



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

دليل وصف البرنامج الأكاديمي والمقرر الدراسي

2026-2025

المقدمة:

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

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

ويتضمن هذا الدليل بنسخته الثانية وصفاً للبرنامج الأكاديمي بعد تحديث مفردات وفقرات الدليل السابق في ضوء مستجدات وتطورات النظام التعليمي في العراق والذي تضمن وصف البرنامج الأكاديمي بشكلها التقليدي نظام (سنوي، فصلي) فضلاً عن اعتماد وصف البرنامج الأكاديمي المعمم بموجب كتاب دائرة الدراسات ت م 2906/3 في 2023/5/3 فيما يخص البرامج التي تعتمد مسار بولونيا أساساً لعملها.

المفاهيم والمصطلحات:

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

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

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

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

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

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

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

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

نموذج وصف البرنامج الأكاديمي

اسم الجامعة: جامعة التراث

الكلية / المعهد: كلية العلوم

القسم العلمي: قسم علوم الذكاء الاصطناعي (تم استحداثه في العام الدراسي 2023-2024)

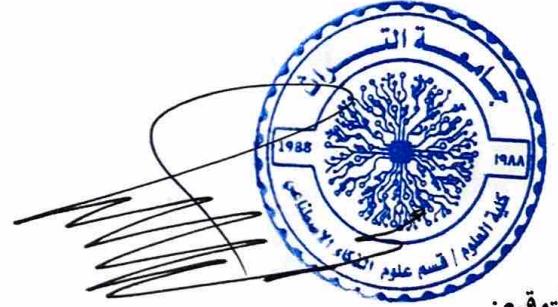
اسم البرنامج الأكاديمي أو المهني: بكالوريوس في علوم الذكاء الاصطناعي

اسم الشهادة النهائية: بكالوريوس في علوم الذكاء الاصطناعي

النظام الدراسي: بولونيا

تاريخ اعداد الوصف:

تاريخ ملئ الملف:



التوقيع:

اسم رئيس القسم: أ.م.د. هادي ربحو سلمان

التاريخ:

التوقيع:

اسم معاون القسم: أ.م.د. هادي ربحو سلمان

التاريخ:

دقق الملف من قبل: أ.م.د. هادي ربحو سلمان

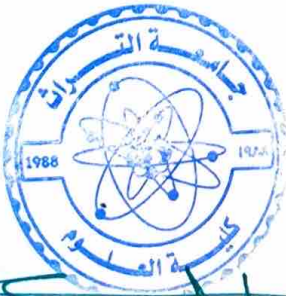
شعبة ضمان الجودة والأداء الجامعي

اسم مدير شعبة ضمان الجودة والأداء الجامعي:

أ.م.د. هادي ربحو سلمان

التاريخ:

التوقيع:



مصادقة السيد الأستاذ
إبراهيم محمد الدين عبد الله
عميد كلية العلوم

1. رؤية البرنامج يتخيل قسم الذكاء الاصطناعي مستقبلاً يُستفاد فيه من تقنيات الذكاء الاصطناعي لإحداث تحول إيجابي في الصناعات والمجتمعات وحبابة الأفراد. ويتطلع إلى أن يكون مركز تميز معترفاً به عالمياً في تعليم الذكاء الاصطناعي وبحثه، منتجاً خريجين ليسوا فقط بارعين تقنياً ولكن أيضاً على دراية عميقة بالآثار الأخلاقية والاجتماعية والبيئية للذكاء الاصطناعي. ومن خلال العمل، يسعى إلى تشكيل مشهد الذكاء الاصطناعي، دافعاً الابتكار والشمولية والاستدامة في تطوير الذكاء الاصطناعي ونشره، وفي النهاية، إحداث تأثير يدوم وإيجابي على العالم.
2. رسالة البرنامج تتمثل رسالة قسم الذكاء الاصطناعي في تثقيف وإلهام وتمكين الجيل القادم من متخصصي الذكاء الاصطناعي. ويلتزم القسم بتوفير تعليم شامل ومتطور في مجال الذكاء الاصطناعي، ورعاية البحث والابتكار، وتعزيز ممارسات الذكاء الاصطناعي الأخلاقية والمسؤولة. ويهدف إلى إعداد الطلاب للتفوق في المجالات المتعلقة بالذكاء الاصطناعي، والمساهمة في تطوير تكنولوجيا الذكاء الاصطناعي، ومواجهة تحديات العالم الحقيقي بحلول مبتكرة للذكاء الاصطناعي.
3. أهداف البرنامج يهدف قسم علوم الذكاء الاصطناعي إلى تحقيق الأهداف التالية من قبل الطلاب الحاصلين على درجة البكالوريوس في علوم الذكاء الاصطناعي ومن أهم الأهداف ما يلي: • تزويد الطلاب بأساس متين في نظرية الذكاء الاصطناعي وتطبيقاته. • تعزيز مهارات التفكير النقدي وحل المشكلات المتعلقة بالذكاء الاصطناعي. • غرس الاعتبارات الأخلاقية والتطوير المسؤول للذكاء الاصطناعي. • تشجيع التعاون والابتكار بين التخصصات. • إعداد الطلاب لوظائف في مجال البحث والتطوير وتطبيق الذكاء الاصطناعي.
4. الاعتماد البرامجي قسم علوم الذكاء الاصطناعي تم استحداثه حديثاً في العام الدراسي 2023-2024
5. المؤثرات الخارجية الأخرى نحن في قسم علوم الذكاء الاصطناعي ندرك أهمية المؤثرات الخارجية في تعزيز مكانة القسم وتحقيق أهدافه. لذا، نعمل على تطوير شراكات استراتيجية مع الجهات الداعمة والمؤسسات الأكاديمية والصناعية لتعزيز البنية التحتية التقنية والمختبرية. هذا التعاون يسهم في توفير أحدث التقنيات والبرمجيات التي تمكن الطلاب من التدريب العملي المتميز. بالإضافة إلى ذلك، نسعى للحصول على تمويل خارجي من خلال المنح البحثية والمشاريع المشتركة مع الجهات المهمة بمجال الذكاء الاصطناعي. هذه الجهود تسهم في استدامة البرامج الأكاديمية وتطويرها بما يتماشى مع التحديات المتزايدة في هذا المجال. كما نولي اهتماماً كبيراً بالتفاعل المجتمعي ونشر الوعي حول أهمية الذكاء الاصطناعي، من خلال تنظيم ورش عمل وفعاليات توعوية تستهدف المجتمع المحلي والمؤسسات المختلفة. هذا الدور المجتمعي يعزز من مكانة القسم كجهة رائدة في تقديم الحلول والخبرات في مجال الذكاء الاصطناعي وتعليم الآلة.

6. هيكلية البرنامج				
هيكل البرنامج	عدد المقررات	وحدة دراسية ECTS	النسبة المئوية	ملاحظات *
متطلبات المؤسسة	6	12	13%	اساسي
متطلبات الكلية	2	8	4%	اساسي
متطلبات القسم	39	220	83%	اساسي
التدريب الصيفي	1			اساسي
أخرى				

7. وصف البرنامج				
السنة / المستوى	رمز المقرر أو المساق	اسم المقرر أو المساق	الساعات المعتمدة	
			نظري	عملي
المرحلة الاولى / الفصل الاول	TU-AI01	تقنيات الحاسوب	2	2
	TU-AI02	اساسيات البرمجة	3	2
	TU-AI03	مقدمة الى الذكاء الاصطناعي	3	-
	TU-AI04	الرياضيات	3	-
	TU-AI05	اللغة الانكليزية I	2	-
	TU-AI06	الديمقراطية وحقوق الإنسان	2	-
المرحلة الاولى / الفصل الثاني	TU-AI07	الرياضيات المتقطعة	3	-
	TU-AI08	البرمجة المهيكلية	4	2
	TU-AI09	التصميم المنطقي	2	2
	TU-AI10	علم البيانات	3	2
	TU-AI11	اللغة العربية I	2	-
	TU-AI12	جرائم حزب البعث البائد	2	-
المرحلة الثانية / الفصل الاول	TU-AI13	تمثيل المعرفة	3	-
	TU-AI14	التحليل العددي	2	2
	TU-AI15	اساسيات البرمجة الشينية	3	2
	TU-AI16	نظرية احتسابية	2	-
	TU-AI17	برمجة بلغة بايثون	3	2
	TU-AI18	تطبيقات الذكاء الاصطناعي	2	-
المرحلة الثانية / الفصل الثاني	TU-AI19	البرمجة الشينية المتقدمة	3	2
	TU-AI20	خوارزميات وهياكل البيانات	3	2
	TU-AI21	اساسيات تعليم الآلة	3	2
	TU-AI22	خوارزميات الذكاء الاصطناعي	3	2
	TU-AI23	اللغة العربية II	2	-
	TU-AI24	اللغة الانكليزية 2	2	-
المرحلة الثالثة / الفصل الاول	TU-AI25	الترجمات	2	2
	TU-AI26	معمارية الحاسبة	2	-
	TU-AI27	شبكات الحاسوب	2	2
	TU-AI28	مشاكل التحسين	3	-
	TU-AI29	قواعد البيانات	2	2
	TU-AI30	تعليم الآلة متقدمة	3	2

2	3	استرجاع المعلومات	TU-AI31	المرحلة الثالثة / الفصل الثاني
2	3	تطبيقات الويب	TU-AI32	
2	3	الاستكشاف الموجه	TU-AI33	
2	3	التعليم العميق	TU-AI34	
-	2	أمنية الحاسوب	TU-AI35	

8. مخرجات التعلم المتوقعة للبرنامج	
المعرفة	
الأهداف المعرفية لقسم علوم الذكاء الاصطناعي : 1- إكساب الطلبة المعرفة والمهارات اللازمة لتحليل مشكلات الذكاء الاصطناعي وتصميم الحلول المناسبة باستخدام أفضل الممارسات التقنية، بما يؤهلهم للتميز والإبداع وتبوء المناصب المرموقة في سوق العمل. 2- تعزيز القدرة على الابتكار مع الالتزام بالإطار المهني والقانوني والأخلاقي، والعمل بفاعلية ضمن فرق عمل متعددة التخصصات. 3- تمكين الطلبة من التعلم الذاتي المستمر لمواكبة التطورات الحديثة في صناعة تقنيات الذكاء الاصطناعي، وتبني الأساليب والتقنيات الجديدة. 4- تنمية قدرات الطلبة على تحليل ومناقشة النتائج باستخدام المعرفة المكتسبة خلال فترة دراستهم. 5- زيادة خبرة الطلبة في البحث العلمي، بما يشمل التأكد من صحة النتائج والاستنتاجات المستخلصة. 6- تعزيز الخبرة المهنية من خلال تطبيق المعارف والمهارات المكتسبة عملياً خلال فترة التعليم. 7- تهيئة الطلبة للالتحاق ببرامج الدراسات العليا في مجالات الذكاء الاصطناعي أو غيرها من التخصصات التقنية ذات الصلة.	
المهارات	
الأهداف مهارتية الخاصة ببرنامج الذكاء الاصطناعي : 1- إتقان البرمجة والتحليل الإحصائي: إجادة أساسيات البرمجة وتطوير الآليات، مع معالجة البيانات الضخمة وإجراء التحليلات الإحصائية المتقدمة لتأمين البنية المعلوماتية. 2- تطوير نماذج الذكاء الاصطناعي والتعلم العميق: تصميم وبناء نماذج التعلم العميق والشبكات العصبية الاصطناعية، مع التخصص في معالجة البيانات غير الهيكلية وتقنيات الرؤية الحاسوبية. 3- تطوير التطبيقات والحلول الذكية: بناء وتطوير التطبيقات والحلول البرمجية الذكية المعتمدة على تقنيات الذكاء الاصطناعي. لدمج اتخاذ القرار وتطوير الخدمات. 4- الالتزام بالمعايير والأخلاقيات المهنية: التطبيق الكامل لأخلاقيات الذكاء الاصطناعي والالتزام بالمعايير والممارسات المهنية المعتمدة ذات الصلة.	
القيم	
1- فهم الطلبة لأسس الذكاء الاصطناعي وتشجيع روح التعاون والعمل الجماعي. 2- ترسيخ القيم الأخلاقية لدى الطلبة، بما في ذلك الانتماء واحترام النظام والالتزام باللوائح الإدارية. 3- غرس روح المبادرة والإيجابية لدى الطلبة لتمكينهم من مواجهة تحديات العمل في المستقبل. 4- تشجيع الطلبة على المشاركة في الأنشطة اللاصفية والتطوعية والمجتمعية لتعزيز دورهم المجتمعي. 5- تعزيز قيم المواطنة والهوية الوطنية وروح الإيثار كجزء من مسؤولياتهم المهنية والاجتماعية. 6- هذا التوجه يعكس رؤية قسم علوم الذكاء الاصطناعي في إعداد خريجين يمتلكون المعرفة والمهارات والقيم اللازمة للنجاح في بيئة العمل الديناميكية والتقنية .	

9. استراتيجيات التعليم والتعلم

- 1- تقديم المحاضرات النظرية والتطبيقية: يتم استخدام الكتب المنهجية والكتب المساعدة، إلى جانب الوسائل الحديثة في التعليم، لضمان تقديم المحتوى الأكاديمي بأسلوب شامل ومبتكر.
- 2- تنمية المهارات الأساسية: يتم تزويد الطلبة بمهارات أساسية في استخدام الحاسوب والتعلم الإلكتروني، مع توظيف الأجهزة والتقنيات الحديثة لتعزيز عملية التعلم وتطوير قدراتهم التقنية.
- 3- تشجيع الإبداع في مشاريع التخرج: يُمنح الطلبة الحرية الكافية لاختيار موضوعات بحوث التخرج بما يتيح لهم استكشاف طاقاتهم الفكرية، والكشف عن اهتماماتهم وميولهم العلمية، بما يتماشى مع متطلبات الذكاء الاصطناعي .
- 4- تعزيز التفاعل والنقاش: يتم توفير بيئة تعليمية تتيح للطلبة طرح أفكارهم خلال المحاضرات، مع فتح المجال للمناقشة وتبادل الآراء، بالإضافة إلى تطوير مهارات تحليل البيانات والتوصل إلى الاستنتاجات العلمية.
- 5- هذه المنهجية تهدف إلى إعداد خريجين يتمتعون بالكفاءة والابتكار والقدرة على مواجهة التحديات في مجال الذكاء الاصطناعي.

10. طرائق التقييم

- 1- الامتحانات الإلكترونية
- 2- الامتحانات المركزية والشهرية.
- 3- الامتحانات اليومية.
- 4- الواجبات اليومية.
- 5- التقارير العلمية.
- 6- الامتحانات المختبرية الحاسوبية.
- 7- مشاريع التخرج.

