Circular Polarization (simulation/demonstration)
Week 5	Wave Propagation in Dielectric and Conducting Media – Attenuation, Skin Depth, and Velocity Changes
Week 6	Reflection and Refraction at Media Boundaries – Normal and Oblique Incidence Simulations
Week 7	Transmission Lines and Waveguides – Mode shapes, VSWR, and Impedance Simulations

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

Required Texts	Ulaby & Ravaioli – *Fundamentals of Applied Electromagnetics*, 7th Edition, Pearson, 2015	No
Recommended Texts	D.K. Cheng – *Field and Wave Electromagnetics*, 2nd Edition, Addison-Wesley, 1989	Yes
Websites	**MIT OpenSemesterWare (OCW)**	

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Digital Signal processing**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	COE32203				
ECTS Credits	**2**				
SWL (hr/sem)	**100**				
Module Level		UGIII	**Semester of Delivery**		6
Administering Department		Computer engineering	**College**	College of engineering	
Module Leader	**Aaid Mohammed Ameer**		**e-mail**	aaid.m.ameer@gu.edu.iq	
Module Leader's Acad. Title		**Assist.Lect**	**Module Leader's Qualification**		**M.CS**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/02/2026	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The objective of this course is to develop an understanding of the basic ideas of the Digital Signal encountered in engineering. Focus will be on the methods for characterizing and analyzing Discrete-time signals and systems. Students will learn some transform techniques (Fourier transform, z-transform) that are useful for the understanding of Digital communication systems, Feedback control systems, Satellite and mobile communications, and Digital image processing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of the course, student will be able to: 7. Understand the fundamentals of signal sampling. 8. Express the concepts of Discrete signals and systems and their different types which can be used in a wide variety of disciplines in engineering. 9. Identify and report system properties such as causality, stability, linearity, and time invariance etc. 10. Apply the convolution sum formulas to determine the output of discrete time systems. 11. Understand and resolve the Discrete time signals in frequency domain using Fourier series and Fourier transforms, and Fast Fourier Transform. 12. Understand the concept of z-transform and its and develop the ability to analyze the system in z- domain. 13. Understand the concept of digital filter design and develop the ability to design filters using different methods.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Sampling of continuous-time signals. • Basic signals of Discrete time. • Discrete time Signals and Their Classification - Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals. • Operations on Discrete time Signals • Properties of Discrete time systems. • Discrete time System Impulse response Evaluation. • Signal convolution methods (Graphical method, Table method, mathematical method). • Representation of Discrete Fourier transform and its properties. • Discrete Fourier series (DFS) • Fast Fourier Transform (FFT) • Introduction to Z-transform and its properties. • Digital FIR Filter Analysis and design • Digital IIR Filter Analysis and design - Butterworth Analog Filters • Digital IIR Filter Analysis and design - Cheby-Chev Analog Filters

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple reports involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Fundamental Concepts of Discrete Signals and Systems - Introduction
Week 2	Sampling of continuous-time signals: the sampling theorem, Aliasing, Nyquist rate.
Week 3	Discrete time signal types and operations on Discrete time signals.
Week 4	Discrete time system types and properties.
Week 5	Discrete time System Impulse response Evaluation
Week 6	Discrete time System convolution (Graphical method, Table method, mathematical method)
Week 7	**Mid-term Exam**
Week 8	Introduction to Discrete Fourier transform and its properties
Week 9	Discrete Fourier series (DFS)
Week 10	Fast Fourier Transform (FFT)
Week 11	Introduction to Z-transform and its properties.
Week 12	Digital FIR Filter Analysis
Week 13	Digital FIR Filter design
Week 14	Digital IIR Filter Analysis
Week 15	Digital IIR Filter design
Week 16	**Preparatory week before the final Exam**

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall John G. Proakis, Dimitris K Manolakis., 1992.	Yes
Recommended Texts	Discrete-Time Signal Processing by A. V. Oppenheim and R. W. Schafer, 1999.	yes
Websites	https://www.coursera.org/learn/ Digital signal processing	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Computer Aided Communication Systems Design Lab

Module Information معلومات المادة الدراسية					
Module Title	**Computer Aided Communication Systems Design Lab**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐ **Lecture** ☒**Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE32303**				
ECTS Credits	4				
SWL (hr/sem)	**150**				
Module Level		UGI	**Semester of Delivery**		1
Administering Department		Electronic and Communication Engineering	**College**	College of Engineering	
Module Leader	Hikmat maad		**e-mail**	hikmat.maad@gu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.

Module Tutor	N/A	**e-mail**	N/A
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	16/02/2026	**Version Number**	1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Learn to use software for designing communication systems. 2. Develop and design communication systems using CAD. 3. Predict system performance through simulations. 4. Improve system efficiency and performance. 5. Analyze design trade-offs and decisions. 6. Apply design concepts practically. 7. Use CAD tools for real-world projects. 8. Follow current trends in CAD for communication system

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the fundamental concepts of digital communication systems, including signal representation, bandwidth, and noise effects. 2. Use MATLAB to generate, visualize, and analyze digital signals in both time and frequency domains. 3. Apply digital line coding techniques such as NRZ, RZ, Manchester, and AMI for data transmission and evaluate their performance. 4. Analyze digital modulation schemes including ASK, FSK, and PSK using mathematical models and MATLAB simulations. 5. Design and evaluate advanced modulation techniques such as QAM using constellation diagrams and symbol mapping. 6. Implement coherent and non-coherent demodulation techniques and assess signal recovery performance. 7. Evaluate the impact of noise and channel impairments, including AWGN, on communication system performance using SNR and BER analysis. 8. Simulate complete digital communication systems in MATLAB, including transmitter, channel, and receiver components. 9. Demonstrate the ability to analyze, design, and present a complete digital communication system using MATLAB-based simulations.
Indicative Contents المحتويات الإرشادية	1. Introduction to Digital Communication and MATLAB: [15 Hours] • Overview of digital communication systems and applications • Introduction to MATLAB environment and basic operations • Representation of signals in time and frequency domains • Basic MATLAB commands for signal generation and visualization 2. Digital Signal Representation and Line Coding: [15 Hours] • Digital data representation and binary signaling • Line coding techniques: NRZ, RZ, Manchester, Differential Manchester, AMI • Bandwidth and synchronization considerations • MATLAB implementation of line coding schemes 3. Digital Modulation Techniques I (ASK, FSK, PSK): [15 Hours] • Principles of amplitude, frequency, and phase shift keying • Mathematical representation of ASK, FSK, and PSK • Signal generation and waveform analysis using MATLAB • Basic transmitter and receiver models 4. Digital Modulation Techniques II (QAM and Advanced Schemes): [15 Hours] • Quadrature Amplitude Modulation (QAM) concepts • Constellation diagrams and symbol mapping • Higher-order modulation schemes and spectral efficiency • MATLAB simulation of QAM systems 5. Demodulation and Receiver Design: [15 Hours] • Coherent and non-coherent detection techniques

	• Signal recovery and filtering • Noise effects and bit error rate (BER) analysis • MATLAB-based demodulation and performance evaluation 6. Channel Effects and Signal Analysis: [15 Hours] • Introduction to noise and channel impairments • Additive White Gaussian Noise (AWGN) • Signal-to-noise ratio (SNR) and system performance • MATLAB simulation of communication channels 7. Review and Assessment: [6 Hours] • Review of key concepts and MATLAB implementations • Practice problems and simulation exercises • Summative assessments (quizzes, assignments, or exams)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module focuses on developing practical digital communication skills through active student engagement in simulation-based labs and guided exercises. Teaching is delivered through lectures, interactive demonstrations using MATLAB, and problem-based learning. Emphasis is placed on line coding, digital modulation techniques (ASK, FSK, PSK, QAM), signal analysis, and system simulation, enabling students to apply theoretical concepts to real-world communication system scenarios.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصول	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير االمنتظم للطالب خلال الفصول	96	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصول	**175**		

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1-2	Introduction to Communication System Design & CAD Tools (e.g., MATLAB, Simulink)
Week 3-4	System Design Flow: Modeling, Simulation, and Verification
Week 5-6	Modulation and Demodulation Simulation (ASK, PSK, QAM)
Week 7-8	BER Performance Analysis and SNR Estimation
Week 9-10	Channel Modeling and Noise Simulation
Week 11-12	Team Design Project: Specification, System Implementation
Week 13-14	Testing, Debugging, and Optimization
Week 15	Final Project Demonstration and Review

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Digital Communication and Signal Generation using MATLAB
Week 2	Lab 2: Implementation and Analysis of Line Coding Techniques (NRZ, RZ, Manchester, AMI)
Week 3	Lab 3: Design and Simulation of Amplitude Shift Keying (ASK) System
Week 4	Lab 4: Design and Simulation of Frequency Shift Keying (FSK) System
Week 5	Lab 5: Design and Simulation of Phase Shift Keying (PSK) System
Week 6	Lab 6: Design and Analysis of Quadrature Amplitude Modulation (QAM) System
Week 7	Lab 7: Simulation of Channel Effects (AWGN) and Bit Error Rate (BER) Analysis
Week 8	Lab 8: Complete Digital Communication System Simulation (Transmitter–Channel–Receiver) using MATLAB

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Modern Digital and Analog Communication Systems by B.P. Lathi.	Yes
Websites	MATLAB, Simulink, or similar tools for simulating communication systems. Access to books, e-books, and reference materials on communication systems and signal processing	

Grading Scheme

مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Computer Aided Electronic Circuit Design Lab