التطوير المهني	
توجيه أعضاء هيئة التدريس الجدد	
1-	التعليم الإلكتروني : تعزيز التعلم عن بعد من خلال منصات تعليمية متخصصة في مجال الذكاء الاصطناعي .
2-	استخدام الإنترنت : توظيف موارد الإنترنت الحديثة لتوفير محتوى علمي محدث ودعم البحث والتطوير .
3-	استخدام وسائل التواصل الحديثة: الاستفادة من تقنيات التواصل المتقدمة لتسهيل التفاعل بين الطلبة وأعضاء هيئة التدريس، ومشاركة المعرفة .
4-	توظيف وسائل الاتصال الحديثة : تطبيق أحدث تقنيات الاتصال لضمان تجربة تعليمية متكاملة وديناميكية .
5-	الأنشطة اللاصفية : تنظيم أنشطة علمية ومجتمعية تهدف إلى تعزيز وعي الطلبة بأهمية الذكاء الاصطناعي وتنمية مهاراتهم الشخصية .
6-	دورات تدريبية متقدمة : تقديم برامج تدريبية متطورة تركز على تعليم أحدث البرامج والتقنيات المستخدمة في الذكاء الاصطناعي.
7-	الاستشارات العلمية : توفير استشارات علمية متخصصة تساعد في تطوير حلول مبتكرة لتطبيقها في مختلف المجالات التقنية .
8-	هذا النهج يدعم رؤية القسم في إعداد كوادر مؤهلة قادرة على مواجهة التحديات في مجال الذكاء الاصطناعي وتعليم الآلة وتلبية متطلبات سوق العمل المتطورة.
التطوير المهني لأعضاء هيئة التدريس	
1-	استراتيجيات التدريس والتعلم :
	تشجيع استخدام أساليب تدريس مبتكرة تتماشى مع متطلبات الذكاء الاصطناعي، مثل التعلم القائم على المشاريع، وحل المشكلات، والتعلم التفاعلي باستخدام تقنيات المحاكاة . دمج التقنيات الحديثة في العملية التعليمية، مثل منصات التعليم الإلكتروني وبرمجيات التدريب على الذكاء الاصطناعي .
2-	تقييم نتائج التعلم :
-	وضع آليات دورية لتقييم نتائج تعلم الطلبة من خلال اختبارات معيارية ومشاريع عملية وتقارير بحثية .
-	إجراء استبيانات لتقييم جودة التدريس واستفادة الطلبة من المناهج، مع تقديم التغذية الراجعة لتحسين الأداء .
3-	التطوير المهني :
-	تنظيم ورش عمل ودورات تدريبية مستمرة لأعضاء هيئة التدريس لتطوير معرفتهم بأحدث تقنيات الذكاء الاصطناعي وأدواته .
-	دعم مشاركة أعضاء هيئة التدريس في المؤتمرات والندوات المحلية والدولية لعرض أبحاثهم والتعرف على التطورات الحديثة .
-	تشجيع البحث العلمي في مجالات الذكاء الاصطناعي وتعليم الآلة من خلال توفير التمويل اللازم والدعم اللوجستي .
4-	التعاون الأكاديمي :
-	إنشاء شراكات مع جامعات ومؤسسات بحثية عالمية لتعزيز التعاون الأكاديمي وتبادل الخبرات .
-	استضافة خبراء في مجال الذكاء الاصطناعي لتقديم محاضرات ودورات تدريبية لأعضاء هيئة التدريس .
5-	التقييم والتطوير الذاتي :
-	وضع خطط فردية لتطوير أعضاء هيئة التدريس بناءً على احتياجاتهم المهنية وأهداف القسم .
-	توفير بيئة داعمة لتبادل الأفكار والخبرات بين أعضاء هيئة التدريس لتعزيز التعاون والتطوير المستمر .
-	تهدف هذه الخطة إلى رفع كفاءة أعضاء هيئة التدريس وضمان تقديم تعليم عالي الجودة يلبي متطلبات سوق العمل في مجال الذكاء الاصطناعي وتعليم الآلة.

11. معيار القبول
1- القبول المركزي : يعتمد القبول في قسم علوم الذكاء الاصطناعي على نظام القبول المركزي التابع لوزارة التعليم العالي والبحث العلمي، لضمان توزيع عادل للطلبة المؤهلين. 2- معايير القبول : يتم تحديد قبول الطلبة بناءً على معدلاتهم ضمن قوائم القبول المركزي. مع ذلك، يُمنح أبناء أعضاء هيئة التدريس وأبناء الشهداء وبعض الفئات المستفيدة من الامتيازات المحددة في تعليمات الوزارة، الحق في اختيار القسم وفق رغبتهم الشخصية، مع ضمان توزيعهم بما يتماشى مع احتياجات الأقسام العلمية . تهدف هذه السياسة إلى تحقيق العدالة في توزيع الطلبة مع مراعاة الفئات ذات الامتيازات الخاصة وفق التعليمات الوزارية. 3- اجتياز الطالب للمقابلة الشخصية مع لجنة القبول في الكلية و لجنة الأهلية.

12. أهم مصادر المعلومات عن البرنامج (تذكر بصورة مختصرة)
1- الموقع الرسمي لجامعة الترات https://uoturath.edu.iq 2- الموقع الالكتروني لكلية العلوم وقسم علوم الذكاء الاصطناعي https://tucos.uoturath.edu.iq 3- ملفات وصف البرنامج الأكاديمي والمقررات الدراسية. 4- تعليمات وأدلة وزارة التعليم العالي والبحث العلمي. 5- مجلس القسم العلمي.

13. خطة تطوير البرنامج
- نعمل في قسم علوم الذكاء الاصطناعي على تعزيز مهارات الطلبة في البحث والتقصي من خلال الأنشطة الأكاديمية المختلفة، بما في ذلك حضور المناقشات العلمية وكتابة البحوث التخصصية في مجال الذكاء الاصطناعي. - كما نركز على تنمية قدراتهم في تحليل البيانات، الاستنتاج المنطقي، وتطوير مهارات التفكير النقدي والحجج العلمية. ولتحقيق ذلك، يتم تشجيع الطلبة على زيارة المكتبة أسبوعياً لاستكشاف المصادر الأكاديمية والكتب والمجلات العلمية التي تُعد مورداً أساسياً للمعلومات. بالإضافة إلى ذلك، يتم توجيههم لاستخدام شبكات الإنترنت، والتعلم الإلكتروني، والمراجع الإلكترونية، والمواقع العلمية المتخصصة في الذكاء الاصطناعي وتعليم الآلة، لتعزيز معارفهم ومواكبة التطورات التكنولوجية الحديثة. - تهدف هذه الجهود إلى إعداد الطلبة ليصبحوا باحثين متميزين قادرين على المساهمة في تطوير مجال الذكاء الاصطناعي وتعليم الآلة ومواجهة تحدياته المستقبلية.

القيم				المهارات				المعرفة				اساسي أم اختياري	اسم المقرر	رمز المقرر	السنة / المستوى
ج4	ج3	ج2	ج1	ب4	ب3	ب2	ب1	أ4	أ3	أ2	أ1				
✓	✓		✓		✓		✓			✓	✓	اساسي	تقنيات الحاسوب	TU-AI01	المرحلة الاولى / الفصل الاول
✓	✓		✓	✓	✓		✓			✓	✓	اساسي	اساسيات البرمجة	TU-AI02	
✓	✓		✓	✓			✓		✓	✓	✓	اساسي	مقدمة الى الذكاء الاصطناعي	TU-AI03	
✓	✓			✓			✓			✓	✓	اساسي	الرياضيات	TU-AI04	
✓	✓	✓				✓			✓		✓	اساسي	اللغة الانكليزية I	TU-AI05	
✓	✓	✓	✓	✓				✓	✓			اساسي	الديمقراطية وحقوق الإنسان	TU-AI06	
✓	✓			✓			✓			✓	✓	اساسي	الرياضيات المنقطعة	TU-AI07	المرحلة الاولى / الفصل الثاني
✓	✓		✓	✓	✓		✓			✓	✓	اساسي	البرمجة المهيكلية	TU-AI08	
✓	✓		✓		✓		✓			✓	✓	اساسي	التصميم المنطقي	TU-AI09	
✓	✓		✓	✓	✓		✓		✓	✓	✓	اساسي	علم البيانات	TU-AI10	
✓	✓	✓					✓		✓		✓	اساسي	اللغة العربية I	TU-AI11	
✓	✓	✓	✓	✓				✓	✓			اساسي	جرائم حزب البعث البائد	TU-AI12	

✓	✓		✓	✓	✓		✓		✓	✓	✓	اساسي	تمثيل المعرفة	TU-AI13	المرحلة الثانية / الفصل الاول
✓	✓			✓			✓			✓	✓	اساسي	التحليل العددي	TU-AI14	
✓	✓		✓	✓	✓		✓			✓	✓	اساسي	اساسيات البرمجة الشينية	TU-AI15	
✓	✓			✓			✓			✓	✓	اساسي	نظرية احتسابية	TU-AI16	
✓	✓		✓	✓	✓		✓			✓	✓	اساسي	برمجة بلغة بايثون	TU-AI17	
✓	✓		✓	✓	✓		✓		✓	✓	✓	اساسي	تطبيقات الذكاء الاصطناعي	TU-AI18	
✓	✓		✓	✓	✓		✓			✓	✓	اساسي	البرمجة الشينية المتقدمة	TU-AI19	المرحلة الثانية / الفصل الثاني
✓	✓		✓	✓	✓		✓			✓	✓	اساسي	خوارزميات وهياكل البيانات	TU-AI20	
✓	✓		✓	✓	✓		✓		✓	✓	✓	اساسي	اساسيات تعليم الالة	TU-AI21	
✓	✓		✓	✓	✓		✓		✓	✓	✓	اساسي	خوارزميات الذكاء الاصطناعي	TU-AI22	
✓	✓	✓					✓		✓		✓	اساسي	اللغة العربية II	TU-AI23	
✓	✓	✓					✓		✓		✓	اساسي	اللغة الانكليزية 2	TU-AI24	
✓	✓		✓	✓	✓		✓			✓	✓	اساسي	المترجمات	TU-AI25	المرحلة الثالثة / الفصل الاول

مخطط مهارات البرنامج													
مخرجات التعلم المطلوبة من البرنامج													

✓	✓		✓		✓		✓			✓	✓	اساسي	معمارية الحاسبة	TU-AI26	المرحلة الثالثة / الفصل الاول
✓	✓		✓		✓		✓	✓		✓	✓	اساسي	شبكات الحاسوب	TU-AI27	
✓	✓		✓	✓	✓		✓			✓	✓	اساسي	مشاكل التحسين	TU-AI28	
✓	✓		✓	✓	✓		✓			✓	✓	اساسي	قواعد البيانات	TU-AI29	
✓	✓		✓	✓	✓		✓		✓	✓	✓	اساسي	تعليم الالة متقدمة	TU-AI30	
✓	✓		✓	✓	✓		✓			✓	✓	اساسي	استرجاع المعلومات	TU-AI31	المرحلة الثالثة / الفصل الثاني
✓	✓	✓	✓	✓		✓		✓		✓	✓	اساسي	تطبيقات الويب	TU-AI32	
✓	✓		✓	✓			✓			✓	✓	اساسي	الاستكشاف الموجه	TU-AI33	
✓	✓		✓	✓	✓		✓		✓	✓	✓	اساسي	التعليم العميق	TU-AI34	
✓	✓		✓	✓	✓		✓	✓		✓	✓	اساسي	امنية الحاسوب	TU-AI35	

القسم العلمي تم استحداثه في العام الدراسي 2023 - 2024 ، لذلك تم الاختصار على مخرجات التعلم من البرنامج للمراحل الأولى والثانية والثالثة – الفصلين
الدراسيين الاول والثاني.

الوصف الأكاديمي
مسار بولونيا
المستوى الأول والثاني والثالث
2026-2025

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Computer Technology		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI01			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	1	Semester of Delivery		1
Administering Department	AI	College	Science	
Module Leader	Assist. Lec. Rashid Merzah		e-mail	Rashid.merzah@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.		Module Leader's Qualification	M.Sc.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		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	- Provide a basic knowledge of computer hardware and software - Introduce the business areas to which computers may be applied. - Provide an introduction to business organization and information systems. - Develop the skills in network & communication , which play an important part in business computing and information processing
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	- The student should understand the architecture of any IT systems. - The student should understand the parts of hardware. - The student should understand the system software. - The student should understand the architecture of networks ,protocols and communications devices.
Indicative Contents المحتويات الإرشادية	Data Conversion · D/A converters · A/D converters · Sample and Hold circuits Digital Component Operations · Multiplexing · Data storage · Integrated Circuits Digital Technology · Memory Technology · Circuit Board Technology · Nano-Technology

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	- The student should use utilities in the lab to apply scientific experiment - The ability to execute the applications software .

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #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 of Computers and Programming
Week 2	Brief history of computer
Week 3	Generation of Computers & Computer hierarchy
Week 4	Basic Computer Components
Week 5	Computer function (fetch cycle, interrupt cycle, I/O function)
Week 6	Semiconductor main memory (RAM, ROM, CACHE)
Week 7	Midterm Exam
Week 8	Computer Software(application software)
Week 9	External & Internal memory
Week 10	Telecommunications system & Network
Week 11	Topology of a network and layering
Week 12	data representation
Week 13	Multimedia
Week 14	Computer Security
Week 15	All Topics
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	Basic Computer Components
Week 2	Computer function (fetch cycle, interrupt cycle, I/O function)
Week 3	Computer function (fetch cycle, interrupt cycle, I/O function)
Week 4	Semiconductor main memory (RAM, ROM, CACHE)
Week 5	Computer Software(application software)
Week 6	Computer Software(application software)
Week 7	External & Internal memory
Week 8	External & Internal memory
Week 9	Telecommunications system & Network
Week 10	Topology of a network
Week 11	Topology of a network
Week 12	Layering model
Week 13	Layering model
Week 14	Protocols
Week 15	addressing communications

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1.Computing Essentials Making IT work for you 2017 by Timothy J. O’Leary. 2.Computer Organization and Architecture Designing for Performance (8th Edition).	No
Recommended Texts		No
Websites		

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

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Programming Basics		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☒ Practical ☐ Seminar	
Module Code	TU-AI02			
ECTS Credits	9			
SWL (hr/sem)	225			
Module Level	UGx11 1	Semester of Delivery		1
Administering Department	AI	College	Science	
Module Leader	Assist. Lec. Ali M. Al-Tameemi		e-mail	ali.mohamed@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.	Module Leader's Qualification	Ms.c.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	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	- Understand the concepts and terms used to describe languages that support the imperative, functional, and logic programming paradigms. - Solve problems using the functional paradigm
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Develop proficiency in the C++ programming language, including a strong understanding of its syntax, semantics, data types, control structures, functions, and object-oriented programming concepts.
Indicative Contents المحتويات الإرشادية	Introduction to C++ Programming Object-Oriented Programming (OOP) in C++ C++ Standard Library Memory Management in C++ Data Structures and Algorithms in C++ C++ Application Development

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Conceptual Understanding: Hands-on Practice Code Review and Feedback Problem-Solving Exercises

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	225		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	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	Algorithms
Week 2	Introduction to programming languages and C++
Week 3	Variables
Week 4	C++ Libraries
Week 5	C++ User Input
Week 6	C++ Operators
Week 7	Mid-term Exam
Week 8	C++ Strings & C++ Math
Week 9	C++ Booleans
Week 10	If condition
Week 11	Switch condition
Week 12	While loop
Week 13	Do-while loop
Week 14	For loop
Week 15	C++ Break and Continue
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المناهج الاسبوعي للمختبر

	Material Covered
Week 1	C++ Libraries
Week 2	C++ User Input
Week 3	C++ Operators
Week 4	If condition
Week 5	Switch condition
Week 6	While loop
Week 7	Do-while loop
Week 8	For loop
Week 9	C++ Break and Continue

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	The C++ Programming Language (4th Edition) by by Bjarne Stroustrup	No
Recommended Texts		
Websites	https://www.learncpp.com/ https://www.w3schools.com/Cpp/default.asp	

Grading Scheme

مخطط الدرجات

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

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	Introduction to Artificial Intelligence (AI)		Module Delivery
Module Type	C		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☒ Practical ☐ Seminar
Module Code	TU-AI03		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	UGx11 1	Semester of Delivery	1
Administering Department	AI	College	Science
Module Leader	Assist. Lec. bushra.rabeea Nada	e-mail	bushra.rabeea@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.	Module Leader's Qualification	M.Sc.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/9/2025	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 aim of this module is to provide an introduction to Artificial Intelligence (AI) and its various applications. Students will gain a comprehensive understanding of the fundamental concepts, techniques, and algorithms used in AI, as well as the ethical considerations associated with its use. The module will also explore the impact of AI on society, economy, and various industries.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students are expected to: 1. Understand the basic concepts and principles of Artificial Intelligence. 2. Gain knowledge of various AI techniques and algorithms. 3. Develop an understanding of the ethical implications of AI. 4. Analyze the impact of AI on different aspects of society and industry. 5. Apply AI techniques to solve real-world problems.
Indicative Contents المحتويات الإرشادية	Introduction to Artificial Intelligence Definition, brief history, and scope of AI. Different types of AI systems. Problem Solving and Search Algorithms Problem formulation and representation. Uninformed search algorithms (e.g., breadth-first search, depth-first Machine Learning Ethical and Social Implications of

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Conceptual Understanding: Hands-on Practice Code Review and Feedback Problem-Solving Exercises

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem)	57	Unstructured SWL (h/w)	4

الحمل الدراسي غير المنتظم للطالب أسبوعيا	الحمل الدراسي غير المنتظم للطالب خلال الفصل
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	Historical overview of AI, AI Introduction
Week 2	Programing and AI important
Week 3	AI Types
Week 4	Problem Solving: Introduction to problem-solving techniques and algorithms
Week 5	AI Applications Overview: A survey of AI applications in various domains such as healthcare, finance, and gaming.
Week 6	search algorithms like depth-first search and breadth-first search.
Week 7	Mid-term Exam
Week 8	Machine Learning Basics: A brief introduction to the fundamentals of machine learning
Week 9	Supervised learning
Week 10	unsupervised learning
Week 11	Expert systems
Week 12	Knowledge base
Week 13	Rule based approaches
Week 14	AI Ethics Awareness: An introduction to ethical considerations in AI, including fairness, bias, and responsible AI development.