Module Information معلومات المادة الدراسية					
Module Title	**Computer Aided Electronic Circuit Design Lab**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐ **Lecture** ☒**Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE32304**				
ECTS Credits	4				
SWL (hr/sem)	**150**				
Module Level	UGI		**Semester of Delivery**	1	
Administering Department	Electronic and Communication Engineering		**College**	College of Engineering	
Module Leader	Hikmat maad		**e-mail**	hikmat.maad@gu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	

Module Tutor	N/A	**e-mail**	N/A
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	16/02/2026	**Version Number**	1.0

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

Co-requisites module	None	**Semester**	None

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Learn to use software for designing communication systems. 2. Develop and design communication systems using 3. CAD. 4. Predict system performance through simulations. 5. Improve system efficiency and performance. 6. Analyze design trade-offs and decisions. 7. Apply design concepts practically. 8. Use CAD tools for real-world projects. 9. Follow current trends in CAD for communication system

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the fundamental concepts of electronic circuit design and the complete PCB development workflow from schematic to fabrication. 2. Use PCB design tools such as Autodesk EAGLE or KiCad to create accurate circuit schematics and manage component libraries. 3. Apply electrical rule checks (ERC) and design rule checks (DRC) to identify and correct errors in schematic and PCB designs. 4. Design PCB layouts by implementing appropriate component placement, routing techniques, vias, and ground planes. 5. Develop multi-layer PCB designs and generate manufacturing outputs such as Gerber files, drill files, and bill of materials (BOM). 6. Analyze circuit performance using basic simulation tools and evaluate signal integrity issues in electronic designs. 7. Evaluate PCB designs for manufacturability by verifying footprints, datasheets, and production constraints. 8. Test and troubleshoot electronic circuits using measurement tools and systematic debugging techniques. 9. Demonstrate the ability to complete a full PCB design project from concept to final implementation and presentation.
Indicative Contents المحتويات الإرشادية	Introduction to PCB Design Tools and Schematic Capture: [15 Hours] Overview of electronic circuit design process (schematic to PCB to fabrication) Introduction to Autodesk EAGLE / KiCad interface Creating projects, schematic entry, and component placement Wiring, labeling, and schematic design rules 2. Component Libraries, and Electrical Rule Check: [15 Hours] Understanding and managing component libraries Netlist generation and connectivity verification Electrical Rule Check (ERC) and error detection Common schematic design issues and corrections 3. PCB Layout Design Techniques: [15 Hours] Converting schematic to PCB layout Component placement strategies Routing techniques (manual and auto-routing) Use of vias and ground planes Design Rule Check (DRC) and layout validation 4. Multi-layer PCB Design and Manufacturing Outputs: [15 Hours] Introduction to multi-layer PCB structures Layer stack-up and signal routing considerations Power and ground plane design Gerber file generation and verification 5. Circuit Simulation and Signal Integrity: [15 Hours] Basics of circuit simulation tools

	Signal integrity concepts (noise, crosstalk, interference) Design validation using simulation Interpretation of simulation results 6. PCB Design for Manufacturing and Testing: [15 Hours] Design for manufacturing (DFM) principles Footprint accuracy and datasheet verification Bill of Materials (BOM) preparation PCB testing, debugging, and fault analysis 7. Review and Assessment: [6 Hours] Review of key concepts and full design workflow Practical exercises and case studies Summative assessments (quizzes, assignments, or project evaluation)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module focuses on developing practical PCB design skills through active student engagement in hands-on labs and guided exercises. Teaching is delivered through lectures, interactive tool demonstrations using Autodesk EAGLE / KiCad, and project-based learning. Emphasis is placed on schematic design, PCB layout, simulation, and design validation, enabling students to apply concepts to real-world circuit design problems.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصول	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير االمنتظم للطالب خلال الفصول	96	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصول	**175**		

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1-2	Introduction to PCB Design Tools (Eagle/KiCad), Schematic Capture
Week 3-4	Component Libraries, Netlists, and Electrical Rule Checks
Week 5-6	PCB Layout: Routing, Vias, Ground Planes, DRC
Week 7-8	Multi-layer PCB Design, Gerber File Generation
Week 9-10	Circuit Simulation & Signal Integrity
Week 11-12	PCB Design for Manufacturing: Footprint Accuracy, BOM, Drill Files
Week 13-14	Testing and Debugging Realistic Circuits (Measurement + QA)
Week 15	Final Review and Project Demonstration

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to PCB Design Tools and Schematic Capture using Autodesk EAGLE / KiCad
Week 2	Lab 2: Design and Simulation of BJT Current Mirror Circuit
Week 3	Lab 3: Design of Linear Voltage Regulator Circuit (Zener/IC Based)
Week 4	Lab 4: Design and Analysis of Voltage Level Shifter Circuit
Week 5	Lab 5: PCB Layout Design Including Routing, Vias, and Ground Planes
Week 6	Lab 6: Design of Multi-stage BJT Amplifier Circuit
Week 7	Lab 7: Design and Simulation of 555 Timer Astable Oscillator Circuit
Week 8	Lab 8: Complete PCB System Design, Testing, and Debugging Project

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Computer-aided Electronic Design: Using Eagle by Practical PCB Design with Eagle	Yes
Websites	Eagle Software: Primary tool for schematic capture, PCB layout, and design.	

Grading Scheme

مخطط الدرجات

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

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

نموذج وصف المقرر لمادة هندسة الهوائيات

المستوى الثالث (الفصل الثاني)

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Antenna Engineering**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE32301				
ECTS Credits	**6**				
SWL (hr/sem)	**90 hours/semester**				
Module Level		Third Stage	**Semester of Delivery**		2nd Semester
Administering Department		Electronics and Communications Engineering	**College**	College of engineering	
Module Leader	Ahmed Emad Saleem		**e-mail**	**ahmed.e.saleem@gu.edu.iq**	
Module Leader's Acad. Title		Assist Lecturer	**Module Leader's Qualification**		M.Sc
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		1/3/2026	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Electromagnetic Wave Propagation (ECE31301)	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Understand the basic principles of antenna theory and radiation mechanisms. • Design and analyze various types of antennas. • Study key antenna parameters like gain, directivity, and impedance. • Learn about antenna polarization and its effects. • Measure and evaluate antenna performance. • Use computational tools for antenna design and simulation. • Understand antennas' role in wireless communication systems. • Explore advanced topics such as smart antennas and MIMO systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	GO1: Comprehend antenna fundamentals, parameters, and radiation mechanisms. GO2: Analyze and evaluate different antenna types (Wire, Arrays, Aperture, Microstrip). GO5: Understand and apply regulatory standards and global impacts. GO6: Utilize software simulation tools and practical labs for design and measurement.
Indicative Contents المحتويات الإرشادية	**Part A. Introduction to Antenna Fundamentals and Parameters (12 hr)** **Part B. Radiation Mechanism, Radiation Patterns, Gain, and Efficiency (12 hr)** **Part C. Wire Antennas: Dipoles, Monopoles, Loop Antennas (12 hr)** **Part D. Antenna Arrays: Principles, Array Factor, Beam Steering (12 hr)** **Part E. Aperture and Horn Antennas, Reflectors (12 hr)** **Part F. Microstrip (Patch) Antennas: Design and Feed Techniques (12 hr)** **Part G. Antenna Measurements and Regulatory Standards (12 hr)** **Part H. Final Design Project Review and Professional Aspects (6 hr)**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lectures and Interactive Discussions • Laboratory Experiments • Problem-Solving Sessions • Design Projects and Group Projects • Tutorials and Recitations • Use of Simulation Software (MATLAB/CST)

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	4,10	GO1, GO2
	Assignments	2	5% (5)	5,11	GO1, GO2
	Projects / Lab.	1	15% (15)	15	GO1, GO2, GO5, GO6
	Report	1	10% (10)	14	GO5, GO6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	GO1, GO2, GO6
	Final Exam	3 hr	50% (50)	16	GO1, GO2, GO5, GO6
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Antenna Fundamentals and Parameters
Week 2	Introduction to Antenna Fundamentals and Parameters
Week 3	Radiation Mechanism, Radiation Patterns, Gain, and Efficiency
Week 4	Radiation Mechanism, Radiation Patterns, Gain, and Efficiency
Week 5	Wire Antennas: Dipoles, Monopoles, Loop Antennas
Week 6	Wire Antennas: Dipoles, Monopoles, Loop Antennas
Week 7	Antenna Arrays: Principles, Array Factor, Beam Steering
Week 8	Antenna Arrays: Principles, Array Factor, Beam Steering
Week 9	Aperture and Horn Antennas, Reflectors
Week 10	Aperture and Horn Antennas, Reflectors

Week 11	Microstrip (Patch) Antennas: Design and Feed Techniques
Week 12	Microstrip (Patch) Antennas: Design and Feed Techniques
Week 13	Antenna Measurements and Regulatory Standards
Week 14	Antenna Measurements and Regulatory Standards

Week 15	Final Design Project Review, Professional & Ethical Aspects

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to Antenna Simulation Software (e.g., MATLAB/CST)
Week 2	Basic Antenna Parameters Simulation
Week 3	Radiation Pattern Measurement Lab
Week 4	Antenna Gain and Efficiency Calculation Lab
Week 5	Design and Simulation of Dipole Antennas
Week 6	Design and Simulation of Loop Antennas
Week 7	Antenna Array Design and Beam Steering
Week 8	Mid-Term Lab Evaluation & Reports Review
Week 9	Aperture Antennas Simulation (Horn Antenna)
Week 10	Reflector Antennas Lab
Week 11	Microstrip Patch Antenna Design Lab
Week 12	Advanced Feed Techniques for Patch Antennas

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Antenna Theory: Analysis and Design by Constantine A. Balanis.	NO
Recommended Texts	Antennas and Wave Propagation by John D. Kraus.	NO
Websites	• Online platforms (e.g., Moodle, Blackboard) for administering quizzes, exams, and providing instant feedback. • MATLAB, Simulink, or similar tools for simulating communication systems. • Access to journals like IEEE Transactions on Antennas and Propagation. • ducational videos, online tutorials, and webinars on antenna design and testing.	