Week 15	Preparatory week before the final Exam
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Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Book Title: "Artificial Intelligence: A Guide to Intelligent Systems" Author: Michael Negnevitsky	No
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
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Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
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	Mathematics		Module Delivery	
Module Type	B		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☒ Practical ☐ Seminar	
Module Code	TU-AI04			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	1	Semester of Delivery		1
Administering Department	AI	College	Science	
Module Leader	Dr. Qais Y. Hatam		e-mail	qais.yahya@uoturath.edu.iq
Module Leader's Acad. Title	Lecturer Dr.	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	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	Core Mathematical Knowledge: The course aims to provide students with a solid foundation of core mathematical concepts and theories. This includes topics such as algebra, calculus, geometry, discrete mathematics, probability, and statistics. The aim is to ensure that students have a comprehensive understanding of fundamental mathematical principles.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: - Understand and use basic mathematical terminology. - Understand the role of formal definitions and proofs and be able to apply them in problem solving. - Understand the basics of propositional and predicate logic. - Understand the basics of elementary set theory. - Understand the basics of mathematical relations and functions. - Understand the basics of graph theory.
Indicative Contents المحتويات الإرشادية	Calculus Linear Algebra Discrete Mathematics Probability and Statistics Differential Equations

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Hands-on Practical Exercises Case Studies and Real-World Examples Collaborative Learning Continuous Assessment and Feedback

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Functions: Function Definition, Domain and range of functions, Graphing of function
Week 2	Limits: Definition of limits, Theorems of limits, Type of limits
Week 3	The Definition and Interpretation of the Derivative
Week 4	Methods of proof and Mathematical induction
Week 5	Counting principles Permutations and combinations
Week 6	Pigeonhole principle Inclusion-exclusion principle
Week 7	Midterm
Week 8	Number Theory: • Prime numbers and factorization • Modular arithmetic • GCD and LCM • Applications in cryptography
Week 9	Probability and Statistics: • Probability spaces • Random variables and distributions

	• Expectation and variance • Applications in data analysis and algorithm analysis
Week 10	Linear Algebra for Computer Science: • Vectors and matrices
Week 11	• Linear transformations
Week 12	• Eigenvalues and eigenvectors • Applications in Machine Learning
Week 13	Special Topics: • Cryptography • Computation theory and Complexity theory
Week 14	Final Exam
Week 15	Recap for the final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Calculus , Thomas ,1990,5th edition	Yes
Recommended Texts	Howard Anton, Irl Bivens, Stephen Davis, CALCULUS, 10th Edition, John Wiley & Sons, Inc., 2012.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
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Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	English Language I		Module Delivery
Module Type	S		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	TU-AI05		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	1	Semester of Delivery	
Administering Department	Artificial Intelligence	College	Science
Module Leader	Dr. Sura Abdul-Rahman		e-mail
Module Leader's Acad. Title	Lecturer Dr.	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	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	Enhance Language Proficiency: The course aims to enhance students' language proficiency in English, including their reading, writing, speaking, and listening skills. It focuses on improving grammar, vocabulary, pronunciation, and overall communication abilities
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Developing advanced reading comprehension skills and critical analysis of various texts. Enhancing writing skills across different genres and formats. Improving oral communication and presentation skills. Expanding language proficiency in English, including grammar, vocabulary, and pronunciation. Analyzing and interpreting literary works from diverse genres and periods. Conducting effective research and demonstrating information literacy. Cultivating critical thinking skills and forming well-supported opinions. Enhancing intercultural communication and understanding. Fostering creativity and imaginative expression through literature and writing. Cultivating a love for lifelong learning in the field of English.
Indicative Contents المحتويات الإرشادية	Study of various literary genres, such as poetry, drama, and prose. Analysis of literary works from different periods and cultural contexts. Development of critical reading and interpretation skills. Exploration of language and linguistics, including grammar, syntax, and phonetics. Introduction to literary theories and their application in analyzing texts. Practice in academic writing, including essay composition and research skills. Development of oral communication and presentation skills. Examination of cultural and historical contexts that influence literature. Integration of technology and digital resources in language and literary studies. Opportunities for creative writing and expression.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Reading and Text Analysis: Provide a variety of reading materials, including literary texts, articles, and authentic sources. Guide students in analyzing and interpreting texts, identifying main ideas, and extracting key information. Facilitate class discussions to promote comprehension and critical thinking. 2. Writing Workshops and Peer Feedback: Conduct writing workshops where students can refine their writing skills and receive feedback from peers and the instructor. Incorporate writing exercises that focus on specific writing techniques and genres. Provide guidance and support in the writing process, including brainstorming, drafting, revising, and editing. 3. Presentations and Public Speaking: Assign oral presentations on various topics to enhance students' public speaking skills. Provide guidelines and practice opportunities for effective delivery, organization, and visual aids. Offer constructive feedback to help students improve their presentation

	skills.
	4. Grammar and Vocabulary Activities: Incorporate interactive grammar and vocabulary activities, such as exercises, games, and quizzes, to reinforce language skills. Provide explicit instruction on grammar rules and strategies for vocabulary acquisition. Encourage students to use new grammar and vocabulary in context.

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	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1		Continuous	All
	Report	1		13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Hello Grammar spot (is, are, am) Possessive Pronouns Everyday English (conversation)

	Word order Sounds
Week 2	Your world Nationalities Grammar spot (abbreviations, Completing a question, Checking the correct sentence) Complete a conversation
Week 3	All about you Grammar spot (Negatives, abbreviations, and Short answers) Writing Personal information (profile) Listening to a conversation Social expressions and jobs
Week 4	Family and friends Objective Pronouns Possession (Possessive pronouns, Possessive S, Has and have) Grammar spot (Checking the correct sentence) Pronunciation
Week 5	The way I live Vocabulary: sports, food, and drinks Grammar spot: (positive, negative, adjectives, and articles: a/an) Listening and speaking Matching countries with nationalities
Week 6	Every day Writing (times) Grammar spot (present simple and its adverbs) Pronunciation (s) Vocabulary and speaking Prepositions
Week 7	Mid-term Exam
Week 8	My favourites/Where I live Grammar spot: Question words, positive, negative, question, and word order. Conversation : using this/ that Vocabulary: completing adjectives, synonyms and antonyms, Everyday English (places and activities). Writing a letter, a postcard and a paragraph. Everyday English: directions
Week 9	Times past

	Grammar spot: passive voice, past simple, questions, past tense adverbs, and question words. Reading and speaking: past form Vocabulary: Using have, do, go, and time expressions Listening and speaking: sport, leisure, seasons, and months.
Week 10	We had a great time Grammar spot: past tense: regular and irregular forms Pronunciation of /t/, /d/ and /id/ Vocabulary: technical terms
Week 11	I can do that Grammar spot: can, adverbs (fast and well), Regular adverbs, and request and offer Pronunciation of can Vocabulary and speaking: adjectives, and everyday English
Week 12	Please and thank you Speaking : activities and places, Grammar spot: would like, some and any, always, and now and soon Reading and speaking: food names, and everyday English (signs all around) Vocabulary: Technical expressions
Week 13	Second Exam
Week 14	Here and now Vocabulary and listening : colours, opposite verbs, everyday English (sense terms) Grammar spot: present continuous
Week 15	It's time to go Writing: transport Grammar spot: going to and present continuous, and Question words Vocabulary revision, Everyday English (social expressions), and Technical abbreviations. Pronunciation of two and three syllables

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Headway Plus Beginner, by John and Liz Soars,2010	Yes
Recommended Texts		
Websites		

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	الديموقراطية وحقوق الإنسان		Module Delivery	
Module Type	S		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI06			
ECTS Credits	2			
SWL (hr/sem)	50			
Module Level	1	Semester of Delivery		1
Administering Department	AI	College	Science	
Module Leader	Assist. Lec. bushra.rabeea Nada		e-mail	bushra.rabeea@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.		Module Leader's Qualification	MS.C.
Module Tutor	Name (if available)		e-mail	
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		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	أ. تعليم الطلبة على أساسيات حقوق الإنسان وقوانينها . ب. التعرف على الحقوق وأهم الإشكاليات والتحديات التي تواجهها ج- تحديد وفهم المفاهيم المتعلقة بالحريات، بما في ذلك الحقوق الفردية والحريات الشخصية . د. تنمية القدرة على التفكير النقدي حول القضايا المتعلقة بالحريات والحقوق الفردية.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- أن يعرف الطالب مفهوم الحقوق وقوانينها وتطبيقاتها . 2- أن يعرف الطالب كيفية المشاركة في نشر الحقوق وتطبيقها بالعمل الواقعي الحقيقي. 3- القدرة على استخدام الحقوق وسيلة من أجل التعايش السلمي بين مكونات المجتمع وجميع المخلوقات . 4- القدرة على مشاركة الآخرين في نشر هذه الحقوق . 5- القدرة على تحليل وتعريف مفهوم الحرية والتمييز بين أنواع مختلفة من الحريات. 6- التفاعل مع قضايا الحريات على الصعيدين الوطني والدولي والتأثير في تشكيل الرأي العام.
Indicative Contents المحتويات الإرشادية	الحقوق والحريات الأساسية وغير الأساسية الحقوق والحريات المدنية الحقوق السياسية حقوق الانسان والقانون الدولي الإنساني

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- المشاركة بالتحضير في قاعة الدرس 2- طريقة الأسئلة والأجوبة في قاعة الدرس 3- الواجبات 4- التقارير

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

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1		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	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المناهج الاسبوعي النظري	
	Material Covered
Week 1	مفهوم الديمقراطية ومميزاتها
Week 2	الديمقراطية المباشرة
Week 3	الديمقراطية شبه المباشرة
Week 4	الديمقراطية غير المباشرة
Week 5	ركائز الديمقراطية
Week 6	آليات الديمقراطية
Week 7	تعريف حقوق الإنسان
Week 8	امتحان
Week 9	الحقوق الأساسية وغير الأساسية
Week 10	الحقوق المدنية
Week 11	الحقوق السياسية
Week 12	الحقوق الاقتصادية والاجتماعية والثقافية
Week 13	الحقوق الفردية والحقوق الجماعية وطائفة الحقوق الجديدة
Week 14	حقوق الإنسان والقانون الدولي الإنساني
Week 15	حقوق الإنسان في الإسلام

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Diamond L. & M. F. Plattner, eds., (2009), Democracy. A Reader, Baltimore, Johns Hopkins University Press.	yes
Recommended Texts	مفهوم الحريات العامة وحقوق الانسان ، إطارها التاريخي والفكري والفلسفي، وضماناتها الأساسية- 2010	
Websites	http://ghrorg-learning.blogspot.com	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Discrete Mathematics		Module Delivery	
Module Type	B		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☒ Practical ☐ Seminar	
Module Code	TU-AI07			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	1	Semester of Delivery		2
Administering Department	AI	College	College of Science	
Module Leader	Dr. Qais Y. Hatam		e-mail	qais.yahya@uoturath.edu.iq
Module Leader's Acad. Title	Lec. Dr.	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CCIT060	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	1- To Describe the aim of study discrete mathematics 2- To Understand what difference between ordinary math and discrete math. 3- To Understand what the relation between computer science and math 4- To Learn the operation between the difference objects of math. 5- To Apply the relation between this objects
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	. A- Knowledge and Understanding 1. Understand the concept of ordinary and partial 2. Understand the set theory 3. Understand the logic math 4. Understand the relation of two sets 5. Understand the graph theory
Indicative Contents المحتويات الإرشادية	• Sets and Graphs Sets and subsets: definitions, examples, Set operations, basic identities, power of a set, Cartesian product of sets, relations on sets, Basic graph terminology. • Recurrence relations (Difference Equations) Definition of a recurrence relation (difference equations), Homogeneous and inhomogeneous difference equations, Nonlinear difference equations: $x_{n+1} = g(x_n)$, Fixed points, linearisation, stability of fixed points. Applications: the Newton and Secant Methods to solve non-linear equations $f(x) = 0$, Programming: Short introduction to Matlab, Numerical algorithms for difference equations: Newton's method, Fibonacci sequences, Recursion.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	. - By solving many exercises - Daily and weekly quizzes. - Guiding the student to some electronic websites.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Abstract of discrete mathematics
Week 2	Set theory
Week 3	Solve some example
Week 4	The Logic
Week 5	Solve some example
Week 6	The Functions
Week 7	Mid-term Exam
Week 8	The Relation
Week 9	Some examples
Week 10	Graph theory
Week 11	Some example
Week 12	The Tree
Week 13	Solve example

Week 14	Solve example
Week 15	General Review
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Structured Programming		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☒ Practical ☒ Seminar	
Module Code	TU-AI08			
ECTS Credits	9			
SWL (hr/sem)	225			
Module Level	1	Semester of Delivery		2
Administering Department	AI	College	College of Science	
Module Leader	Assist. Lec. Ali M. Al-Tameemi		e-mail	ali.mohamed@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.		Module Leader's Qualification	MS.C.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		Version Number	1.0

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	AIDC112		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	Learn how to use the Advanced Tools helps programmers write fast, portable programs The main principles of programming and the development of programming languages Learn the principles of Structure programming
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	- Learn the algorithms - Learn the Flowchart - Learn C++ Programming
Indicative Contents المحتويات الإرشادية	Introductions to C++ Programming; Introductions to essential computer graphics concepts and theories; Object Oriented programming for 2D graphics; Algorithms design for 2D graphics; Graphic interface creations and implementations.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	- Daily and weekly quizzes. - Class room activities. - Guiding the student to some electronic websites.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	225		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	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	The Function
Week 2	Passing Parameters. Passing by Value. Passing by Reference.
Week 3	The Pointers
Week 4	Arrays. Array of One Dimension: Declaration of Arrays.
Week 5	Initializing Array Elements
Week 6	Accessing Array Elements
Week 7	Mid-term Exam
Week 8	Read / Write / Process Array Elements.
Week 9	Array of Two Dimension: Declaration of 2D-Arrays
Week 10	Read / Write / Process Array Elements.
Week 11	Member Function of String stdlib Library.
Week 12	Structures. The Three Ways for Declare the Structure.
Week 13	Array of Structures.
Week 14	The Files in c++
Week 15	
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	The Function
Week 2	Passing Parameters. Passing by Value. Passing by Reference.
Week 3	The Pointers
Week 4	Arrays. Array of One Dimension: Declaration of Arrays.