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

نموذج وصف المقرر لمادة مختبر التصميم النظم الرقمية

المستوى الثالث (الفصل الثاني)

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Digital Systems Design Lab**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE32305				
ECTS Credits	4				
SWL (hr/sem)	**60/4**				
Module Level	Third-stage		**Semester of Delivery**	2nd Semester	
Administering Department	Department of Electronic and Communications Engineering		**College**	College of Engineering	
Module Leader	Ahmed Emad Saleem		**e-mail**	ahmed.e.saleem@gu.edu.iq	
Module Leader's Acad. Title	Assist. Lec.		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	1/3/2026		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Introduce the concepts of Digital System Design (DSD). 2. Familiarize students with Programmable Logic Devices (PLDs) such as PROM, PLA, PAL, CPLD, and FPGA. 3. Teach the fundamentals of Very High Speed Integrated Circuit Hardware Description Language (VHDL). 4. Train students to model digital systems at various abstraction levels (from gate level to algorithmic level). 5. Provide hands-on experience in simulating and implementing combinational and sequential logic circuits using VHDL.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. **GO1**: Understand the architecture and differences between various PLDs (PLA, PAL, FPGA, etc.). 2. **GO2**: Write basic to advanced VHDL codes including libraries, entities, and architectures. 3. **GO3**: Implement Boolean functions and logic gates using Programmable Logic Arrays (PLA). 4. **GO4**: Design, simulate, and verify Moore and Mealy sequential state machines using VHDL. 5. **GO5**: Gain practical skills in testing and debugging digital circuits through simulation tools.

Indicative Contents المحتويات الإرشادية	**Part A.** Introduction to DSD and Programmable Logic Devices (PLDs) (6 hr) **Part B.** Implementation of Logic Functions using PLA and PAL (6 hr) **Part C.** VHDL Basics: Structure, Entity, and Architecture (6 hr) **Part D.** VHDL Modeling Styles and Combinational Logic Design (8 hr) **Part E.** Sequential Logic Design and State Machines (Moore & Mealy) in VHDL (8 hr) **Part F.** Simulation, Testing, and Advanced VHDL Design Projects (11 hr)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Hands-on Laboratory Experiments and Practical Work. • Use of Simulation Software for VHDL coding and circuit testing. • Interactive Laboratory Discussions. • Problem-Solving and Implementation Sessions. • Mini-Projects for designing functional digital subsystems.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	25	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	35	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**60**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	Week 5, 10	GO1, GO2
	Assignments	2	5% (5)	Weekly	GO2, GO3, GO4
	Projects / Lab.	1	15% (15)	Week 14	GO4, GO5
	Report	Weekly	10% (10)	Week 8	GO1, GO2, GO3
Summative assessment	**Midterm Exam**	2	10% (10)	Week 15/16	All
	Final Exam	3	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Digital Systems Design and Hardware Description Languages.
Week 2	Introduction to Programmable Logic Devices (PLDs): PROM, PLA, PAL, CPLD, FPGA.

Week 3	Implementation of Boolean Functions using Programmable Logic Array (PLA).
Week 4	Programmable Array Logic (PAL) Design and Applications.
Week 5	VHDL Basics: Introduction, Libraries, Entity, and Architecture definitions.
Week 6	Modeling Digital Systems at the Gate Level using VHDL.
Week 7	Combinational Logic Design in VHDL (Adders, Multiplexers, Decoders).
Week 8	Mid-Term Practical Evaluation
Week 9	Advanced Combinational Logic Design using Dataflow and Behavioral modeling.
Week 10	Introduction to Sequential Logic Design in VHDL.
Week 11	Modeling Flip-Flops and Registers in VHDL.
Week 12	Design of Synchronous and Asynchronous Counters.
Week 13	Design of Locked Sequential Networks: Moore and Mealy Machines.
Week 14	Final VHDL Design Mini-Project & Simulation Testing.

Week 15	Final Lab Practical Exam & Projects Evaluation

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	VHDL Basics: Library declarations, Entity, and Architecture.
Week 2	VHDL Basics: Library declarations, Entity, and Architecture.
Week 3	Modeling Digital Systems at the Gate Level (AND, OR, NOT gates).
Week 4	Combinational Logic Design: Half/Full Adders and Subtractors.
Week 5	Mid-Term Practical Exam
Week 6	Dataflow Modeling: Design of Multiplexers and Decoders.
Week 7	Sequential Logic Design: Modeling Flip-Flops (D, JK, T).
Week 8	Sequential Logic Design: Modeling Flip-Flops (D, JK, T).
Week 9	Registers and Shift Registers Design using VHDL.
Week 10	Design of Synchronous and Asynchronous Counters.
Week 11	Locked Sequential Networks: Moore Machine Design.
Week 12	Locked Sequential Networks: Mealy Machine Design.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	DSD Lab Manual (VHDL Basics) by Assist. Lec. Ahmed Emad Saleem.	Yes
Recommended Texts	"Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog" by M. Morris Mano.	Yes
Websites	EDA Playground, IEEE digital logic design resources.	

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

نموذج وصف المقرر

المستوى الثالث (الفصل الاول)

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Sequential Logic Circuits			**Module Delivery**	
Module Type	C			☒ **Theory**	
Module Code				☒ **Lecture**	
ECTS Credits	6			☒ **Lab**	
SWL (hr/sem)	150			☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Level			**Semester of Delivery**	5	
Administering Department	Electronic and Communications Engineering		**College**	College of Engineering	
Module Leader	Batool Rafid Natiq		**e-mail**	batool.r.natiq@gu.edu.iq	
Module Leader's Acad. Title	Asst. Lec.		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Combinational Logic Circuits	**Semester**	3

Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To provide students with a solid foundation in the fundamental concepts, methods, and principles for sequential logic circuits design. 2. To develop students' ability to analyze and design basic concept of synchronous and asynchronous sequential circuits electronic circuits problems. 3. To familiarize students with the properties and behavior of principle sequential logical components of electronic circuits, including but not limited to: Flip Flops, counters, registers, clock-dividers, memory and programmable logic. 4. To introduce students to state machine analysis for sequential circuits, theorems and their applications in circuit analysis. 5. To enhance students' critical thinking and problem-solving skills in the context of logic-design of sequential circuit analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Recognize logical construction of sequential circuits. 2. Utilize various analysis techniques to design sequential circuits. 3. Realize basic similarities and differences between combinational and sequential circuit. 4. Understand basics of flip flops. 5. Describe circuit state diagram, state table, and equations of a sequential circuit. 6. Identify basic elements of a sequential circuit. 7. Discuss operations and performance of various sequential circuits. 8. Understand various properties of flip-flops, counters, and registers. 9. Understand operations of principle components of sequential logic circuits, like: flip-flops, counters, registers, memory, and programmable logic circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Sequential Logic Circuit Theory</u> Sequential Logic Circuits – Definitions of essential elements: Flip Flops, SR-Latches, and D-Latches. [15 hrs] Registers: Definitions of registers, shift-registers. Digital Systems including, Binary, Octal, Decimal, and Hexadecimal systems. This also includes the basic arithmetic operations on these systems, such addition, subtraction, multiplication, and division. [15 hrs]

	Counters: Asynchronous and Synchronous Counters. This includes the design of principle components of a sequential logic circuit, such as D-Type Flip Flop, JK-Type Flip Flop, and T-Type Flip Flops. [10 hrs] Advanced design techniques by utilizing principle components to design more complex sequential logic circuit. [15 hrs] Revision problem classes [6 hrs] <u>Part B – Sequential Circuits</u> Fundamentals Principle components of a sequential circuit, which includes: D-type flip flop, JK-Type flip flop, and T-type flip flop. [15 hrs] State machine analysis of sequential circuits, which includes state diagram, state table, reduction of state table, and construction of sequential circuit based on state table. [7 hrs] Revision problem classes. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. **Lectures**: Conduct interactive lectures to introduce and explain the key concepts, theories, and principles related to each topic. Use visual aids, examples, and real-world applications to enhance student understanding. 2. **Problem-solving Sessions**: Dedicate regular sessions to solving problems and exercises related to each topic. Encourage students to actively participate in problem-solving discussions and provide guidance and feedback during these sessions. 3. **Laboratory Sessions**: Conduct laboratory sessions where students can apply the learned theories and techniques to real-world circuit analysis. Provide hands-on experiments and projects to reinforce their understanding and enhance their practical skills. 4. **Group Discussions**: Assign group activities or case studies that require students to work collaboratively on analyzing and solving circuit problems. This fosters teamwork, critical thinking, and communication skills. 5. **Assessments**: Implement regular formative assessments, such as quizzes, assignments, and in-class exercises, to evaluate students' understanding and progress. Provide constructive feedback to guide their learning and address any misconceptions. 6. **Mid-term Exam**: Administer a mid-term exam to assess students' comprehension of the topics covered in the first half of the module. This exam can help identify areas that require further clarification or reinforcement. 7. **Final Exam**: Conduct a comprehensive final exam to assess students' overall understanding of the module's content. Design the exam to incorporate a variety of question formats, including theoretical concepts, problem-solving, and circuit analysis.