Week 5	Initializing Array Elements
Week 6	Accessing Array Elements
Week 7	Array of Two Dimension: Declaration of 2D-Arrays
Week 8	Read / Write / Process Array Elements.
Week 9	Array of Structures.
Week 10	The Files in c++

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Mastering C++, shomme's series	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 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	Logic Design		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI09			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	1	Semester of Delivery		2
Administering Department	AI	College	College of Science	
Module Leader	Assist. Lec. Rashid merzah		e-mail	Rashid.merzah@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.		Module Leader's Qualification	MS.C.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		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- The student should understand number systems and codes and conversion between them. 2- The student should understand the Boolean expression and how to apply it. 3- The student should recognize among different logic gates and how to use them. 4- The student should understand how to design a logic circuit. 5- The student should understand using K-map for simplification.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Demonstrate a solid understanding of digital logic principles, including Boolean algebra, logic gates, truth tables, and the concept of binary representation.
Indicative Contents المحتويات الإرشادية	Introduction to Digital Logic Combinational Logic Design Arithmetic circuits Sequential Logic Design Circuit Testing and Verification

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Conceptual Understanding Problem-Solving Approach Hands-on Laboratory Experience Design Projects Simulation and Modeling Problem-Based Learning

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #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: Digital System
Week 2	Number Systems: Octal and Hexadecimal Numbers
Week 3	Number base conversion
Week 4	- Theories of Boolean Algebra - Digital Logic gates
Week 5	Boolean Expression and Truth table
Week 6	- Sum of Product Simplification - Product Of Sum Simplification
Week 7	- Exclusive OR - NAND gates - NOR gates
Week 8	Medterm
Week 9	- Two- and Three-Variables Karnaugh Maps. - Four Variables Karnaugh Maps.
Week 10	Quine-McCluskey method
Week 11	Combinational Logic: Adder, Subtractor Comparators, Decoders and Encoders
Week 12	Multiplexers (Data Selectors). and DE multiplexers
Week 13	Sequential Logic and Latches
Week 14	Applied Logic
Week 15	Memory and Programmable logic

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Codes and conversion among them
Week 2	Codes and conversion among them1
Week 3	Boolean expression
Week 4	Logic gates
Week 5	Circuit Design
Week 6	Second month exam
Week 7	NAND gates & NOR gates
Week 8	Sum of product form
Week 9	Product Of sum form
Week 10	K-map

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	An Introduction to Logic Technology by Luoish Nashlsky	Yes
Recommended Texts	Fundamentals of logic design by J. Roth	No
Websites		

Grading Scheme

مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Data Science		Module Delivery
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☒ Seminar
Module Code	TU-AI10		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	
Administering Department	AI	College	College of Science
Module Leader	Assist. Lec. bushra.rabeea	e-mail	bushra.rabeea@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec	Module Leader's Qualification	MS.C.
Module Tutor		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	AIDC111	Semester	1
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course has been designed to help learners to understand the core concepts and applications of Data Science and Familiarize them with essential data manipulation and visualization techniques. Various data sources and collection methods will be explored in this course to enable learners develop skills in data cleaning and preprocessing. It is anticipated that learners, at the end of this course, will be able to effectively communicate data insights and build data narratives by creating reports and visualizations for data communication.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of this comprehensive Data Science course, learners will have achieved a diverse set of learning outcomes. They will have a solid understanding of the core principles of data science, enabling them to proficiently collect, clean, and explore data for analysis. Learners will develop strong data visualization skills, including advanced techniques, and will be able to apply statistical and probability concepts to perform robust data analysis. Furthermore, by the end of this course, learners will have the knowledge and skills needed to communicate their findings effectively and present data insights in a compelling manner. The capstone project will serve as a practical application of their skills, allowing them to tackle real-world data science challenges and showcase their problem-solving abilities.
Indicative Contents المحتويات الإرشادية	• Definition and scope of Data Science. • Data preprocessing: encoding, scaling, and normalization. • Data cleaning techniques: handling missing data, data formatting. • Descriptive statistics: mean, median, variance, skewness. • Exploratory data analysis techniques: box plots, scatter plots, histograms. • Correlation Analysis, Analysis of variance, and Non-parametric statistical tests. • Time series data exploration. • Data extraction and manipulation using SQL. • Data wrangling techniques: filtering, merging, pivoting • Ethical considerations in data collection and analysis. • Building data narratives and reports. • Applying data science skills to a real-world project.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Hands-on Practical Exercises Case Studies and Real-World Examples Collaborative Learning Continuous Assessment and Feedback

Student Workload (SWL) الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب 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	5% (5)	Continuous	All
	Report	1	5% (5)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	20% (20)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Data Science
Week 2	Data and information
Week 3	Data analytics Lifecycle
Week 4	Data Collection and Cleaning
Week 5	Exploratory Data Analysis (EDA)
Week 6	Data Visualization
Week 7	Statistical Analysis
Week 8	Time Series Analysis
Week 9	Data Wrangling
Week 10	Feature Engineering
Week 11	Data Ethics and Privacy
Week 12	Data Storytelling and Communication
Week 13	Capstone Project
Week 14	SQL and Databases for Data Science
Week 15	Project Presentations and Wrap-up

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Data Collection and Cleaning
Week 2	Exploratory Data Analysis (EDA)
Week 3	Data Visualization
Week 4	Statistical Analysis
Week 5	Time Series Analysis
Week 6	Data Wrangling
Week 7	Feature Engineering
Week 8	Data Ethics and Privacy
Week 9	Data Storytelling and Communication
Week 10	Capstone Project

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Introducing Data Science, Davy Cielen, Anro DB Meysman, Mohamed Ali	No
Recommended Texts	Data Science Job: How to Become a Data Scientist, Przemek Chojeki	No
Websites		

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	اللغة العربية		Module Delivery
Module Type	S		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	TU-AI11		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	2	Semester of Delivery	
Administering Department	AI	College	College of Science
Module Leader	Dr. Abdullah Bander Ali		e-mail
Module Leader's Acad. Title	Lec. Dr.	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	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	- تعليم الطلبة على أساسيات اللغة العربية وقواعدها - تعليم الطلبة على كيفية العرب -
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	- أن يتعرف الطالب على قواعد اللغة العربية - أن يعرف الطالب كيفية بناء الجمل واستخراجها للعنوان المطلوب - القدرة على استعمال العبارات الصحيحة - القدرة على مشاركة الآخرين في الحوار الصحيح
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	- مشاركة بالتحضير في قاعة الدرس - طريقة الأسئلة والأجوبة في قاعة الدرس - ادارة المحاضرة على نحو تطبيقي مرتبط بواقع الحياة اليومية - تكليف الطالب ببعض الأنشطة والواجبات

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

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.				

	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	20% (20)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	العدد تذكره وتأتيه
Week 2	الاعداد المفردة والمركبة
Week 3	ألفاظ العقود والأعداد مئة ، ألف ، مليون)
Week 4	تعريف العدد وتذكره
Week 5	ما يصاغ من العدد على وزن فاعل
Week 6	كتابة الهمزة المتوسطة والمتطرفة
Week 7	امتحان
Week 8	كتابة الالف اللينة
Week 9	كتابة التاء المربوطة والمبسوطة
Week 10	كتابة الضاد والطاء
Week 11	اللامات وأنواعها
Week 12	الهاءات وأنواعها
Week 13	النونات وأنواعها
Week 14	استعمالات (ما ، من)، والفرق بين (أما ، إما)
Week 15	استعمالات (أن ، إن)
Week 16	الامتحان النهائي

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	- قواعد اللغة العربية، يوسف الصيداوي	لا
Recommended Texts		
Websites		

Grading Scheme

مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	جرائم حزب البعث		Module Delivery
Module Type	S		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	TU-AI12		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	1	Semester of Delivery	
Administering Department	AI	College	College of Science
Module Leader	Lec. Dr. Manar Munther Ali	e-mail	
Module Leader's Acad. Title	Lec. Dr.	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	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- معرفة الاشكاليات التي تثار حول نطاق تطبيق النصوص الديمقراطية . 2- اشراك الطلبة بوقائع مستمدة من سوح المحاكم الشرعية العراقية. 3- تعزيز الروح الوطنية للطلبة بما يخدم المسيرة العلمية الديمقراطية. 4- تنمية روح المواطنة من خلال القيم التفاعلية (الاجتماعية والعلمية) . 5- استخدام وسائل التواصل الاجتماعية الحديثة بما يخدم المسيرة العلمية.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- أن يتعرف الطالب على مفهوم انتهاكات الحقوق والحريات. 2- أن يتعرف الطالب على الانظمة السياسية في العراق. 3- ان يتعرف الطالب على انتهاكات النظام البعثي للحقوق والحريات العامة. 4- القدرة على مشاركة الآخرين في فهم الفصل بين السلطات.
Indicative Contents المحتويات الإرشادية	انتهاكات الحقوق والحريات. الانظمة السياسية في العراق. انتهاكات النظام البعثي للحقوق والحريات العامة. فهم الفصل بين السلطات.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- المشاركة بالتحضير في قاعة الدرس 2- طريقة الأسئلة والأجوبة في قاعة الدرس 3- الواجبات 4- التقارير

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

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1		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	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	انتهاكات الحقوق والحريات
Week 2	الانظمة السياسية في العراق
Week 3	النظام الملكي
Week 4	النظام الجمهوري
Week 5	انتهاكات النظام البعثي للحقوق والحريات العامة
Week 6	انتهاكات الحقوق الفكرية
Week 7	انتهاك الحقوق العامة
Week 8	انتهاك الحق في التعددية الحزبية
Week 9	الانتهاكات التي تمس حقوق الاجتماعية والسياسية والثقافية
Week 10	اسقاط الجنسية
Week 11	انتهاك القانون الدولي
Week 12	الحصار الدولي على العراق
Week 13	الاعتقالات العشوائية / الاعتقالات للسكان المدنيين / العسكريين / العلماء
Week 14	حصر السلطات بيد النظام البعثي
Week 15	أمتحان نهاية الفصل

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	الكتب والمراجع الساندة التي يوصى بها (المجلات العلمية، التقارير....) وزارة التعليم العالي والبحث العلمي- دائرة الدراسات والتخطيط والمتابعة	yes
Recommended Texts	الكتب والمراجع الساندة التي يوصى بها (المجلات العلمية، التقارير....) وزارة التعليم العالي والبحث العلمي- دائرة الدراسات والتخطيط والمتابعة	
Websites	المراجع الإلكترونية ، مواقع الانترنت	

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	Knowledge Representation			Module Delivery	
Module Type	C			☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☒ Practical ☐ Seminar	
Module Code	TU-AI13				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	2	Semester of Delivery			
Administering Department	AI	College	College of Science		
Module Leader	Assist. Lec. Husham Ibrahim Mahdi		e-mail		
Module Leader's Acad. Title	Assist. Lec.		Module Leader's Qualification	MS.C.	
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name	Name		e-mail	E-mail	
Scientific Committee Approval Date	01/09/2025		Version Number	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDC125	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	- will understand the foundations of KRR and the tradeoff between representation and reasoning - will understand which knowledge-based techniques are appropriate for which tasks; - can apply KRR systems to their research and challenging problems;
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	- Students satisfying the prerequisites are expected to understand the fundamental principles of logic-based Knowledge Representation; - be able to model simple application domains in a logic-based language; - understand the notion of a reasoning service; - master the fundamentals of the reasoning algorithms underlying current systems; - understand the fundamental trade-off between representation power and computational properties of a logic-based representation language; - be conversant with several widely used knowledge representation languages; and - understand how the theoretical material covered in the course is currently being applied in practice.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	- Lectures delivered by the teacher; - guided self-studies on specific, individual topics; - seminars delivered by the students on these specific topics; - practical group exercises. Hands-on Practical Exercises - Case Studies and Real-World Examples - Collaborative Learning - Continuous Assessment and Feedback

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150
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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	5% (5)	Continuous	All
	Report	1	5% (5)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	20% (20)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Knowledge Representation - Overview of knowledge representation and its importance in AI
Week 2	- Different types of knowledge representation methods
Week 3	Logical Representations - Propositional logic - First-order logic
Week 4	- Inference and reasoning with logical representations
Week 5	Semantic Networks - Basic concepts of semantic networks - Types of semantic networks (taxonomic, part-whole relations, etc.) - Inference in semantic networks
Week 6	Frame-Based Representation - Basic concepts of frames as a knowledge representation tool - Frame attributes, default values, and slots - Inheritance hierarchies and reasoning with frames
Week 7	Ontologies - Definition and components of ontologies - Ontology languages like OWL - Developing and using ontologies for knowledge sharing
Week 8	Midterm Term

Week 9	Rules and Production Systems - Basic concepts of rules and rule-based systems
Week 10	- Forward chaining and backward chaining inference - Conflict resolution strategies
Week 11	Uncertainty in Knowledge Representation - Representing uncertainty using Bayesian networks
Week 12	- Reasoning with uncertain knowledge - Applications involving uncertainty
Week 13	Knowledge Graphs - Structure and construction of knowledge graphs - Querying knowledge graphs
Week 14	- Knowledge graph applications
Week 15	Projects Presentation

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Van Harmelen, F., Lifschitz, V., Porter, B. (ed.). Handbook of knowledge representation. – Elsevier, 2008. – Vol. 1. – 1034 pp.	NO
Recommended Texts	Boolos, G. S., Burgess, J. P., Jeffrey, R. C. Computability and logic. – Cambridge university press, 2002. – 364 pp. Nipkow, T., Grumberg, O., Hauptmann, B. (ed.). Software Safety and Security: Tools for Analysis and Verification. – IOS Press, 2012. – 400 pp.	No
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Numerical Analysis		Module Delivery	
Module Type	B		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI14			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	UGx11 2	Semester of Delivery		3
Administering Department	AI	College	College of Science	
Module Leader	Dr. Qais Y. Hatam		e-mail	qais.yahya@uoturath.edu.iq
Module Leader's Acad. Title	Lec. Dr.	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	1/9/2025		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CCIT061	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. Appreciate the value of mathematical reasoning and analysis in applications 2. Realize the importance of mathematical principles and skills in solving some types of problems 3. Develop critical and analytical thinking, accuracy, neatness when using mathematics 4. Realize that a large number of problems cannot be solved by prepared "theoretical" formulas; instead, the solution is arrived at by a succession of approximations until the desired accuracy is obtained 5. Appreciate the usefulness of the computer and see how its use removed the drudgery involved in computations and how by use of programming techniques sequential processes are placed in the correct order 6. Exhibit values like: - o cooperation through group study; - o honesty by claiming credit only for the work he has done; - o zeal and seriousness of intent to learn by participating actively in class discussion, doing his homework regularly and consulting his mentor; - o patience, perseverance and diligence by solving assigned exercises completely including the difficult ones; - o faith by doing what is right and giving his best in performing any assigned task; - o show concern for the community through sharing of know-how and resources during group discussion; - o self-reliance by being able to solve problems independently.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowledge and Understanding: During the lecture the student understands the nature and operations of Numerical Analysis, demonstrates familiarity with theories and concepts used in Numerical Analysis, and identifies the steps required to carry out a piece of research on a topic in Numerical Analysis. 2. Intellectual Skills: By the end of the course the student is expected to recognize and apply appropriate theories, principles and concepts relevant to Numerical Analysis, critically assess and evaluate the literature within the field of Numerical Analysis, analyze and interpret information from a variety of sources relevant to Numerical Analysis. 3. Practical Skills: By the end of the course student will have the ability to compare the computational methods for advantages and drawbacks, choose the suitable computational method among several existing methods, implement the computational methods using any of existing programming languages, testing such methods and compare between them, identify the suitable computational technique for a specific type of problems, and develop the computational method that is suitable for the underlying problem. 4. Transferable Skills: Within the lectures the student is able to transfer ideas

	and experience, work effectively as a part of a group and independently.
Indicative Contents المحتويات الإرشادية	Introduction to Mathematical Modelling and Computational Methods – Importance of computational modelling in engineering. Data representation and errors. Applications of commercial software packages such as MATLAB. Functions and plotting using MATLAB. Computer Solution of Non-linear Equations - Bracketing Methods. Bisection Method. Open Methods. Newton-Raphson Method. Secant Method. Convergence of methods. Determination of multiple roots. Engineering applications. Simultaneous Linear Equations - Solving simultaneous linear equations by Matrix Inversion. Cramer's Rule. Gauss Elimination. Gauss-Jordan Elimination. LU decomposition method. Engineering applications and choice of methods. Eigenvalues Problems. Optimization - Unconstrained optimization. Multi-dimensional optimization. Unconstrained optimization. Curve Fitting and Data Analysis - Interpolation using splines. Linear Least-Squares Regression. Nonlinear Regression. Introduction to Machine Learning Algorithms. Numerical Differentiation and Integration - Taylor's series expansion. Finite differences for the first derivative and the second derivative. High-accuracy differentiation formulas. Trapezoidal rule. Simpson's rule. High-order Newton-Cotes formulas. Applications of numerical differentiation and integration in heat transfer, solid mechanics and fluid flow problems.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Numerical analysis is the story of how functions, derivatives, integrals, and differential equations are handled as strings of numbers in the computer. At the heart of numerical analysis is an understanding of the speed of convergence of Taylor, Fourier, and other series expansions. Most scientists and engineers are sooner or later faced with computing tasks that require some knowledge of numerical analysis.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #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	Direct methods for solving linear system of equation
Week 2	Simple Gaussian elimination method, gauss elimination method with partial pivoting,
Week 3	determinant evaluation, gauss Jordan method,
Week 4	L U decompositions Doolittle's LU decomposition, Doolittle's method with row interchange
Week 5	Finding Matrix Inverse
Week 6	Iterative methods for solving linear systems of equations
Week 7	Jacobin iteration, gauss – seidel method,
Week 8	Successive over relaxation method (sort method)
Week 9	Mid-term Exam
Week 10	Newton-Raphson Method
Week 11	Runge-kutta Method
Week 12	Interpolation and the Lagrange Polynomial, Data Approximation and Neville's Method
Week 13	Numerical Analysis Methods for Differential Equation
Week 14	Numerical Analysis Methods for Integral Equation
Week 15	Final Exam
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

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

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Richard L. Burden and etc." Numerical Analysis ", 9th edition, 2014	Yes
Recommended Texts	Richard L. Burden and etc." Numerical Analysis ", 9th edition, 2014	Yes
Websites	https://www.coursera.org/courses?query=numerical%20analysis	

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	Basics of Object Oriented Programming		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI15			
ECTS Credits	8			
SWL (hr/sem)	200			
Module Level	UGx11 2	Semester of Delivery		3
Administering Department	AI	College	College of Science	
Module Leader	Assist. Lec. Husham Ibrahim Mahdi		e-mail	
Module Leader's Acad. Title	Assist. Lec.		Module Leader's Qualification	MS.C.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDC123	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. Introduce the principles of object-oriented programming in a higher-level programming language in c++. 2. Analyze a problem statement to develop a mental model of objects necessary to create a software architecture 3. Utilize object-oriented programming to frame software architectures, with care towards separation of concerns and abstraction 4. Gain skills in designing, and programming software for reuse of code. 5. Establish development methods in object-oriented programming to qualify students for teaching the language in other settings
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Explain the motivation for and development of object-oriented programming languages. • Produce a set of use cases given a problem statement. • Produce class diagrams, object interaction diagrams and object state transition diagrams for a given problem. • Describe the essential features of an object-oriented programming language. • Produce and/or debug code fragments that illustrate principles of object-oriented software development. • Describe the principles for testing object-oriented software and derive sets of test data given a specification.
Indicative Contents المحتويات الإرشادية	✓ Structured programming ✓ Procedural programming ✓ Abstract data types (ADTs) ✓ Type of variable and range of applicable operations ✓ Use of classes in object-oriented programming ✓ How coupling and cohesion are implemented in OOP ✓ Abstraction and Encapsulation ✓ Data hiding/information hiding ✓ Classes and objects instances

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	There are different teaching and learning activities including lectures and laboratories. The concepts, process, and applications of data science will be discussed in lectures. Students will also learn computer programming knowledge and the skills of manipulating, processing, retrieving, storing, and plotting data. Students will develop small programs and learn different in laboratories.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	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	Overview of C++ Programming
Week 2	Introduction to Object Oriented Programming
Week 3	Comparison between Structural programming and OOP.
Week 4	Class in OOP
Week 5	Class Object
Week 6	Class constructor
Week 7	Local variable and class variable

Week 8	Static and none static variable.
Week 9	Static and none static method.
Week 10	Encapsulation
Week 11	Inheritance (Super class and sub class)
Week 12	Mid exam
Week 13	Array Objects & Type of inheritance
Week 14	OOP Project
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: develop a program to implement 1 dimension array
Week 2	Lab 2: develop a program to perform matrix operation using multi-dimensions array
Week 3	Lab 3: develop program that implement a class and use it with objects
Week 4	Lab 4: develop program that implement a class and create array of objects
Week 5	Lab 5: write program for single inherence
Week 6	Lab 6: write program for hybrid inherence
Week 7	Lab 7: write code for overload function

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Object-oriented programming with C++ by E.Balagurusamy, 2nd Edition, TMH.	Yes
Recommended Texts	1. Object Oriented Design by Rumbaugh (Pearson publication) 2. Object-oriented programming in Turbo C++ By Robert Lafore, Galgotia Publication.	No
Websites	https://www.coursera.org	

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

(50 - 100)	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Computation Theory		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI16			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	UGx11 2	Semester of Delivery		3
Administering Department	AI	College	College of Science	
Module Leader	Assit. Lec. Ali M. Al-Tameemi		e-mail	ali.mohamed@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.	Module Leader's Qualification	MS.C.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		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	Finite automata are useful models for many important kinds of hardware and software. Here are the most important kinds: Software for designing and checking the behavior of digital circuits; The “lexical analyzer” of a typical compiler, that is, the compiler component that breaks the input text into logical units, such as identifiers, keywords, and punctuation; Software for scanning large bodies of text, such as collections of Web pages, to find occurrences of words, phrases, or other patterns; Software for verifying systems of all types that have a finite number of distinct states, such as communication protocols or protocols for secure exchange of information.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Knowledge and understanding - Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Stack's, Turing machines, and Grammars • Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics - Be able to design sample automata • Communication skills (personal and academic). - Be able to minimize FA's and Grammars of Context Free Languages • Practical and subject specific skills (Transferable Skills).
Indicative Contents المحتويات الإرشادية	• Training in the applied use of key coding languages for creative computing • Training in key frameworks for creative computing • Introduction to online collaboration for creative computing

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Class discussions with examples.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem)	125		

الحمل الدراسي الكلي للطالب خلال الفصل	
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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	Basic concepts and definitions; Set operations; partition of a set
Week 2	Central concepts of Automata Theory.
Week 3	Regular Expressions; Operations on Regular expressions
Week 4	Finite Automata and Regular Expressions.
Week 5	Deterministic Finite Automata (DFA) and Non-Deterministic Finite Automata (NDFA)
Week 6	Equivalence of Deterministic and Non-Deterministic Finite Automata.
Week 7	Finite Automata with Epsilon-Transition. Equivalence between DFA, NFA, NFA- Λ
Week 8	Conversion from FA and regular expressions.
Week 9	Mealy and Moore Machines
Week 10	Conversion between mealy and Moore machines
Week 11	Reglual grammar and Context-Free Grammars
Week 12	Parse Trees; Ambiguity in Grammars and Languages
Week 13	Standard Forms; Chomsky Normal Forms;
Week 14	Chomsky normal form
Week 15	Greibach normal Forms.

Week 16	Preparatory week before the final Exam
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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	Introduction to Computer Theory, Daniel I. A. Cohen, Prentice-Hall, Second Edition, 1997.	Yes
Recommended Texts	John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman: Introduction to Automata Theory, Languages, and Computation; Addison Wesley, 2000.	No
Websites	https://www.coursera.org/courses?query=theory%20of%20computation	

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	Python Programming Language		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI17			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	UGx11 2	Semester of Delivery		3
Administering Department	AI	College	College of Science	
Module Leader	Assist. Lec. Bushra Rabeea Nada		e-mail	bushra.rabeea@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.		Module Leader's Qualification	MS.C.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		Version Number	1.0

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	AIDC123		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. Introduce the principles of a higher-level programming language in python. 2. Analyze a problem statement to develop a mental model of objects necessary to create a software architecture 3. Utilize object-oriented programming to frame software architectures, with care towards separation of concerns and abstraction 4. Gain skills in designing, and programming software for reuse of code.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Explain the motivation for and development of python programming language. • Produce a set of use cases given a problem statement. • Produce class diagrams, object interaction diagrams and object state transition diagrams for a given problem. • Describe the essential features of an object-oriented programming language. • Produce and/or debug code fragments that illustrate principles of object-oriented software development. • Describe the principles for testing object-oriented software and derive sets of test data given a specification.
Indicative Contents المحتويات الإرشادية	✓ Structured programming ✓ Procedural programming ✓ Abstract data types (ADTs) ✓ Type of variable and range of applicable operations ✓ Use of classes in object-oriented programming

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	There are different teaching and learning activities including lectures and laboratories. The concepts, process, and applications of data science will be discussed in lectures. Students will also learn computer programming knowledge and the skills of manipulating, processing, retrieving, storing, and plotting data. Students will develop small programs and learn different in laboratories.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem)	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4

الحمل الدراسي غير المنتظم للطالب خلال الفصل		
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	Installation of Python and an Integrated Development Environment (IDE)
Week 2	Python Fundamental: Introduction, Variables, Comments, Python Data Types
Week 3	Python Fundamental: Operators, Python Conditions and If statements, Python Loops,
Week 4	Python Fundamental: Functions: defining functions, parameters, and return values
Week 5	Lists, tuples, sets, and dictionaries
Week 6	Introduction to Class Fundamentals
Week 7	Python - Object Oriented Programming (objects, inheritance, polymorphism)
Week 8	Mid-term Exam
Week 9	Reading and writing files in Python
Week 10	Exception handling and error management
Week 11	Introduction to standard input/output and libraries
Week 12	Exploring key Python libraries (e.g., NumPy, pandas, matplotlib)
Week 13	Installing and using external libraries

Week 14	Introduction to databases (SQLite, MySQL, or PostgreSQL) Connecting Python to databases
Week 15	python Project

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	Installation of Python and an Integrated Development Environment (IDE)
Week 2	Python Fundamental: Introduction, Variables, Comments, Python Data Types
Week 3	Python Fundamental: Operators, Python Conditions and If statements, Python Loops,
Week 4	Python Fundamental: Functions: defining functions, parameters, and return values
Week 5	Lists, tuples, sets, and dictionaries
Week 6	Reading and writing files in Python
Week 7	Exception handling and error management

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	"Python Cookbook" by David Beazley and Brian K. Jones:	No
Recommended Texts		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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	AI Applications		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI18			
ECTS Credits	2			
SWL (hr/sem)	75			
Module Level	UGx11 2	Semester of Delivery		
Administering Department	AI	College	College of Science	
Module Leader	Assist. Lec. Rashid merzah		e-mail	Rashid.merzah@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.		Module Leader's Qualification	MS.C.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	1/9/2025		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDC111	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 Core AI Concepts and Applications • Explore AI's Role Across Various Industries • Hands-on Application of AI Techniques • Address Ethical Considerations and Challenges in AI • Investigate AI's Future and Impact on Society • Understand AI Scalability and Deployment
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Students will be able to explain core concepts in artificial intelligence, including the differences between Narrow AI and General AI. • Students will understand the historical development of AI and current trends shaping its future. • Students will be able to identify and describe AI applications in various fields, including healthcare, finance, marketing, robotics, smart cities, gaming, and entertainment. • Students will demonstrate an understanding of the specific AI tools, algorithms, and techniques used in these applications. • Students will be able to build basic AI models using techniques such as deep learning, reinforcement learning, natural language processing, and time-series analysis. • Students will understand key ethical concerns related to AI, including bias, fairness, and privacy issues. • Students will be able to deploy AI models using cloud platforms and understand the challenges involved in scaling AI solutions.
Indicative Contents المحتويات الإرشادية	• Overview of AI concepts and terminology (Artificial Intelligence, Machine Learning, Deep Learning) • Types of AI: Narrow AI vs. General AI • Key trends in AI (automation, AI ethics, autonomous systems) • Case studies: Google Search, Amazon recommendation engine, Tesla's autonomous driving • In healthcare, AI applications in medical imaging (e.g., tumor detection, MRI analysis). Predictive models for disease prevention and diagnosis. • AI in Finance: Fraud detection, algorithmic trading, credit scoring. Techniques: Machine learning for anomaly detection, time-series forecasting, reinforcement learning for trading algorithms. • AI in Marketing and Customer Experience: AI in recommendation systems (e.g., Netflix, Amazon). Customer sentiment analysis using NLP. • AI in Marketing and Customer Experience: Recommendation systems in e-

	commerce (e.g., Amazon, Netflix) using collaborative filtering. • Natural Language Processing (NLP) and AI: AI-driven language models (e.g., GPT, BERT) for text generation, translation, and summarization. • AI in Gaming and Entertainment: Game development and AI-driven interactive storytelling (e.g., NPC behavior, dynamic environments).
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Students will engage with foundational AI concepts through lectures and case studies that highlight real-world applications across various industries. Interactive discussions will encourage critical thinking, particularly around ethical considerations and challenges in. The capstone project will provide independent learning, teamwork, and problem-solving by having students develop an AI solution to a real-world problem, presenting their findings at the end of the course. This comprehensive approach ensures both knowledge acquisition and skill development in AI.