8. **Office Hours**: Offer dedicated office hours or consultations to provide individualized support and address students' questions or concerns. This facilitates personalized guidance and ensures students receive assistance when needed.
9. **Review Sessions**: Before exams or major assessments, conduct review sessions to summarize key concepts, address common challenges, and provide additional practice problems. This helps consolidate knowledge and reinforces understanding.
10. **Technology Integration**: Utilize appropriate software tools, simulation software, and circuit analysis software to reinforce theoretical concepts and enable students to analyze complex circuits efficiently.
11. **Continuous Feedback**: Provide ongoing feedback to students on their progress, performance, and problem-solving skills. Encourage self-reflection and self-assessment to foster a growth mindset and promote continuous improvement.
12. **Encourage Active Learning**: Incorporate active learning strategies such as think-pair-share, concept mapping, and problem-based learning. Engage students in discussions, encourage questions, and promote independent thinking to deepen their understanding.

By employing these varied learning and teaching strategies, you can create an engaging and supportive environment that promotes active learning, critical thinking, and mastery of the combinational logic circuits analysis concepts and techniques.

Rubric

The following is the rubric assessment in the combinational logic circuits that provides a clear breakdown of the assessment criteria and weightings for each type.

Criteria	Excellent (A)	V. Good (B)	Good (C)	Satisfactory (D)	Fail (
Final Exam Content Mastery	Demonstrates comprehensive understanding and mastery of all module concepts and principles, applying them accurately and effectively to solve complex problems.	Demonstrates strong understanding and mastery of most module concepts and principles, applying them appropriately to solve a variety of problems.	Demonstrates satisfactory understanding and mastery of many module concepts and principles, applying them adequately to solve standard problems.	Demonstrates limited understanding and mastery of some module concepts and principles, with inconsistent or inaccurate application in problem-solving.	Demonstrat little to no understandi mastery of module con and principl with signific errors in pr solving atte
Mid-term Exam Conceptual Understanding	Demonstrates a thorough grasp of key concepts and theories covered in the first half of the module, providing clear explanations and accurate application in problem-solving	Demonstrates a solid grasp of most key concepts and theories covered in the first half of the module, providing coherent explanations and generally accurate application in problem-solving.	Demonstrates a satisfactory grasp of many key concepts and theories covered in the first half of the module, providing adequate explanations and generally correct application in problem-solving.	Demonstrates a limited grasp of some key concepts and theories covered in the first half of the module, with occasional inconsistencies or errors in explanations and problem-solving.	Demonstrat little to no g of key conce and theorie covered in t first half of t module, wit significant inaccuracies misunderst s in explana and problen solving atte

	Lab Exam Practical Understanding	Successfully applies theoretical knowledge to practical experiments and projects in laboratory sessions, demonstrating proficiency in practical skills and accurate data analysis.	Applies theoretical knowledge to most practical experiments and projects in laboratory sessions, demonstrating solid proficiency in practical skills and generally accurate data analysis.	Applies theoretical knowledge to some practical experiments and projects in laboratory sessions, demonstrating adequate proficiency in practical skills and generally correct data analysis.	Applies theoretical knowledge to few practical experiments and projects in laboratory sessions, with limited proficiency in practical skills and occasional errors in data analysis.	Fails to apply theoretical knowledge effectively to practical experiments and projects in laboratory sessions, demonstrating little to no proficiency in practical skills and significant errors in data analysis.
	Assignments Quality and Genuine Content	Consistently submits assignments of exceptional quality, demonstrating thorough understanding, critical analysis, and creative problem-solving.	Typically submits assignments of good quality, demonstrating solid understanding, clear analysis, and effective problem-solving.	Occasionally submits assignments of satisfactory quality, demonstrating adequate understanding, coherent analysis, and acceptable problem-solving.	Often submits assignments of poor quality, indicating limited understanding, superficial analysis, and ineffective problem-solving	Consistently submits assignments of very poor quality, reflecting little to no understanding, unclear analysis, and ineffective problem-solving.
	In-class Participation Actively Attending and Engaging	Actively participates in in-class exercises, contributing valuable insights, collaborating effectively with peers, and demonstrating a strong grasp of the material.	Generally participates in in-class exercises, offering relevant contributions, engaging with peers, and demonstrating a satisfactory grasp of the material.	Occasionally participates in in-class exercises, providing limited contributions, interacting with peers, and demonstrating a basic grasp of the material.	Rarely participates in in-class exercises, offering minimal contributions, lacking interaction with peers, and demonstrating a weak grasp of the material.	Consistently fails to participate in in-class exercises, providing no contributions, avoiding interaction with peers, and demonstrating no grasp of the material.
	Quizzes Progress Feedback	Consistently achieves high scores on quizzes, demonstrating deep understanding and significant progress in mastering module concepts and techniques.	Typically achieves satisfactory scores on quizzes, demonstrating solid understanding and steady progress in mastering module concepts and techniques.	Occasionally achieves satisfactory scores on quizzes, demonstrating adequate understanding and progress in mastering module concepts and techniques.	Often achieves low scores on quizzes, indicating limited understanding and inconsistent progress in mastering module concepts and techniques.	Consistently achieves low scores on quizzes, reflecting little to no understanding and minimal progress in mastering module concepts and techniques.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	98	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	2,6,10,14	LO #2, #4, #5, #8, #11 and #12
	Assignments	4	5% (10)	2 and 12	LO #3 to #12
	Attendance	1	5% (10)	13	LO #1 to #10
	Lab/reports	5	10% (10)	3,6,9,12,15	LO #1,#2, #7, #10, #13, #14 and #15
Summative assessment	**Midterm Exam**	2hr	20% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Combinational Circuits vs. Sequential Circuits
Week 2	Introduction to Sequential Logic Circuits
Week 3	Elements of a Sequential Logic Circuits: Latches and Flip Flops
Week 4	Introduction Registers and Counters
Week 5	Synchronous and Asynchronous Counters
Week 6	Shift Registers
Week 7	Sequential Circuit Design Procedure
Week 8	Sequential Circuit Design Procedure: State Diagram, State Table
Week 9	Midterm Exam
Week 10	Memory and Programmable Logic
Week 11	Random Access Memory
Week 12	Read Only Memory
Week 13	Programmable Logic Array
Week 14	Programmable Array Logic
Week 15	Error Detection and Correction
Week 16	A preparatory week before the Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: SR Latch and D Latch
Week 2	Lab 2: JK Flip Flop

Week 3	Lab 3: System Design Using Sequential Logic Gates
Week 4	Lab 4: Shift Registers
Week 5	Lab 5: Application of Shift Registers
Week 6	Lab 6: Asynchronous Counters
Week 7	Lab 7: Synchronous Counters
Week 8	Lab 8: Traffic Light Controller System

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Digital Design with an Introduction to the Verilog HDL, 5th Ed. M. Morris Mano, Michael D. Ciletti, Pearson Education	Yes
Recommended Texts		
Websites		

Grading Scheme

مخطط الدرجات

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Power Electronics**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☒**Lecture** ☒**Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE32306**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGIII		**Semester of Delivery**	6	
Administering Department	COE		**College**	Engineering	
Module Leader	Aaid Mohammed Ameer		**e-mail**	aaid.m.ameer@gu.edu.iq	
Module Leader's Acad. Title	Assist. Lec.		**Module Leader's Qualification**	M.CS	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/02/2026		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop problem solving skills and understanding of power electronic theory through the application of techniques. 2. To understand thyristor ,transistor as switching from a given circuit. 3. This course deals with the basic concept of rectifier . 4. This is the basic subject chopper. 5. To understand ac-ac converter, inverter. 6. Application of power electronics especially in medical instrument.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how power electronic works in electrical circuits. 2. List the various terms associated with power electronic. 3. Summarize what is meant by a basic with power electronic. 4. Discuss the reaction and involvement of in rectifier circuit. 5. Describe thyristor ,transistor diode . 6. Dc- dc converter. 7. Identify the basic circuit elements and their applications. 8. Discuss the operations of ac-ac converter. 9. Discuss the various properties inverter. 10. Explain the applications of power electronics in industry especially in medical equipment .
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A - Circuit Theory</u>]Diode and Transistor Thyristor as switch its characteristic ,protection, triggering circuit. [15 hrs.] AC circuits I –Single phase half wave and full wave Rectifier . [10 hrs] Revision problem classes [5 hrs]

	Part B Applications dc-dc converter ,stepdown and step up chopper. [15 hrs] Single phase and three phase inverters. [15 hrs] Applications oof power Electronics UPS.SMPS and Health car application. [10 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 8 and 10
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	8	15% (10)	Continuous	
	Report	1	5% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to power electronics. Lect.1and 1a
Week 2	Switching devices, power & control device
Week 3	Types and characteristic, rating (diode, transistor …).
Week 4	Methods of turning – on & turning – off.
Week 5	Protection of power devices.
Week 6	Triggering & base drive circuits. Controlled rectifiers, 1 – phase
Week 7	Mid-Exam
Week 8	Controlled Rectifier 3 – phase circuits
Week 9	Half – wave & full – wave circuits3 phase Rectifiers.
Week 10	D.C choppers; step – up & step – down choppers
Week 11	A.C phase controllers.
Week 12	Invertors, 1 – phase & 3 – phase bridges
Week 13	Some applications: a – uninterruptible power supply UPS).
Week 14	switching mode power supply (SMPS)
Week 15	**Application of power Electronics in medical instruments** **Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Uncontrolled Resistive Half Wave Rectifier with Load.
Week 2	Controlled Half Wave Rectifier with Resistive Load.
Week 3	Controlled Half Wave Rectifier with Inductive Load.
Week 4	Single Phase Full Wave Rectifier (Bridge) /Part I.
Week 5	Single Phase Full Wave Rectifier (Bridge) /Part II.
Week 6	Three Phase Half Wave Rectifier.
Week 7	Three Phase Full Wave Rectifier.
Week 8	Single Phase Half Bridge Inverter/ Part 1.
Week 9	Single Phase Half Bridge Inverter/ Part 2.
Week 10	Single Phase Full Bridge Inverter.
Week 11	Single-Phase Half Wave AC Voltage Controller.
Week 12	Single-Phase Full wave AC Voltage Controller.
Week 13	Step-Down DC Chopper.
Week 14	Step-Down DC Chopper.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Power Electronics By Lander	Yes
Recommended Texts	Power Electronics and drive By Mohmmed T.Lazim	No
Websites	M.T.Lazim	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Communication Systems II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE32302**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	COE		**College**	Engineering	
Module Leader	Aaid Mohammed Ameer		**e-mail**	aaid.m.ameer@gu.edu.iq	
Module Leader's Acad. Title	Assist. Lec.		**Module Leader's Qualification**	M.CS	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/02/2026		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aims to students in third stage to defined and understand the -Concepts and terminology used in digital communications -The advantage and disadvantage of each type of digital communication systems -Types of Digital modulation - Send multiple digital signals at the same time and how to retrieve it
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Describe of concepts and terminology used in digital communications 2 -Explain the advantage and disadvantage of each type of digital communications systems 3- Identify types of digital modulation 4- Discuss the comparison between the types of digital systems and its advantages 5- work on digital systems and Describe the most suitable designs 6- Explain how can send more than a signal at the same time and how to retrieve it 7- analog signal into a digital signal converter (PCM) 8- Explain types of digital modulation ask , psk , fsk 9- Explain the modulation and demodulation of quadrature amplitude modulation
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. - Introduction to digital communication **&** Sampling theorem **(10 hr)** - Pulse Amplitude Modulation (PAM), Pulse width and Pulse Position **(10 hr)** - Source Coding Techniques Modulation **(24 hr)** - Baseband modulation (Digital Modulation), **(30 hr)**
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	

Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Signal types, General block diagram of digital communication
Week 2	Advantage and disadvantage of digital modulation, digital coding
Week 3	Sampling theorem, Pulse Amplitude Modulation (PAM),
Week 4	Pulse width and Pulse Position Modulation (PWM & PPM),
Week 5	Time Division Multiplexing (TDM) , Pulse Code Modulation PCM),
Week 6	Mid exam
Week 7	Noise Consideration in PCM, Limitation and Modifications of PCM
Week 8	Differential PCM (DPCM), Delta Modulation (DM),
Week 9	Delta-Sigma Modulation
Week 10	Baseband modulation (Digital Modulation), Amplitude Shift Keying (ASK) [Modulation and demodulation].
Week 11	Frequency Shift Keying (FSK) [Modulation and demodulation],
Week 12	Phase Shift Keying (PSK) [Modulation, Coherent and Noncoherent Detection], Differential PSK.
Week 13	Quadrature Phase Shift Keying (QPSK), Offset QPSK
Week 14	Minimum Shift Keying
Week 15	Quadrature Amplitude Modulation (QAM), Multilevel Modulation Techniques M-ary PSK, M-ary QAM

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Fourier series and Fourier Transform , Spectrum analysis of signal
Week 2	Pulse Amplitude Modulation
Week 3	Pulse Position Modulation (PPM)
Week 4	Pulse Code Modulation
Week 5	Digital Time Division Multiplexing (TDM)
Week 6	Delta Modulation (DM)
Week 7	Amplitude shift key (ASK)
Week 8	Phase Shift Key (PSK)
Week 9	Frequency Shift Key (FSK)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	- Sarkar N., Elements of Digital Communications, first edition, 2003	NO
Recommended Texts	- Haykin S., Introduction to Analog and Digital Communications, second edition, 2007.	No
Websites	https://www.coursera.org	

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

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

1. Course Name: English4	
2. Course Code: **ENG421**	
3. Semester / Year: Semester 1\ 2025-2026	
4. Description Preparation Date: 01/10/2025	
5. Available Attendance Forms: Offline, In class	
6. Number of Credit Hours (Total) / Number of Units (Total)	
2 hours per week / 30 hours of study in the classroom / 2 unit	
7. Course administrator's name (mention all, if more than one name)	
Name: - Email: -	
8. Course Objectives	
Course Objectives	Explaining and clarifying through lectures. Presenting scientific materials using presentation devices: data projectors, interactive whiteboards, and screens with speakers. Encouraging self-learning through homework assignments and mini-projects integrated within the lectures.

9. Teaching and Learning Strategies	
Strategy	Cognitive objectives: A1- Making students familiar with the rules of the English language. A2- Enabling students to understand how to interact with English speakers. A3- Instilling in students the recognition of the significance of English as a global language. Affective and values-based objectives: B1- Encouraging students to learn English vocabulary and grammar rules. B2- Developing students' verbal communication skills. B3- Acquiring the required skills for post-graduation plans and advanced studies. Skills-based objectives: C1- Listening to English speakers and making continuous efforts to speak for linguistic development. C2- Preparing students with a broad understanding of English grammar rules so that graduates can employ this knowledge in their respective fields of specialization. C3- Acquiring knowledge and understanding of the English language, along with the ability to write research in it.

10. Course Structure

Course Structure: Second Semester

The week	Hours	Required learning outcomes	Unit/Module or Topic Title	Teaching Method	Assessment Method

Week 1	2 Theoretical	A1, B1, C1	Present perfect	In class	In class activities
Week 2	2 Theoretical	A1, B1, C1	Simple and continuous	In class	In class activities and home duties
Week 3	2 Theoretical	A1, B1, C1	Passive and adverbs	In class	In class activities
Week 4	2 Theoretical	A2, B2, C2	Time expression	In class	In class activities
Week 5	2 Theoretical	A2, B2, C2	Spoken English	In class	In class activities and home duties
Week 6	2 Theoretical	A2, B2, C2	Verb + ing	In class	In class activities and home duties
Week 7	2 Theoretical		Verb + infinitive	In class	In class activities and home duties
Week 8	2 Theoretical	A3, B3, C3	Adjective + + infinitive	In class	Quiz 1
Week 9	2 Theoretical	A3, B3, C3	Spoken English	In class	Questions during the lecture
Week 10	2 Theoretical	A3, B3, C3	Conditionals	In class	Home duties and questions during the lecture
Week 11	2 Theoretical	A3, B3, C3	Second conditionals	In class	Mid Term
Week 12	2	A4, B4, C4	Third Conditionals	In class	Quiz 2

	Theoretical				
Week 13	2 Theoretical	A4, B4, C4	Might have done\	In class	In class activities
Week 14	2 Theoretical	A4, B4, C4	Could have done	In class	Assignment Presentation
Week 15	2 Theoretical	A4, B4, C4	Mid-course Exam	In class	In class activities
Week 16	3 hrs		**Final Exam**		Final Exam

11. Course Evaluation
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports etc
12. Learning and Teaching Resources

Required textbooks (curricular boo if any)	Text book: Head Way Intermediate Level Fourth Edition; Liz and John Soars; OXFORD.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	Research in research engines specialized in scientific research such as: • Google scholar • Science direct • IEEE.

Course Description Form

1. Course Name: Project Management
2. Course Code: ECE41304
3. Semester / Year: Year: Semester 2/2025-2026
4. Description Preparation Date:01/10/2025
5. Available Attendance Forms: official full attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 hours per week / 30 hours of study in the classroom / 2 unit
7. Course administrator's name (mention all, if more than one name)
Name: Hasan Mohammed Kalil Email: hasan.m.khalil@gu.edu.iq
8. Course Objectives
Course Objectives: The objective of this course is to develop an understanding of the basic ideas of pro management encountered in engineering. Focus will be on the methods for understanding project initiation lifecycle in addition to fundamentals of the project planning techniques such as Bar chart, CPM, and pro networks. Students will learn some about program evaluation and review technique (PERT) and time-c relationship in PM (project crashing) that are useful for the understanding of different engineering projects. Ano objective is to teach the Engineering student about Cash flow forecasting, Linear programming problem, manag Project Stakeholders, and project quality control and assurance. Finally, the student will learn the concept of us MS project software for designing real-life projects.

9. Teaching and Learning Strategies

Strategy A. Cognitive goals The student will learn the basic and applied concepts of Project management with the following fundamentals:

A.1. Understand the fundamentals and importance of project management in achieving organizational goals and objectives.

A.2. Developing skills in project initiation and planning.

A.3. Gaining knowledge of project planning.

A.4 Understand and apply network planning techniques (A.O.N & A.O.A).

A.5. Apply network planning techniques such as Bar chart, CPM, and project networks.

A.6. Express the concepts of time-cost relationship in PM (project crashing).

A.7. Understand the concept of cash flow forecasting.

A.8 Understand the concept of Linear programming problem.

A.9. Express the concepts of Managing Project Stakeholders and Project Quality control.