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	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	33	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

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

Total assessment	100% (100 Marks)		
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Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to AI Applications
Week 2	AI in Healthcare
Week 3	AI in Finance
Week 4	AI in Marketing and Customer Experience
Week 5	AI in Robotics
Week 6	AI in Natural Language Processing (NLP) 1
Week 7	AI in Natural Language Processing (NLP) 2
Week 8	Mid-term Exam
Week 9	AI in Smart Cities and IoT
Week 10	AI in Gaming and Entertainment
Week 11	AI for Social Good
Week 12	AI Ethics, Bias, and Privacy
Week 13	AI Deployment and Scalability
Week 14	Capstone Project Presentation
Week 15	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	Applied Artificial Intelligence: A Handbook for Business Leaders" by Mariya Yao, Adelyn Zhou, and Marlene Jia	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 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	Advanced Object Oriented Programming		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI19			
ECTS Credits	8			
SWL (hr/sem)	200			
Module Level	UGx11 2	Semester of Delivery		4
Administering Department	AI	College	Science	
Module Leader	Assist. Lec. Husham Ibrahim Mahdi		e-mail	
Module Leader's Acad. Title	Assist. Lec	Module Leader's Qualification		MS.C.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	Version Number		1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDC213	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. Introduce the principles of object-oriented programming in a higher-level programming language in c++. 2. Analyze a problem statement to develop a mental model of objects necessary to create a software architecture 3. Utilize object-oriented programming to frame software architectures, with care towards separation of concerns and abstraction 4. Gain skills in designing, and programming software for reuse of code. 5. Establish development methods in object-oriented programming to qualify students for teaching the language in other settings
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Explain the motivation for and development of object-oriented programming languages. • Produce a set of use cases given a problem statement. • Produce class diagrams, object interaction diagrams and object state transition diagrams for a given problem. • Describe the essential features of an object-oriented programming language. • Produce and/or debug code fragments that illustrate principles of object-oriented software development. • Describe the principles for testing object-oriented software and derive sets of test data given a specification.
Indicative Contents المحتويات الإرشادية	✓ Structured programming ✓ Procedural programming ✓ Abstract data types (ADTs) ✓ Type of variable and range of applicable operations ✓ Use of classes in object-oriented programming ✓ How coupling and cohesion are implemented in OOP ✓ Abstraction and Encapsulation ✓ Data hiding/information hiding ✓ Classes and objects instances

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	There are different teaching and learning activities including lectures and laboratories. The concepts, process, and applications of data science will be discussed in lectures. Students will also learn computer programming knowledge and the skills of manipulating, processing, retrieving, storing, and plotting data. Students will develop small programs and learn different in laboratories.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	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	Fried function
Week 2	Polymorphism Based on Overloaded Methods
Week 3	Polymorphism, Type Conversion, Casting, Etc.
Week 4	Abstract class.
Week 5	Exception Handling
Week 6	Event Handling
Week 7	Using (try, catch, throw and final) with Exception

Week 8	Interface
Week 9	Inner class
Week 10	Static Members
Week 11	Encapsulation
Week 12	Mid exam
Week 13	Purpose of Framework Interfaces
Week 14	File
Week 15	OOP Project
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: write a program to implement inline function
Week 2	Lab 2: write a program to implement all types of constructors
Week 3	Lab 3: write a program to implement multiple inheritance
Week 4	Lab 4: write program to demonstrate pointer to object
Week 5	Lab 5: write a program to demonstrate pointer to derived class
Week 6	Lab 6: write program to demonstrate function overloading
Week 7	Lab 7: write program to read and write data to and from a file

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Object-oriented programming with C++ by E.Balagurusamy, 2nd Edition, TMH.	Yes
Recommended Texts	1. Object Oriented Design by Rumbaugh (Pearson publication) 2. Object-oriented programming in Turbo C++ By Robert Lafore, Galgotia Publication.	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Algorithms and Data Structures		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI20			
ECTS Credits	7			
SWL (hr/sem)	175			
Module Level	UGx11 2	Semester of Delivery		
Administering Department	AI	College	Science	
Module Leader	Lec. Dr. Mustafa Tareq		e-mail	
Module Leader's Acad. Title	Lec. Dr.	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDC123	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- How to build your Algorithm (Programs) efficiently. 2- How to measure your algorithm complexity. 3- What data structure is appropriate for your algorithm. 4- Learning different data structures. 5- Understand why this data structure is better than the other one. 6- Learning how to choose the best data structure for your algorithm. 7- learn how to deal with your problem, building its algorithm and fitting the best data structures to it.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• How to measure the performance of your algorithm. • What are data structures and how to use them • Explain and utilize linked lists, stacks, queues and trees. • Apply design guidelines to evaluate alternative software designs. • Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class. • Master a variety of advanced abstract data type (ADT) and data structures and their implementations. • Ability to apply and implement learned algorithm design techniques and data structures to solve problems.
Indicative Contents المحتويات الإرشادية	• Analysis in Algorithms: Basic concepts of complexity measures Recursion • Basic Data Structures: Vector, linked list, stack, queue, dequeue, tree, trie, set, and hashing • Search Algorithms: Linear search for unordered/ordered lists, binary search, and interpolation search • Sorting Algorithms: Insertion sorts, exchange sort, selection sort, merge sort, quicksort, bucket sort, radix sort, and topological sort • Object-oriented Programming: Abstract classes and abstract methods, encapsulation, superclass and subclass, inheritance, and polymorphism

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	There are a number of teaching and learning activities including lectures, laboratories and group projects. The concepts and principles of complexity analysis in algorithms, data structures, search algorithms, sort algorithms, and object-oriented programming will be covered in lectures. The implantations of data structures and algorithms in an object-oriented language will be taught during the laboratories. Students are required to perform a group project to apply the concepts and principles covered in this course to critically analyses the given problem(s) and creatively formulate the solution(s). Students implement the solution(s) in an object-oriented language.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	108	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Algorithms and Data Structures
Week 2	Algorithm Complexity and Asymptotic Analysis
Week 3	Sorting Algorithms
Week 4	Sorting Algorithms
Week 5	Searching Algorithms
Week 6	Searching Algorithms
Week 7	First exam
Week 8	Arrays and Pointers

Week 9	Linked List
Week 10	Stack and Queue
Week 11	Tree lecture 1
Week 12	Tree lecture 2
Week 13	Graph
Week 14	Hashing
Week 15	Second try exam
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Implement Sorting algorithms.
Week 2	Implement Search Algorithms.
Week 3	Student information system using linked list or Color cubes games using Stack
Week 4	A snake game using queue
Week 5	Social Media connections using Graph data structure
Week 6	Simple search engine application using hash table data structure

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Introduction to Algorithm, third Edition, Thomas H. Cormen Algorithms, fourth edition, Robert Sedgewick and Kevin Wayne	Yes
Recommended Texts	Introduction to Algorithm, third Edition, Thomas H. Cormen Algorithms, fourth edition, Robert Sedgewick and Kevin Wayne	Yes
Websites	https://www.coursera.org/learn/data-structures	

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	Machine Learning Basics		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI21			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	2	Semester of Delivery		4
Administering Department	AI	College	Science	
Module Leader	Lec. Dr. Qais Y. Hatam		e-mail	qais.yahya@uoturath.edu.iq
Module Leader's Acad. Title	Lec. Dr.	Module Leader's Qualification		Ph.D.
Module Tutor		e-mail		
Peer Reviewer Name	Name	e-mail	E-mail	
Scientific Committee Approval Date	01/09/2025	Version Number	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDS214	Semester	4
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Machine Learning Course aims to equip students with a solid foundation of learning algorithms concepts and theories, including supervised and unsupervised learning. Students are expected to have a comprehensive understanding of the fundamental concepts and techniques of machine learning, regression modules, naive bayes, and more advance concepts including support vector machine and neural networks.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: 1- Understanding core concepts of machine learning, including supervised and unsupervised learning, neural networks, and various algorithms. 2- Developing a strong foundation in mathematics and statistics, which are essential for understanding machine learning algorithms. 3- Gaining hands-on experience in implementing machine learning algorithms and models using programming languages like Python. 4- Learning how to preprocess and clean data effectively, as high-quality data is crucial for accurate machine learning model training. 5- Understanding how to evaluate the performance of machine learning models, including metrics like accuracy, precision, recall, and F1-score, and techniques like cross-validation. 6- Exploring practical applications of machine learning across various domains, such as healthcare, finance, natural language processing, and computer vision.
Indicative Contents المحتويات الإرشادية	Linear Algebra Probability and Statistics Hypothesis Testing

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Hands-on Practical Exercises Case Studies and Real-World Examples Collaborative Learning Continuous Assessment and Feedback

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus)	
المناهج الاسبوعي النظري	
	Material Covered
Week 1	Inferential Statistics
Week 2	Hypothesis Testing
Week 3	Introduction to Machine Learning (supervised, unsupervised, reinforcement learning)
Week 4	Linear Regression Module
Week 5	Logistic Regression
Week 6	Naive Bayes
Week 7	Model Selection + (Skill test)
Week 8	Support Vector Machine (SVM)

Week 9	Tree Models
Week 10	Random Forests
Week 11	Boosting
Week 12	Time Series Analysis and Forecasting using ARIMA models
Week 13	Advanced Model Evaluation (Cross-validation and Performance metrics)
Week 14	Capstone Project
Week 15	Case Study + (Skill test)
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Install Python and essential libraries (e.g., NumPy, scikit-learn). Verify your environment with a "Hello, World!" ML program.
Week 2	Implement a simple linear regression model. Perform data preprocessing and visualize results.
Week 3	Implement a logistic regression model for binary classification. Evaluate the model using accuracy, precision, recall, and F1-score.
Week 4	Implement decision tree models for classification and regression. Explore tree visualization and interpretability.
Week 5	Understand the concept of ensemble learning. Build and evaluate Random Forest models.
Week 6	Learn about boosting algorithms, like AdaBoost and Gradient Boosting. Implement a boosting model for classification.
Week 7	Explore cross-validation methods (e.g., k-fold cross-validation). Learn about various performance metrics (e.g., accuracy, precision, recall).

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Machine Learning Algorithms	No
Recommended Texts	Machine Learning Concepts	No
Websites		

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Artificial Intelligence Algorithms		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI22			
ECTS Credits	7			
SWL (hr/sem)	175			
Module Level	UGx11 2	Semester of Delivery		4
Administering Department	AI	College	Science	
Module Leader	Asssit Lec. Ali M. Al-Tameemi		e-mail	ali.mohamed@uoturath.edu.iq
Module Leader's Acad. Title	Asssit Lec.	Module Leader's Qualification	Ms.C.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	Version Number	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDC210	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	This module aims to provide a comprehensive understanding of AI algorithms, from foundational concepts to practical applications, and to equip learners with the skills needed to apply these algorithms in real-world scenarios.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completing the module Gaining a strong foundation in AI algorithms to address real-world challenges. Gaining the ability in applying in different search algorithms, such as depth-first search and breadth-first search.
Indicative Contents المحتويات الإرشادية	This indicative content aims to cover a broad spectrum of AI algorithms, providing students with a comprehensive understanding of foundational concepts, techniques, and their practical applications.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	- Online Courses and Tutorials: Utilize online courses, tutorials, and video lectures to provide structured learning materials. - Interactive Coding Exercises: Incorporate interactive coding exercises and challenges to reinforce concepts and provide hands-on practice.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

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

Formative assessment	Quizzes	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 Artificial Intelligence
Week 2	Applications of Artificial Intelligence
Week 3	Properties of AI and Characteristics of AI
Week 4	Search Algorithms
Week 5	Structures and Strategies for State Space Search
Week 6	General graph search algorithms and Tree structure search
Week 7	Mid-term Exam
Week 8	Blind search such as – Depth First Search. - Breadth Forst Search. - Hybrid First Search.
Week 9	
Week 10	Heuristic Search Algorithm such as A algorithm and A* Algorithm
Week 11	B tree search algorithm and B* tree search algorithm and AVL search
Week 12	Best First Search and Hill climbing search
Week 13	Dijkstra's search algorithm for Shortest Path
Week 14	Kruskal's Algorithm
Week 15	prim's algorithm

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
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Week 1	Understanding the implement for the AI code
Week 2	Understanding the theoretical and practical of AL algorithm
Week 3	Structures and Strategies for search algorithms
Week 4	Coding for the tree search and graph sorting
Week 5	Coding for the Blind search
Week 6	Coding for the Heuristic Search
Week 7	Coding for the find the Best First Search and Hill climbing search
Week 8	Coding for the Dijkstra's search algorithm to find the Shortest Path
Week 9	Coding for the Kruskal's Algorithm and prim's algorithm to find the shortest path

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1) Karumanchi, N. (2011). <i>Data structures and algorithms made easy in java</i> . CareerMonk Publications. 2) Mehlhorn, K. (2013). <i>Data structures and algorithms 1: Sorting and searching</i> (Vol. 1). Springer Science & Business Media.	No
Recommended Texts		
Websites	1) https://www.libgen.is/search.php?req=data+structure+and+algorithms+in+java&open=0&res=25&view=simple&phrase=1&column=def . 2) https://books.google.iq/books?hl=en&lr=&id=zdupCAAAQBAJ&oi=fnd&pg=PA1&dq=+Data+structures+and+algorithms+&ots=6A4Spz6ohf&sig=LIAQSrfmXUkGK1QeR0JYPQtElkl&redir_esc=y#v=onepage&q=Data%20structures%20and%20algorithms&f=false .	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	اللغة العربية 2		Module Delivery	
Module Type	Type S		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI23			
ECTS Credits	2			
SWL (hr/sem)	50			
Module Level	UGx11 1	Semester of Delivery		
Administering Department	AI	College	Science	
Module Leader	Dr. Abdullah Bander Ali		e-mail	
Module Leader's Acad. Title	Lecturer Dr.	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)	e-mail	E-mail	
Peer Reviewer Name	Name	e-mail	E-mail	
Scientific Committee Approval Date	01/09/2025	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- تعليم الطلبة على أساسيات اللغة العربية وقواعدها 2- تعليم الطلبة على كيفية الاعراب 3- ان يتعلم الطالب على قواعد اللغة العربية 4- أن يتعلم الطالب كيفية بناء الجمل واستخراجها للعنوان المطلوب 5- القدرة على استعمال العبارات الصحيحة 6- القدرة على مشاركة الآخرين في الحوار الصحيح 7- تطوير قدرة الطالب على الحوار والمناقشة في الامور العامة والخاصة 8- تطوير قدرات الطالب في القيام بالأنشطة اللغوية والأدبية 9- تطوير قدرات الطالب على التعامل مع الكتب الرسمية والمخاطبات باللغة السليمة
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- ادارة المحاضرة على نحو تطبيقي مرتبط بواقع الحياة اليومية 2- تكليف الطالب ببعض الأنشطة والواجبات 3- المشاركة الفاعلة في قاعة الدرس دليل التزام الطالب وتحمله المسؤولية 4- الالتزام بالموعد المحدد في تقديم الواجبات والبحث 5- الاختبارات الاسبوعية والشهرية ونهاية الفصل تعبر عن الالتزام والتحصيل المعرفي
Indicative Contents المحتويات الإرشادية	1- حث الطلبة على الاهتمام بالجانب الصحي 2- حث الطلبة على الاهتمام بالجانب العلمي 3- ارشاد الطلبة في مجال المحافظة على توقيتات المحاضرات

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	1- المشاركة بالتحضير في قاعة الدرس 2- طريقة الاسئلة والاجوبة في قاعة الدرس 3- الاختبارات الاسبوعية والشهرية ونهاية الفصل

Student Workload (SWL)			
الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	ظرف الزمان وظرف المكان
Week 2	الضمير وأقسامه
Week 3	همزة الوصل
Week 4	الحروف الصغيرة الزائدة على الرسم
Week 5	النسبة والاختصاص
Week 6	الاغراء والتحذير
Week 7	مفردات الاستهلال في الكتب الرسمية
Week 8	علامات الترقيم في الكتابة العربية ومواقع استعمالها : تعريفها ، اقسامها ، اهميتها
Week 9	الفاصلة (،) والفاصلة المنقوطة (؛)
Week 10	النقطة (.) والنقطتان الرأسيتان (:)
Week 11	الشارحة أو الوصلة (-) والشارحتان (--)
Week 12	علامة الاستفهام (?) وعلامة التعجب (!) وعلامة الحذف (...)
Week 13	الأقواس ، والأقواس المزدوجة ، والألوان
Week 14	الاشارة المائلة (/) والاشارة المائلة المعاكسة (\) واشارة القوة (^) واشارة الضرب (*) واشارة العطف (&)
Week 15	طرق التخلص من التقاء الساكنين عند القراءة
Week 16	امتحان

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

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1- الكتاب : الحوار في شرح الاجرومية ، تأليف السيد بن حسن الديب ، تقرّظ : (أ.د. حمزة بن عبدالله - د. عبدالله بن محمد) ، الناشر : (دار الارقم ، مصر) - (دار الرسالة العالمية ، بيروت - لبنان) ، الطبعة الاولى ، 1433 هـ - 2012 م . 2- الكتاب : قواعد اللغة العربية المبسطة ، تأليف : عبد اللطيف السعيد ، الطبعة الثالثة- 2006 . 3- الكتاب : إضاءات لغوية في المخاطبات الادارية ، تأليف: صفاء صابر مجيد البياتي مطبعة المجمع العلمي العراقي، بغداد- العراق ، ط1 ، 1445 هـ-2023 م.	Yes
Recommended Texts		Yes
Websites	https://www.os-book.com/OS9/	

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	English Language II		Module Delivery	
Module Type	S		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI24			
ECTS Credits	2			
SWL (hr/sem)	50			
Module Level	UGx11 2	Semester of Delivery		
Administering Department	AI	College	Science	
Module Leader	Lec. Dr. Hanaa Nori Hanon		e-mail	
Module Leader's Acad. Title	Lec. Dr.	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	Version Number	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	UOA003	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	- Enhancing English speaking, reading and writing - Memorize a big number of vocabularies - Helping students to deal with the English language in easier ways
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A1. Reading A2. writing A3. Speaking. A4. Listening B. Subject-specific skills B1. Learn scanning and skimming skills in reading B2. Right pronunciation B3. Vocabularies
Indicative Contents المحتويات الإرشادية	- Developing self-confidence through speaking freely - Understanding English from various accents

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	- Working in groups. - Home work - Quizzes and exams. - Referring to some related specialist subjects.

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	200		

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

Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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	Grammar, reading, writing, listening, vocabulary
Week 2	Grammar, reading, writing, listening, vocabulary
Week 3	Grammar, reading, writing, listening, vocabulary
Week 4	Grammar, reading, writing, listening, vocabulary
Week 5	Grammar, reading, writing, listening, vocabulary
Week 6	Grammar, reading, writing, listening, vocabulary
Week 7	Grammar, reading, writing, listening, vocabulary
Week 8	Grammar, reading, writing, listening, vocabulary
Week 9	Grammar, reading, writing, listening, vocabulary
Week 10	Grammar, reading, writing, listening, vocabulary
Week 11	Grammar, reading, writing, listening, vocabulary
Week 12	Grammar, reading, writing, listening, vocabulary
Week 13	Grammar, reading, writing, listening, vocabulary
Week 14	listening,
Week 15	Grammar, reading, writing, listening, vocabulary
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	- New headway plus pre-intermediate student's book - New headway plus Pre-intermediate Teacher's book	Yes
Recommended Texts	New headway plus pre-intermediate workbook	No
Websites	https://elt.oup.com/student/headway/int/download?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 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	Compilers		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI25			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	UGx11 3	Semester of Delivery		5
Administering Department	AI	College	Science	
Module Leader	Assist. Lec. Ali M. Al-Tameemi		e-mail	ali.mohamed@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.	Module Leader's Qualification	MS.C	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	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 objective the compiler course is to understand the basic principles of compiler design, its various constituent parts, algorithms and data structures required to be used in the compiler.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the fundamental concepts of compiler design: Students should be able to comprehend the basic principles, techniques, and components involved in designing and implementing compilers. 2. Analyze and describe the various phases of a compiler: Students should be able to explain the different phases of a compiler, including lexical analysis, syntax analysis, semantic analysis, intermediate code generation, optimization, and code generation. 3. Implement a compiler: Students should gain practical experience by implementing a simple compiler for a programming language. This may involve designing and developing the lexical analyzer, parser, semantic analyzer, and code generator. 4. Apply formal language theory: Students should understand formal languages, regular expressions, context-free grammars, and automata theory, and be able to apply this knowledge to analyze and manipulate programming languages. 5. Perform lexical and syntactic analysis: Students should be able to develop lexical analyzers and parsers to break down the source code into meaningful tokens and construct the corresponding parse tree or abstract syntax tree. 6. Conduct semantic analysis: Students should learn how to perform semantic analysis, including type checking, symbol table management, and static analysis techniques to ensure program correctness and identify potential errors. 7. Understand intermediate representations: Students should become familiar with various intermediate representations used in compilers, such as three-address code, abstract syntax trees, and control flow graphs. They should understand how to manipulate and optimize these representations. 8. Apply optimization techniques: Students should learn about common compiler optimization techniques, such as constant folding, common subexpression elimination, loop optimization, and register allocation. They should be able to apply these techniques to improve the efficiency of generated code. 9. Generate machine code: Students should understand the process of generating machine code or assembly language from the intermediate representation. They should be able to apply code generation algorithms and handle low-level details such as instruction selection and addressing modes. 10. Test and debug compilers: Students should develop skills in testing and debugging compilers. They should be able to identify and fix errors in the compiler implementation and evaluate the correctness and performance of generated code. 11. Stay updated with current compiler trends: Students should be aware of

	recent developments and trends in the field of compiler design, including just-in-time (JIT) compilation, language-specific optimizations, and parallelizing compilers.
Indicative Contents المحتويات الإرشادية	1. Introduction to compilers • Overview of the compiler structure and its role in software development • Compilation process and phases • Types of compilers (e.g., native compilers, just-in-time compilers) 2. Lexical analysis • Tokenization and regular expressions • Lexical analyzer design and implementation • Scanning techniques (e.g., finite automata, regular expressions, lexer generators) 3. Syntax analysis • Context-free grammars and parsing techniques • Top-down parsing (e.g., recursive descent parsing) • Bottom-up parsing (e.g., LR(0), SLR(1), LALR(1), and LR(1) parsing) • Parser generators (e.g., Yacc, Bison) 4. Semantic analysis • Symbol tables and identifier management • Type systems and type checking • Attribute grammars and semantic actions • Static analysis and error detection 5. Intermediate code generation • Intermediate representations (e.g., abstract syntax trees, three-address code) • Syntax-directed translation and code generation • Control flow analysis and basic blocks • Code optimization at the intermediate representation level 6. Code optimization • Common optimization techniques (e.g., constant folding, common subexpression elimination) • Loop optimization (e.g., loop unrolling, loop fusion) • Data-flow analysis and optimization • Register allocation and instruction scheduling 7. Code generation • Target machine models and instruction sets • Instruction selection and mapping • Addressing modes and memory management • Runtime support for generated code (e.g., runtime libraries, exception handling) 8. Compiler testing and debugging • Testing strategies for compilers • Compiler validation techniques • Debugging and error handling in compilers

	Performance evaluation of generated code
	9. Advanced topics - Just-in-time (JIT) compilation - Language-specific optimizations - Parallelizing compilers - Recent trends and research directions in compiler design

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 Compilers • Overview of compilers and their role in software development • Compilation process and phases • Types of compilers
Week 2	Lexical Analysis • Tokenization and regular expressions • Lexical analyzer design and implementation • Scanning techniques
Week 3	Syntax Analysis (Part 1) • Context-free grammars and parsing techniques • Top-down parsing
Week 4	Syntax Analysis (Part 2) • Bottom-up parsing • Parser generators
Week 5	Semantic Analysis (Part 1) • Symbol tables and identifier management • Type systems and type checking
Week 6	Semantic Analysis (Part 2) • Attribute grammars and semantic actions • Static analysis and error detection
Week 7	Mid-term Exam + Static analysis and error detection
Week 8	Intermediate Code Generation • Intermediate representations • Syntax-directed translation and code generation
Week 9	Control Flow Analysis and Optimization • Control flow analysis • Basic blocks • Code optimization at the intermediate representation level
Week 10	Code Optimization (Part 1) • Common optimization techniques • Loop optimization
Week 11	Code Optimization (Part 2) • Data-flow analysis and optimization • Register allocation and instruction scheduling
Week 12	Code Generation • Target machine models and instruction sets • Instruction selection and mapping
Week 13	Memory Management and Runtime Support • Addressing modes • Memory management • Runtime support for generated code

Week 14	Compiler Testing and Debugging • Testing strategies for compilers • Compiler validation techniques • Debugging and error handling in compilers •
Week 15	Advanced Topics • Just-in-time (JIT) compilation • Language-specific optimizations
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to Compiler Tools and Setup • Introduction to compiler development tools (e.g., Lex, Yacc/Bison)
Week 2	• Setting up the development environment for compiler labs • Installing and familiarizing with compiler tools
Week 3	Lab 2: Lexical Analysis Lab • Implementing a lexical analyzer using Lex or a similar tool
Week 4	• Testing and validating the lexical analyzer with sample inputs
Week 5	Lab 3: Syntax Analysis Lab • Implementing a recursive descent parser or a bottom-up parser
Week 6	• Constructing and analyzing parse trees for sample inputs
Week 7	Lab 4: Semantic Analysis Lab • Building a symbol table and performing type checking
Week 8	• Handling semantic errors and reporting them in the compiler
Week 9	Lab 5: Intermediate Code Generation Lab • Generating intermediate code (e.g., three-address code)
Week 10	• Implementing basic optimizations at the intermediate representation level
Week 11	Lab 6: Code Generation Lab • Mapping intermediate code to target machine instructions
Week 12	• Handling memory management and addressing modes in code generation
Week 13	Lab 7: Compiler Project • Integrating the individual components into a complete compiler
Week 14	• Testing and debugging the compiler on sample programs • Finalizing the project and preparing for submission
Week 15	• Recap to previous lectures

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes

Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Computer Architecture		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI26			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	UGx11 3	Semester of Delivery		
Administering Department	AI	College	Science	
Module Leader	Assist. Lec. Rashid merzah		e-mail	Rashid.merzah@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec.		Module Leader's Qualification	Ms.c.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	1/9/2025		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDC113	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	1.To understand the structure, function and characteristics of computer systems. 2. To understand the design of the various functional units and components of computers. 3. To identify the elements of modern instructions sets and their impact on processor design. 4. To explain the function of each element of a memory hierarchy, 5. To identify and compare different methods for computer I/O.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. This course introduces Machine Architecture with coverage of digital logic, machine level data and instruction representation, ALU design, and organization of the processor data path and control. Examines performance analysis, memory system hierarchy, pipelining, and communication.
Indicative Contents المحتويات الإرشادية	1. Introduction to Computer Architecture: • Definition and importance of computer architecture • Historical overview of computer architecture evolution • Basic components and functionalities of a computer system 2. Instruction Set Architecture (ISA): • Overview of instruction formats and addressing modes • Instruction execution cycle and pipeline concepts • RISC (Reduced Instruction Set Computer) and CISC (Complex Instruction Set Computer) architectures 3. Computer Arithmetic: • Representation of numbers (integer and floating-point) • Arithmetic operations and algorithms (addition, subtraction, multiplication, division) • Handling of overflow and underflow 4. Processor Design and Organization: • CPU components (registers, ALU, control unit) • Datapath and control unit design • Instruction fetch and decode, execution, and memory access stages 5. Memory Hierarchy: • Caches and cache organization (associativity, replacement policies) • Virtual memory and paging techniques • Secondary storage (hard disk drives, solid-state drives) 6. Input/Output (I/O) Systems: • I/O devices and interfaces • I/O architectures (programmed I/O, interrupt-driven I/O, DMA) • Bus architectures and protocols (PCI, USB, SATA) 7. Parallel Processing and Multiprocessors: • Flynn's taxonomy of parallel architectures • Shared memory and distributed memory multiprocessor systems • Parallel programming models and synchronization techniques

	8. Performance Evaluation and Benchmarking: • Performance metrics (execution time, throughput, latency) • Performance measurement techniques and tools • Benchmarking and performance analysis methodologies 9. Computer System Interconnects: • Network topologies and protocols (Ethernet, TCP/IP) • Interconnection networks (bus, ring, mesh, hypercube) • High-speed interconnect technologies (InfiniBand, PCIe) 10. Emerging Trends and Technologies in Computer Architecture: • Multi-core and many-core architectures • Accelerators (e.g., GPUs, FPGAs) and heterogeneous computing • Energy-efficient and green computing 11. Computer Architecture Case Studies: • Analysis of real-world computer systems and architectures • Exploration of the design choices and trade-offs in different architectures • Evaluation of performance, power, and scalability in specific case studies
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Instructor-led lectures are used to deliver the theoretical concepts and principles of computer architecture. The lectures provide an overview of the topics, explain complex concepts, and present real-world examples. 2. Hands-on Lab Exercises: Lab sessions provide students with practical experience in computer architecture. They involve working with hardware components, simulators, and software tools to implement and evaluate architectural concepts. Students may work individually or in groups to solve specific problems and gain hands-on experience. 3. Case Studies and Examples: Real-world case studies and examples are used to illustrate the application of computer architecture concepts. Students analyze and discuss the design choices, performance characteristics, and trade-offs in different architectures. 4. Interactive Discussions: Interactive discussions encourage student engagement and participation. Students can ask questions, clarify doubts, and engage in discussions on various topics related to computer architecture. This can be done through in-class discussions, online forums, or group activities. 5. Simulations and Virtual Labs: Computer architecture simulations and virtual labs provide a virtual environment for students to explore and experiment with different architectural concepts. They allow students to simulate hardware components and systems, run experiments, and observe the effects of various design decisions. 6. Assignments and Projects: Assignments and projects are given to students to

	apply their knowledge and skills in practical scenarios. These can include designing a simple processor, optimizing code for performance, analyzing and comparing different architectures, or implementing specific architectural features. 7. Guest Lectures and Industry Talks: Inviting guest lecturers from industry or academia who have expertise in computer architecture can provide students with real-world insights, current trends, and industry practices. Industry talks and visits to relevant companies or research centers can also provide exposure to the practical applications of computer architecture. 8. Assessment Methods: Various assessment methods are used to evaluate students' understanding and application of computer architecture concepts. This may include exams, quizzes, lab reports, project presentations, and class participation. 9. Online Resources and Materials: Supplementary online resources such as lecture notes, slides, video tutorials, and interactive simulations are made available to support students' learning. Online discussion platforms or learning management systems can be used to facilitate communication, share resources, and provide additional learning materials. 10. Continuous Feedback and Support: Regular feedback and support mechanisms are established to assist students in their learning journey. This may include individual consultations with the instructor, peer feedback, or formative assessments to identify areas of improvement and provide guidance.
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Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
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	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.				
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction
Week 2	Data Representation in Computer Systems1
Week 3	Data Representation in Computer Systems2
Week 4	An Introduction to a Simple Computer 1
Week 5	An Introduction to a Simple Computer 2
Week 6	Assembler
Week 7	Mid-term Exam
Week 8	Instruction Set Architecture (ISA) 1
Week 9	Instruction Set Architecture (ISA) 2
Week 10	Memory1
Week 11	Memory2
Week 12	CPU Arithmetic 1
Week 13	CPU Arithmetic 2
Week 14	Review
Week 15	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Computer Organization and Architecture. Linda Null, Julia Lobur.	Yes
Recommended Texts	Computer Organization and Architecture. Linda Null, Julia Lobur.	No
Websites	https://www.coursera.org/browse/ Computer Architecture	

Grading Scheme

مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Computer Networks		Module Delivery	
Module Type	B		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☐ Seminar	
Module Code	TU-AI27			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	UGx11 3	Semester of Delivery		
Administering Department	AI	College	Science	
Module Leader	Lec. Dr. Mustafa Tareq		e-mail	
Module Leader's Acad. Title	Lec. Dr.	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	1/09/2025		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.Understanding Network Fundamentals: Introduce students to the basic concepts and components of computer networks, including network architectures, protocols, and network layers. 2.Exploring Network Protocols: Familiarize students with various network protocols, such as TCP/IP, UDP, HTTP, FTP, DNS, and their roles in facilitating communication and data transfer in computer networks. 3.Studying Network Topologies and Technologies: Explore different network topologies, such as bus, star, ring, mesh, and hybrid, and technologies such as Ethernet, Wi-Fi, and cellular networks. 4.Learning Network Design and Implementation: Develop skills in designing and implementing computer networks, including network planning.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1.Understand the fundamental concepts and principles of computer networks, including network architectures, protocols, layers, and networking technologies. 2.Explain the functions and interactions of various network layers, including the physical layer, data link layer, network layer, transport layer, and application layer. 3.Demonstrate knowledge of network addressing and routing, including IP addressing, subnetting, and routing algorithms. 4.Configure and troubleshoot network devices, such as routers, switches, and firewalls. 5.Analyze and evaluate network performance and identify and resolve network-related issues and bottlenecks. 6.Design and implement a local area network (LAN) or a wide area network (WAN), considering factors such as network topology, security, and scalability. 7.Understand the principles and protocols of wireless networking, including Wi-Fi and cellular networks. 8.Evaluate network security risks and implement appropriate security measures, including authentication, encryption, and intrusion detection systems. 9.Demonstrate knowledge of network management and monitoring techniques, including network monitoring tools and protocols.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to Computer Networks: ● Basic concepts of computer networks ● Network architecture and protocols ● Networking standards and organizations Network Models and Protocols: ● OSI model and TCP/IP protocol suite ● Data encapsulation and protocol stacks ● Network addressing and subnetting Physical Layer and Data Link Layer: ● Transmission media and signaling techniques ● Ethernet LANs and switching

	• MAC addressing and error detection and correction Network Layer: • IP addressing and subnetting • Routing algorithms and protocols (e.g., RIP, OSPF) • IPv6 and transition mechanisms Transport Layer: • Transport protocols (e.g., TCP, UDP) • Connection-oriented and connectionless communication • Flow control and congestion control Application Layer: • Application layer protocols (e.g., HTTP, FTP, DNS) • Client-server model and peer-to-peer applications • Web services and APIs Network Security: • Threats and vulnerabilities in computer networks • Cryptography and encryption techniques • Network security protocols (e.g., SSL/TLS, IPSec) Wireless and Mobile Networks: • Wireless LANs and cellular networks • Mobile IP and mobile network protocols • Wireless security and mobile application development Network Management and Performance: • Network monitoring and troubleshooting • Quality of Service (QoS) and traffic management • Network management protocols (e.g., SNMP) Network Design and Planning: • LAN and WAN design considerations • Network scalability and redundancy • Network documentation and project management Case Studies and Practical Applications: • Real-world network deployment and configurations • Analysis of network performance and optimization • Hands-on exercises and network simulations
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lectures: Instructors deliver lectures to introduce and explain the fundamental concepts, principles, and protocols of computer networks. Lectures may include visual aids, diagrams, and examples to enhance understanding.