A.10. Gaining practical experience in developing and managing projects using MS project software.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 Theoretical	A1, B1, C1	Introduction to Project Management (PM)	In class	In class activities
2	2 Theoretical	A1, B1, C1	Project Methodologies and Processes	In class	In class activities and home duties

3	2 Theoretical	A1, B1, C1	Project Planning	In class	In class activities
4	2 Theoretical	A2, B2, C2	Project Planning: The	In class	In class activities
5	2 Theoretica	A2, B2, C2	Work Breakdown Structure (WBS)	In class	In class activities and home duties
6	2 Theoretica	A2, B2, C2	Developing the Project Schedule: Critical Path Management (CPM)	In class	In class activities and home duties
7	2 Theoretica		Project Network Diagrams:	In class	In class activities and home duties
8	2 Theoretica	A3, B3, C3	A.O.N & A.O.A	In class	Quiz 1
9	2 Theoretica	A3, B3, C3	Bar Charts & Program	In class	Questions during the lecture
10	2 Theoretica	A3, B3, C3	evaluation and review technique (PERT)	In class	Home duties and questions during the lecture
11	2 Theoretica	A3, B3, C3	Mid-course Exam	In class	Mid Term
12	2 Theoretica	A4, B4, C4	Time-Cost Relationship	In class	Quiz 2
13	2 Theoretica	A4, B4, C4	in PM (project crashing)	In class	In class activities
14	2 Theoretica	A4, B4, C4	Cash flow forecasting	In class	Assignment Presentation
15	2 Theoretica	A4, B4, C4	Linear programming problem	In class	In class activities
16	2 Theoretica		Final Exam		Final Exam

Course description (practical)		
weeks	**Laboratory sessions & *Clinical requirements***	hours
1		
2		
3 4		
5		
6		
7		
8		
9		
10		
12		
13		
14		
15		

1. Course evaluation Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc	
2. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	**Information Technology Project Management, Jack T. Marchewka, Wiley, 2015** **. • PMP in Depth: Project Management Professional Study PMP in Depth, 2nd Edition, ISBN: 159863996X** **• Project Management Professional Study Guide for the PMP Exam**
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Research in research engines specialized in scientific research such as: • Google scholar • Science direct • IEEE.
Electronic References, Websites	Here's a summary of important URLs related to this book: https://www.coursera.org/learn/

Course Description Form

1. Course Name: Internet of Things

2. Course Code: ECE41205

3. Semester / Year: 2025-2026

4. Description Preparation Date: 2025-10-01

5. Available Attendance Forms: official full attendance

6. Number of Credit Hours (Total) / Number of Units (Total): 3 Units / 3 Credit Hours

7. Course administrator's name (mention all, if more than one name)

Name: Aaid Mohammed Ameer
Email: aaid.m.ameer@gu.edu.iq

8. Course Objectives

Course Objectives:

This course aims to provide students with comprehensive knowledge of Internet of Things (IoT) technology and its integration with emerging technologies such as blockchain and Web3. Students will gain practical understanding of IoT architecture, networking protocols, security mechanisms, cloud computing integration, and modern application development. The course emphasizes hands-on experience through practical projects and covers the convergence of IoT with distributed ledger technologies and next-generation web platforms.

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

- Understand IoT fundamentals and microcontroller-based systems
- Implement IoT networking using various application-level protocols
- Apply security mechanisms to protect IoT systems

- Integrate IoT solutions with cloud computing platforms
- Comprehend blockchain technology and its applications in IoT
- Develop practical IoT applications incorporating modern web technologies
- Analyze the synergy between Web3, Blockchain, and IoT ecosystems

9. Teaching and Learning Strategies

- Interactive lectures with multimedia presentations
- Hands-on laboratory sessions with IoT hardware and development boards
- Practical demonstrations of protocols and security implementations
- Case studies of real-world IoT applications
- Collaborative mini projects
- Problem-based learning scenarios
- Online resources and simulation tools
- Guest lectures from industry professionals

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	2	Understanding IoT basics	Introduction to IoT	Lecture	Quiz
2	2	Learn hardware	Introduction to the IoT Microcontrollers	Lecture/Demo	Lab Report
3	2	Understand networking	IoT Networking Fundamentals	Lecture	Quiz
4	2	Master protocols	Applications Level Protocol (MQTT, REST, CoAP)	Lecture	Homework
5	2	Understand encryption	IoT Security: Symmetric encryption (DES, AES, Hashing)	Lecture	Quiz

6	2	Implement security	IoT Security: Asymmetric encryption (RSA...)	Lecture	Review
7	2	Conceptualize Web1-3	Introduction to Web generations (web1, web2, web3)	Lecture	Report
8	2	Assessment	Exam (mid)	Exam	Score
9	2	Cloud integration	IoT Cloud Computing	Lecture	Homework
10	2	Understand Blockchain	Introduction to Blockchain Technology (Types, Architecture)	Lecture	Quiz
11	2	Blockchain use cases	Blockchain in IoT	Lecture	Report
12	2	Tech convergence	The Synergy between Web3, Blockchain and IoT	Lecture	Presentation
13	2	App development	How to Develop IoT Apps	Workshop	Proposal
14	2	Apply concepts	Mini projects (Development)	Lab/Guidance	Progress Check
15	2	Finalize projects	Mini projects (Presentation)	Presentation	Final Grade

Course description (practical)

Weeks	Laboratory Sessions & Clinical Requirements	Hours
1	Lab Introduction & Safety	2
2	Microcontroller GPIO Programming	2
3-4	IoT Protocols (MQTT/CoAP) Setup	4
5	Symmetric Encryption Lab	2
6	Asymmetric Encryption & Keys	2
7	Web Generations Research Lab	2
8	Midterm Exam (No Lab)	-
9	Cloud Platform Integration	2
10	Blockchain Simulation Lab	2
Weeks	**Laboratory Sessions & Clinical Requirements**	**Hours**
1	Lab Introduction & Safety	2
2	Microcontroller GPIO Programming	2
3-4	IoT Protocols (MQTT/CoAP) Setup	4

11. Course Evaluation	
Weekly examinations/quizzes	10%
Laboratory reports	15%
Homework assignments	10%
Midterm examination	25%

Mini projects	20%
Final examination	20%
Total	100%

1. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• "Internet of Things: A Hands-On Approach" by Arshdeep Bahga and Vijay Madisetti • "Blockchain and IoT: A Comprehensive Guide" (or equivalent current edition)
Main references (sources)	• "Building the Web of Things" by Dominique Guinard and Vlad Trifa • "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases" by David Hanes et al. • "Mastering Blockchain" by Imran Bashir • MQTT Protocol Specification (OASIS Standard) • CoAP Protocol RFC 7252 • NIST Guidelines on IoT Security
Recommended books and references (scientific journals...)	• IEEE Internet of Things Journal • ACM Transactions on Internet of Things • "Practical Internet of Things Security" by Brian Russell and Drew Van Duren • "Web3: Charting the Internet's Next Economic and Cultural Frontier" by Alex Tapscott

	• Research papers on blockchain-IoT integration • Industry white papers on IoT security best practices
Electronic References, Websites	Arduino.cc, Ethereum.org, IBM IoT Hub

Course Description Form

1. Course Name:

Mobile Communications

2. Course Code:

ECE41202

3. Semester / Year:

1st Semester / 4th Stage

4. Description Preparation Date:

1/12/2025

5. Available Attendance Forms: official full attendance

Smart Absence System

6. Number of Credit Hours (Total) / Number of Units (Total)

90 hours / 6 units

7. Course administrator's name (mention all, if more than one name)

Assist.Lect.Jaafar ali

Email: jaafar.ali@gu.edu.iq

8. Course Objectives

Course Objectives

- Fundamentals of mobile communication systems.
- Analysis of signal propagation and fading.
- Multiple access techniques (TDMA, FDMA, CDMA, OFDMA).
- Modulation and coding techniques.
- Cellular network engineering and emerging technologies.
- Handover and mobility management.
- Mobile communication standards (GSM, UMTS, LTE, 5G).

- Security and privacy in mobile networks.
- Quality of Service (QoS) and performance analysis.
- Trends and emerging technologies in mobile communications.

9. Teaching and Learning Strategies

1-Interactive lectures and discussions
2- Practical laboratory experiment
3- Problem-solving sessions
4- Design projects
5- Report writing
6- Group projects and peer learning
7- Use of simulation software

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1, 2	12	Understand the fundamentals of mobile communications	Introduction to Mobile Communications	Introduction to Mobile Communications	
3,4,5		Cellular Concepts and Spectrum	Get familiar with cellular concepts and spectrum allocation	Get familiar with cellular concepts and spectrum allocation	Quizes

6,7		Propagation and Fading	Analyse signal propagation, path loss, and fading	Analysis of signal propagation, path loss, and fading	Mid-Term Exam
8,9		Multiple Access Techniques	Explore multiple access techniques	Exploration of multiple access techniques	
10,11		Modulation and Coding Techniques	Understand modulation and coding in mobile communications	Understanding modulation and coding in mobile communications	Assignments
12		Cellular Network Engineering	Study the structure and components of mobile networks	Study the structure and components of mobile networks	
13		Handover and Mobility Management	Get familiar with handover and mobility management	Get familiar with handover and mobility management	Quizes
14		Mobile Communication Standards	Acquire knowledge of mobile communication standards	Acquire knowledge of mobile communication standards	Assignments
15		Review Sessions and Q&A	Comprehensive review and integration of all covered topics	Comprehensive Review	

Course description (practical)		
weeks	**Laboratory sessions & *Clinical requirements***	hours
1	Introduction to Digital Communications-BPSK Modulation	2
2	QPSK modulation	2
3 4	16 QAM Modulation	2
5	Implement Communication System Compute the system's BER	2
6	Computing the Symbol Error Rate	2
7	Frequency Division Multiplexing & DeMultiplexing	2
8	Time Division Multiplexing & DeMultiplexing	2

1. **Course evaluation**
   weekly examination
   reports
   Homeworks

2. Learning and Teaching Resources

- *Wireless Communications: Principles and Practice* by Theod S. Rappaport.
- *Mobile Communications* by Jochen Schiller.
- *Fundamentals of Wireless Communication* by David Tse a Pramod Viswanath.

Online platforms (e.g., Moodle, Blackboard) for administer quizzes, exams, and providing instant feedback. IEEE Transactions on Mobile Computing. MATLAB for simulating mobile communication systems a analyzing performance. MATLAB, Simulink, or similar tools for simulat communication systems. Laboratory Equipment. Research papers, tutorials, and additional learning modules	

Course Description Form

1. Course Name: Project Management
2. Course Code: ECE41304
3. Semester / Year: Year: Semester 2/2025-2026
4. Description Preparation Date:01/10/2025
5. Available Attendance Forms: official full attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 hours per week / 30 hours of study in the classroom / 2 unit
7. Course administrator's name (mention all, if more than one name)
Name: Hasan Mohammed Kalil Email: hasan.m.khalil@gu.edu.iq
8. Course Objectives
Course Objectives: The objective of this course is to develop an understanding of the basic ideas of pro management encountered in engineering. Focus will be on the methods for understanding project initiation lifecycle in addition to fundamentals of the project planning techniques such as Bar chart, CPM, and pro networks. Students will learn some about program evaluation and review technique (PERT) and time-c relationship in PM (project crashing) that are useful for the understanding of different engineering projects. Ano objective is to teach the Engineering student about Cash flow forecasting, Linear programming problem, manag Project Stakeholders, and project quality control and assurance. Finally, the student will learn the concept of us MS project software for designing real-life projects.

9. Teaching and Learning Strategies

Strategy A. Cognitive goals The student will learn the basic and applied concepts of Project management with the following fundamentals:

A.1. Understand the fundamentals and importance of project management in achieving organizational goals and objectives.

A.2. Developing skills in project initiation and planning.

A.3. Gaining knowledge of project planning.

A.4 Understand and apply network planning techniques (A.O.N & A.O.A).

A.5. Apply network planning techniques such as Bar chart, CPM, and project networks.

A.6. Express the concepts of time-cost relationship in PM (project crashing).

A.7. Understand the concept of cash flow forecasting.

A.8 Understand the concept of Linear programming problem.

A.9. Express the concepts of Managing Project Stakeholders and Project Quality control.

A.10. Gaining practical experience in developing and managing projects using MS project software.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 Theoretical	A1, B1, C1	Introduction to Project Management (PM)	In class	In class activities
2	2 Theoretical	A1, B1, C1	Project Methodologies and Processes	In class	In class activities and home duties

3	2 Theoretical	A1, B1, C1	Project Planning	In class	In class activities
4	2 Theoretical	A2, B2, C2	Project Planning: The	In class	In class activities
5	2 Theoretica	A2, B2, C2	Work Breakdown Structure (WBS)	In class	In class activities and home duties
6	2 Theoretica	A2, B2, C2	Developing the Project Schedule: Critical Path Management (CPM)	In class	In class activities and home duties
7	2 Theoretica		Project Network Diagrams:	In class	In class activities and home duties
8	2 Theoretica	A3, B3, C3	A.O.N & A.O.A	In class	Quiz 1
9	2 Theoretica	A3, B3, C3	Bar Charts & Program	In class	Questions during the lecture
10	2 Theoretica	A3, B3, C3	evaluation and review technique (PERT)	In class	Home duties and questions during the lecture
11	2 Theoretica	A3, B3, C3	Mid-course Exam	In class	Mid Term
12	2 Theoretica	A4, B4, C4	Time-Cost Relationship	In class	Quiz 2
13	2 Theoretica	A4, B4, C4	in PM (project crashing)	In class	In class activities
14	2 Theoretica	A4, B4, C4	Cash flow forecasting	In class	Assignment Presentation
15	2 Theoretica	A4, B4, C4	Linear programming problem	In class	In class activities
16	2 Theoretica		Final Exam		Final Exam

Course description (practical)		
weeks	**Laboratory sessions & *Clinical requirements***	hours
1		
2		
3 4		
5		
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7		
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10		
12		
13		
14		
15		

1. Course evaluation Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc	
2. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	**Information Technology Project Management, Jack T. Marchewka, Wiley, 2015** **. • PMP in Depth: Project Management Professional Study PMP in Depth, 2nd Edition, ISBN: 159863996X** **• Project Management Professional Study Guide for the PMP Exam**
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Research in research engines specialized in scientific research such as: • Google scholar • Science direct • IEEE.
Electronic References, Websites	Here's a summary of important URLs related to this book: https://www.coursera.org/learn/

Course Description Form

1. Course Name: Artificial Intelligence
2. Course Code: ECE48204
3. Semester / Year: 2025-2026
4. Description Preparation Date: 2026
5. Available Attendance Forms: Full Attendance
6. Number of Credit Hours (Total) / Number of Units (Total) 120 hours
7. Course administrator's name (mention all, if more than one name)
Name: Lina Thamer Sultan Email: lina.t.sultan@gu.edu.iq

8. Course Objectives	
Course Objectives	Upon Completion of this course the student will be able •Understand the objectives and functions of Artifi Intelligence. •Categorize an AI problem based on characteristics and its constraints. •Understand a implement search and adversarial (game) algorithr •Learn different knowledge representation metho •Learn how to analyze the complexity of a given probl and come with suitable optimizations. •Demonstr practical experience by implementing and experiment with the learnt algorithms. Through experiments a projects in the laboratory.

9. Teaching and Learning Strategies	
Strategy	Knowledge and Understanding A1. Essential facts, concepts, principles and theor relating to computing and information and computer applications as appropriate the program of study. A2. Modeling and design of computer-based systems bear in mind the tradeoffs. A4. Criteria and specifications appropriate to spec problems, and plan strategies for their solution. Subject-specific skills B2. Implement comprehensive computing knowledge and skills in projects and deployment of computers to solve practical problems. B3. Develop a range fundamental research skills, through the use of online resources, techni

	repositories and library-based material B7. design, Evaluate, and implem computer-based systems in terms of general quality attributes and possible tradec presented within the given problem. Teaching and learning Methods 1- Lectures a tutorials. 2- Supervised lab work. Assessment methods 1- Reports and essays. Presentations. 3- Regular oral, practical and written quizzes 4- End terms and Fi written exam

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Understand the topic	Introduction to Artificial Intelligen	Lecture	Discussions
2	4	Understand the topic	Intelligent Agents	Lecture	Assignment
3	4	Understand the topic	Problem solving agents	Lecture	Assignment
4	4	Understand the topic	Problem formulati	Lecture	Assignments and quiz
5	4	Understand the topic	Uninformed search strategies	Lecture	Assignment
6	4	Understand the topic	Breadth-first searc depth-first search	Lecture	Assignment
7	2	Understand the topic	Uninformed search strategies	Lecture	Assignments and Exan
8	4	Understand the topic	Uniform-cost searc	Lecture	Assignment
9	4	Understand the topic	Informed search strategies	Lecture	Assignments and quiz
10	4	Understand the topic	Heuristic Function	Lecture	Assignment
11	4	Understand the topic	Informed search strategies	Lecture	Assignments and quiz
12	4	Understand the topic	Best first search	Lecture	Assignment
13	4	Understand the topic	Informed search strategies	Lecture	Assignment
14	4	Understand the topic	-A* search	Lecture	Assignments and quiz
15	4	Understand the topic	Local search algorithms and optimization problems	Lecture	Assignment
16	4	Understand the topic	Hill climbing and Local beam search	Lecture	Assignment
17	4	Understand the topic	Genetic algorithms	Lecture	Assignments and quiz

18	4	Understand the topic	Deep Learning	Lecture	Assignment
19	4	Understand the topic	Simple Feedforwar Networks -part 1	Lecture	Assignment
20	4	Understand the topic	Deep Learning	Lecture	Assignment
21	2	Understand the topic	Simple Feedforwar Networks -part 2	Lecture	Assignments and Exar
22	4	Understand the topic	Games theory (adversarial search	Lecture	Assignment
23	4	Understand the topic	The minimax algorithm	Lecture	Assignments and quiz
24	4	Understand the topic	Minimax with AlphaBeta Pruning Algorithm	Lecture	Assignment
25	4	Understand the topic	Knowledge Representation	Lecture	Assignments and quiz
26	4	Understand the topic	Introduction Knowledge	Lecture	Assignment
27	4	Understand the topic	Production System -Rule base system	Lecture	Assignment

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricu books, if any)	References [1] Rus sell, S., & Norvig, P. Artific intelligence: a modern approach. Third Editic 2014.
Main references (sources)	2] Chowdhary, K. R. Fundamentals of artificial intelligence. Springer Nature, 2020. [3] Khorasa Elham S. "Artificial Intelligence: Structures and Strategies for Complex Problem Solving." Scalabl Computing: Practice and Experience 9.3 (2008). [4] Joshi, Prateek. Artificial intelligence with python. Packt Publishing Ltd, 2017. [5] Poole, David L., and Alan K. Mackworth. "Python code f artificial intelligence: Foundations of computational agents." Version 0.7 6 (2017).
Recommended books and references (scientific journals, reports...)	Rus sell, S., & Norvig, P. Artificial intelligence: modern approach. Third Edition. 2014.
Electronic References, Websites	1.GeeksforGeeks https://www.geeksforgeeks.org/about/?ref=foo r

	2.Javatpoint https://www.javatpoint.com/artificialintelligen -ai 3.W3schools https://www.w3schools.com/python/default.as

Course Description Form

1. Course Name: Project Management

2. Course Code: **ECE41304**

3. Semester / Year: Year: Semester 2/2025-2026

4. Description Preparation Date:01/10/2025

5. Available Attendance Forms: official full attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

2 hours per week / 30 hours of study in the classroom / 2 unit

7. Course administrator's name (mention all, if more than one name)

Name: Hasan Mohammed Kalil

Email: hasan.m.khalil@gu.edu.iq

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A.1. Understand the fundamentals and importance of project management in achieving organizational goals and objectives.
A.2. Developing skills in project initiation and planning.
A.3. Gaining knowledge of project planning.
A.4 Understand and apply network planning techniques (A.O.N & A.O.A).
A.5. Apply network planning techniques such as Bar chart, CPM, and project networks.
A.6. Express the concepts of time-cost relationship in PM (project crashing).
A.7. Understand the concept of cash flow forecasting.
A.8 Understand the concept of Linear programming problem.
A.9. Express the concepts of Managing Project Stakeholders and Project Quality control.
A.10. Gaining practical experience in developing and managing projects using MS project software.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 Theoretical	A1, B1, C1	Introduction to Project Management (PM)	In class	In class activities
2	2 Theoretical	A1, B1, C1	Project Methodologies and Processes	In class	In class activities and home duties
3	2 Theoretical	A1, B1, C1	Project Planning	In class	In class activities
4	2 Theoretical	A2, B2, C2	Project Planning: The	In class	In class activities
5	2 Theoretica	A2, B2, C2	Work Breakdown Structure (WBS)	In class	In class activities and home duties
6	2 Theoretica	A2, B2, C2	Developing the Project Schedule: Critical Path	In class	In class activities and home duties

			Management (CPM)		
7	2 Theoretica		Project Network Diagrams:	In class	In class activities and home duties
8	2 Theoretica	A3, B3, C3	A.O.N & A.O.A	In class	Quiz 1
9	2 Theoretica	A3, B3, C3	Bar Charts & Program	In class	Questions during the lecture
10	2 Theoretica	A3, B3, C3	evaluation and review technique (PERT)	In class	Home duties and questions during the lecture
11	2 Theoretica	A3, B3, C3	Mid-course Exam	In class	Mid Term
12	2 Theoretica	A4, B4, C4	Time-Cost Relationship	In class	Quiz 2
13	2 Theoretica	A4, B4, C4	in PM (project crashing)	In class	In class activities
14	2 Theoretica	A4, B4, C4	Cash flow forecasting	In class	Assignment Presentation
15	2 Theoretica	A4, B4, C4	Linear programming problem	In class	In class activities
16	2 Theoretica		Final Exam		Final Exam

Course description (practical)		
weeks	**Laboratory sessions & *Clinical requirements***	hours
1		
2		
3 4		

5		
6		
7		
8		
9		
10		
12		
13		
14		
15		

1. **Course evaluation**
   Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

2. Learning and Teaching Resources

Required textbooks (curricular books, if any)	**Information Technology Project Management, Jack T. Marchewka, Wiley, 2015** **. • PMP in Depth: Project Management Professional Study PMP in Depth, 2nd Edition, ISBN: 159863996X** **• Project Management Professional Study Guide for the PMP Exam**
Main references (sources)	

Recommended books and references (scientific journals, reports...)	Research in research engines specialized in scientific research such as: • Google scholar • Science direct • IEEE.
Electronic References, Websites	Here's a summary of important URLs related to this book: https://www.coursera.org/learn/

Course Description Form

Control Engineering

1. Course Name: Control Engineering
2. Course Code: **ECE41303**
3. Semester / Year: Semester 1\ 2025-2026
4. Description Preparation Date: 01/12/2025
5. Available Attendance Forms: Offline, In class
6. Number of Credit Hours (Total) / Number of Units (Total)
2 hours per week / 60 hours of study in the classroom / 6unit
7. Course administrator's name (mention all, if more than one name)
Name: - Dr. Dhamyaa Husam Mohammed Email: - Dhamyaa.husam@gu.edu.iq
8. Course Objectives

Course Objectives	• Provides a background of control principles in various engineering applications • Use Basic mathematical tools such as Laplace transform, transfer function, bl diagram, signal flow graph, mathematical modeling of dynamic systems, time respond analysis, stability of linear system, root locus, and, frequency domain analysis are utilize • Design and implement Controllable and observable system. • Study the stability of linear systems.
9. Teaching and Learning Strategies	
Strategy	The student will learn the basic and applied concepts of probability and statics with the following fundamentals: 1- The student acquires a general definition of probability and the possibility of applyi it in other sciences, scientifically and humanly 2- Studying the methods and methods used in solving questionnaires and analyzing problems about principles of counting. 3- Enable the student to understand the content of probability and how it overlaps wit the rest of the sciences 4- Identify the odd and common marginal functions 5- Understanding the types of probability and how to differentiate between it. 6- Identifying the discontinuous and continuous variables and how to deal with each o them. 7- Studying the statistical measures, relation between them and how we applicate it w respect to real problems

	8- Studying the statistical distributions with respect to types of variables and applicate the measures on it. 9- Studying the relation between x & y according to correlation coefficient of joint probability distribution. 10- The skills goals special to the course of probability 11- The possibility of predicting life issues and their behavior in the future or in the pas 12- The possibility of using probabilistic measures to solve the probability distributions the samples and the population 12- The ability to relate vital issues to possibility and to find possible solutions to them, or hypothetical

10. Course Structure

The week	Hours	Required learning outcomes	Unit/Module or Topic Title	Teaching Method	Assessment Method
Week 1	2 theoretical and 1 tutorial		Introduction to control systems	In class	In class activities
Week 2	2 theoretical and 1 tutorial		Open and Close system	In class	In class activities and home duties
Week 3	2 theoretical and 1 tutorial		Transfer function concept and Block Diagram reduction	In class	In class activities
Week 4	2 theoretical and 1 tutorial		Feedback system	In class	In class activities
Week 5	2 theoretical and 1 tutorial		Study Linear systems and its Transfer Function (RLC circuit and AC motor)	In class	In class activities and home duties
Week 6	2 theoretical and 1 tutorial		Block Diagram Algebra	In class	In class activities and home duties
Week 7	2 theoretical and 1 tutorial		Signal flow graphs and Mason's signal-flow Graph Models	In class	In class activities and home duties
Week 8	2 theoretical and 1 tutorial		Mid Exam	In class	Quiz 1
Week 9	2 theoretical and 1 tutorial		Stability of system & Transient Response stability	In class	Questions during the lecture
Week 10	2 theoretical and 1 tutorial		Steady State error	In class	Home duties and questions during the lecture
Week 11	2 theoretical and 1 tutorial		Routh's Hurwitz stability	In class	Mid Term
Week 12	2 theoretical and 1 tutorial		State Transition Matrix	In class	Quiz 2
Week 13	2 theoretical and 1 tutorial		Root Locus and zero-pole placement	In class	In class activities

Week 14	2 theoretical and 1 tutorial		PID Controller	In class	Assignment Presentation
Week 15	2 theoretical and 1 tutorial		Comprehensive semester exam	In class	In class activities
Week 16	3 hrs		**Final Exam**		Final Exam

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .....etc

12. Learning and Teaching Resources

Required textbooks (curricular boo if any)	• Richard C. Dorf and Robert H. Bishop ”Mode Control Systems”. • Katsuhiko Ogata “Modern control engineering”, 5th edition.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	Research in research engines specialized in scientific research such as: • Google scholar • Science direct • IEEE.
Electronic References, Websites	

Semester Description Form
Computer Networks

1. Semester Name:
Computer Networks
2. Semester Code:
3. Semester / Year:
fourth-stage/2st Semester
4. Description Preparation Date:
1/2/2026
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)
90 Hrs. / 6
7. Semester administrator's name (mention all, if more than one name)
Name: dr.Dhamyaa Husam Mohammed Email: bahaa.almusawi@uokufa.edu.iq

8. Semester Objectives

Semester Objectives	• Understand the fundamental concepts and architecture of computer networks. • Analyze network protocols and their roles in data communication. • Study network topologies, including LAN, WAN, and their components. • Learn about IP addressing, subnetting, and routing protocols. • Explore the principles of network design and implementation. • Understand the functionality and configuration of network devices like routers and switches. • Study network security concepts, including encryption, authentication, and firewalls. • Apply knowledge of network management and monitoring tools to ensure optimal performance.

9. Teaching and Learning Strategies

Strategy	• Lectures and Interactive Discussions

	• Laboratory Experiments • Problem-Solving Sessions: • Design Projects • Tutorials and Recitations • Group Projects and Peer Learning • Use of Simulation Software

10. Semester Structure

Weeks	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1–2	12		Introduction to Computer Networks, OSI & TCP/IP Models	Lectures, Interactive Activities	Quiz, Assignment
3–4	12		Physical and Data Link Layers: Ethernet, Switching, MAC Protocols	Lectures, Wireshark Labs	Homework, Lab Report
5–6	12		Network Layer: IP Addressing, Subnetting, Routing Protocols	Hands-on Labs, Packet Tracer Simulations	Lab Assignment, Midterm Exam
7–8	12		Transport Layer: TCP/UDP Mechanisms and Error Control	Simulation Labs, Protocol Analysis	Lab Report, Quiz
9–10	12		Application Layer Protocols (HTTP, DNS, DHCP)	Problem-Based Learning, Mini Design Task	Assignment, Case Study
11–12	12		Network Design Principles, Performance Metrics, and Testing	Network Simulation Tools (e.g., Cisco Packet Tracer, GNS3)	Project Planning, Team Report
13–14	12		Team Design Project: LAN/WAN Design and Implementation	Group Project, Configuration & Troubleshooting	Peer Assessment, Presentation
15	6		Final Project Presentation & Course Wrap-up	Presentations, Team Review	Final Project, Viva Exam

11. Semester Evaluation

- Problem-Based Learning (PBL), Frequent Quizzes, Peer Review, Homework = 10%
- Project Work
- Mid Exams based on Rubric
- Final Exam based on Rubric
- Lab reports

12. Learning and Teaching Resources

- Computer Networking: A Top-Down Approach by James Kurose and Keith Ross
- Computer Networks by Andrew S. Tanenbaum and David J. Wetherall
- Data and Computer Communications by William Stallings
- Cisco Networking Academy for online Semesters and certifications in networking
- Semesters or edX Semesters on computer networks, cybersecurity, and network protocols Laboratory Equipment
- Cisco Packet Tracer for network simulation and practice Research papers, tutorials, and additional learning modules.
- Model platform