	Case Studies and Real-world Examples: Presenting case studies and real-world examples helps students understand how computer networks are utilized in various industries and scenarios. It demonstrates the practical applications of network technologies and protocols. Group Projects: Assigning group projects allows students to collaborate, apply their knowledge, and develop problem-solving skills. Projects may involve designing and implementing network solutions, analyzing network performance, or securing a network infrastructure. Interactive Discussions: Engaging students in discussions encourages active participation and deeper understanding. It provides opportunities to clarify doubts, analyze scenarios, and discuss network design considerations or security issues. Networking Simulations: Utilizing network simulation software allows students to experiment with network configurations, simulate network behavior, and observe the impact of various parameters. This helps reinforce theoretical concepts and gain practical experience. Online Resources and Tutorials: Recommending online resources, tutorials, and documentation helps students supplement their learning. These resources may include websites, forums, online courses, or educational videos that provide additional explanations, demonstrations, and practice exercises. Networking Events and Workshops: Encouraging students to attend networking events, workshops, or conferences helps them stay updated with the latest trends, technologies, and research in the field. It fosters networking and provides exposure to industry professionals. Ethical and Professional Considerations: Emphasizing ethical and professional conduct in networking, including discussions on privacy, security, and legal implications, helps students develop a sense of responsibility and ethical decision-making skills.
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Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

					Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #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 Computer Networks: - Basic concepts of computer networks - Network architecture and protocols - Networking standards and organizations
Week 2	Network Models and Protocols: - OSI model and TCP/IP protocol suite - Data encapsulation and protocol stacks - Network addressing and subnetting
Week 3	Physical Layer and Data Link Layer: - Transmission media and signaling techniques - Ethernet LANs and switching - MAC addressing and error detection and correction
Week 4	Network Layer - IP addressing and subnetting - Routing algorithms and protocols (e.g., RIP, OSPF) - Introduction to IPv6
Week 5	Transport Layer - Transport protocols (e.g., TCP, UDP) - Connection-oriented and connectionless communication - Flow control and congestion control
Week 6	Application Layer - Application layer protocols (e.g., HTTP, FTP, DNS) - Client-server model and peer-to-peer applications - Web services and APIs
Week 7	Mid-term Exam + Network Security, Threats and vulnerabilities in computer networks, Cryptography and encryption techniques and Network security protocols (e.g., SSL/TLS, IPSec)

Week 8	Wireless and Mobile Networks - Wireless LANs and cellular networks - Mobile IP and mobile network protocols - Wireless security and mobile application development
Week 9	Network Management and Performance - Network monitoring and troubleshooting - Quality of Service (QoS) and traffic management - Network management protocols (e.g., SNMP)
Week 10	Virtual Private Networks (VPNs) and Remote Access - VPN concepts and protocols - Remote access technologies (e.g., PPP, SSH) - VPN deployment and configuration
Week 11	Network Design and Planning - LAN and WAN design considerations - Network scalability and redundancy - Network documentation and project management
Week 12	Emerging Network Technologies Cloud computing and virtualization
Week 13	Emerging Network Technologies Software-Defined Networking (SDN)
Week 14	Emerging Network Technologies Internet of Things (IoT) and network connectivity
Week 15	Review and Exam Preparation - Recap of key concepts and topics - Practice exams and exam preparation
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction and Network Basics Introduction to lab equipment and software tools
Week 2	- Familiarization with network simulation software (e.g., Cisco Packet Tracer, GNS3) - Configuring and testing basic network connectivity
Week 3	Lab 2: Ethernet LANs and Switching Configuring and testing Ethernet LANs using switches
Week 4	- Configuring VLANs and inter-VLAN routing - Implementing and troubleshooting Spanning Tree Protocol (STP)

Week 5	Lab 3: IP Addressing and Subnetting • Practicing IP addressing and subnetting calculations • s
Week 6	• Configuring IP addressing on network devices • Testing IP connectivity between devices within subnet
Week 7	Lab 4: Routing and Dynamic Routing Protocols • Configuring static routes and dynamic routing protocols (e.g., RIP, OSPF) •
Week 8	• Testing routing functionality and verifying route tables • Troubleshooting routing issues
Week 9	Lab 5: Transport Layer Protocols • Configuring and testing TCP and UDP services •
Week 10	• Analyzing packet captures to understand transport layer behavior • Implementing and troubleshooting port forwarding and NAT
Week 11	Lab 6: Application Layer Protocols • Configuring and testing common application layer protocols (e.g., HTTP, FTP, DNS) •
Week 12	• Setting up web servers and clients • Analyzing application layer traffic using packet captures
Week 13	Lab 7: Network Security • Configuring and testing basic network security measures (e.g., access control lists, firewall rules) •
Week 14	• Implementing port security on switches • Analyzing network traffic for security threats using intrusion detection systems
Week 15	• Preparation of final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Distributed Systems And TCP/IP Programming In .NET 4.0,	Yes
Recommended Texts	Distributed Systems And TCP/IP Programming In .NET 4.0,	No
Websites	https://www.coursera.org/ComputerNetworks	

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	Optimization Problems		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI28			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	3	Semester of Delivery		5
Administering Department	AI	College	Science	
Module Leader	Lec. Dr. Qais Y. Hatam		e-mail	qais.yahya@uoturath.edu.iq
Module Leader's Acad. Title	Lec. Dr	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		Version Number	1.0

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	AIDC225		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	• The student must also know as learning objectives or course objectives, are statements that specify what students are expected to learn or achieve during a particular module or course. These objectives serve as a guide for both instructors and students, outlining the intended outcomes and skills that will be gained by the end of the module. Here are some key points about module objectives: • Clarity: Module objectives should be clear and specific. They should describe what students will know or be able to do after completing the module in concrete and measurable terms. • Alignment: Objectives should align with the overall goals of the course or program. They should reflect the broader educational outcomes that the module contributes to. • Measurability: Objectives should be measurable, meaning that it should be possible to assess whether students have achieved them. This often involves using specific criteria, such as assessments, exams, or projects, to gauge student progress. • Relevance: Objectives should be relevant to the content and activities of the module. They should reflect the key concepts and skills that are central to the subject matter. • Hierarchy: In a course, objectives may be organized hierarchically. There may be overarching course objectives and more specific module or unit objectives that contribute to the larger goals. • Action-Oriented: Objectives often begin with action verbs that describe what students will do. Common action verbs used in objectives include "understand," "analyze," "apply," "synthesize," and "evaluate." • Timeframe: Objectives should be achievable within the timeframe of the module or course. They should be realistic and attainable given the resources available. • Here's an example of a module objective for a course in artificial intelligence: • Module Objective: By the end of this module, students will be able to analyze and implement various metaheuristic algorithms to solve complex optimization problems in artificial intelligence, demonstrating an understanding of their underlying principles and the ability to apply them to practical scenarios. This module objective outlines the specific skills and knowledge that students are expected to acquire during the module, including the ability to analyze algorithms, implement them, and apply them in real-world AI problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Here are some key points about module learning outcomes: 1. Alignment: Learning outcomes should align with the module objectives, which, in turn, should align with the broader goals of the course or program. They provide a more detailed description of what students are expected to achieve.

	2. Measurability: Learning outcomes should be measurable, meaning that they can be assessed or evaluated to determine whether students have met them. This often involves using specific assessment methods, such as exams, projects, or assignments. 3. Specificity: Learning outcomes should be specific and focused on particular skills, knowledge, or abilities they provide clear guidance to both instructors and students regarding what precisely needs to be achieved or demonstrated. This alignment between outcomes and assessments ensures that assessment results accurately reflect student performance. 4. Demonstrate Proficiency in Programming: Write, debug, and test computer programs in a selected programming language, applying sound programming principles and best practices. 5. Analyze and Solve Problems: Analyze complex problems, break them down into manageable components, and design algorithmic solutions using appropriate data structures and control structures. 6. Collaborate Effectively: Work collaboratively in pairs or teams to develop software solutions, communicate ideas, and resolve programming challenges. 7. Apply Debugging and Testing Techniques: Use debugging and testing techniques to identify and rectify errors in code, ensuring the reliability and robustness of software. 8. Understand Software Development Lifecycle: Describe the stages of the software development lifecycle, from requirements gathering and design to implementation and maintenance, and appreciate the importance of software documentation.
Indicative Contents المحتويات الإرشادية	Introduction to Optimization Software Using Solver Tools (e.g., Excel Solver), What is Optimization? Types of Optimization Problems, Applications of Optimization, Mathematical Optimization Libraries (e.g., PuLP, Gurobi), Simulation-Based Optimization, Machine Learning and Data Science Applications, Real-world Case Studies, Hybrid Metaheuristics.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Conceptual Understanding: Problem-Solving Exercises, here there are some general strategies and approaches that can be applied when tackling optimization problems such as: 1. Problem Formulation: The first step in solving an optimization problem is to correctly formulate it. This involves defining the decision variables, objective function to be minimized or maximized, and any constraints that must be satisfied. Accurate problem formulation is crucial because it sets the

foundation for subsequent steps.

2. Selecting the Right Algorithm: Choose an appropriate optimization algorithm or method based on the problem type. Linear programming (LP), integer programming (IP), nonlinear programming (NLP), metaheuristic algorithms (e.g., genetic algorithms, simulated annealing), and heuristic methods are some options. The choice depends on the problem's characteristics, such as linearity, convexity, and the presence of integer or discrete variables.

3. Initialization: Many optimization algorithms require an initial solution. Providing a good initial solution can significantly affect the convergence and quality of the final solution. For some algorithms, random initial solutions are used, while for others, heuristic methods can provide better starting points.

4. Exploration vs. Exploitation: Striking a balance between exploration (searching for new and potentially better solutions) and exploitation (improving upon known solutions) is essential. This balance is crucial in metaheuristic algorithms and can be controlled through parameters like mutation rates, crossover rates, and temperature schedules (in simulated annealing).

5. Convergence Criteria: Define stopping criteria or convergence criteria that determine when to stop the optimization process. These criteria may be based on a maximum number of iterations, reaching a specific objective value, or a convergence tolerance.

6. Constraints Handling: Handle constraints appropriately. In some cases, constraint violations can be penalized in the objective function, turning a constrained problem into an unconstrained one. For others, constraint-handling techniques like penalty functions or repair operators may be used.

7. Local vs. Global Search: Depending on the problem's complexity, it may be necessary to consider both local and global search strategies. Local search methods focus on finding improved solutions in the vicinity of the current solution, while global search methods explore a broader search space.

8. Parameter Tuning: Many optimization algorithms have parameters that can be tuned to influence their behavior. Parameter tuning involves adjusting these parameters to achieve better performance. This can be done manually or through automated techniques like grid search or evolutionary strategies.

9. Parallel and Distributed Computing: In some cases, optimization problems can benefit from parallel or distributed computing to speed up the search process. Parallelization allows multiple solutions to be evaluated concurrently.

10. Visualization and Analysis: Visualize and analyze the results to gain insights into the optimization process. Tools like visualization plots, sensitivity

	analysis, and Pareto fronts can help in understanding the trade-offs between different solutions. 11. Post-Processing: After obtaining an optimal solution, it's important to evaluate its practical implications and, if necessary, perform post-processing to round or refine the solution to make it more feasible or interpretable in real-world terms. 12. Iterative Improvement: In many optimization problems, it's beneficial to iterate between optimization and problem-specific improvement steps. This approach is often used in real-world applications to fine-tune solutions.
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Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Traveling Salesman Problem (TSP): Metaheuristics like Genetic Algorithms, Ant Colony Optimization, and Simulated Annealing are often used to find optimal or near-optimal routes for a salesman visiting a set of cities once and returning to the starting city.
Week 2	Knapsack Problem: Metaheuristics can be applied to various knapsack problems, where items have different values and weights, and the goal is to maximize the total value of items while respecting weight constraints.
Week 3	Scheduling Problems: Metaheuristics are used in job shop scheduling, project scheduling, and other scheduling problems to optimize the allocation of resources and the order of tasks to minimize makespan, costs, or other objectives.
Week 4	Function Optimization: Metaheuristics can optimize mathematical functions with complex, multi-modal, or discontinuous landscapes. Examples include optimizing neural network parameters or tuning hyperparameters of machine learning models.
Week 5	Vehicle Routing Problem (VRP): Metaheuristics are used to optimize the routes and schedules of a fleet of vehicles for tasks like delivery, pickup, or service calls while minimizing costs or time.
Week 6	Facility Location Problems: Metaheuristics can help determine the optimal locations for facilities (e.g., warehouses, factories) to minimize transportation costs or maximize coverage.
Week 7	Mid-term Exam
Week 8	Feature Selection in Machine Learning: Metaheuristics can be used to select a subset of relevant features from a larger feature set to improve the performance of machine learning models and reduce dimensionality.
Week 9	Parameter Tuning: Metaheuristics can optimize the hyperparameters of machine learning algorithms to improve their performance on specific datasets.
Week 10	Network Design: Metaheuristics can optimize the design of communication networks, transportation networks, and other network structures to minimize costs, maximize efficiency, or meet specific constraints.
Week 11	Combinatorial Optimization: Many combinatorial problems, such as graph coloring, set covering, and bin packing, can be tackled using metaheuristic algorithms.
Week 12	Game Strategies: In game theory, metaheuristics can be used to find optimal strategies for various games and scenarios.
Week 13	Vehicle Routing with Time Windows (VRPTW): An extension of the VRP, VRPTW adds time windows to customer visits, making it more challenging. Metaheuristics are commonly used to solve VRPTW instances.
Week 14	Image Segmentation: Metaheuristics can be used to segment images into meaningful regions or objects, optimizing criteria like edge continuity and color similarity.
Week 15	Multi-Objective Optimization: In cases where there are multiple conflicting objectives to optimize, metaheuristics like Multi-Objective Genetic Algorithms (MOGA) and Multi-Objective Particle Swarm Optimization (MOPSO) can be applied.
Week 16	Terrain Coverage in Robotics: For robotic exploration or monitoring tasks, metaheuristics can optimize the paths of robots to maximize terrain coverage while considering sensor limitations.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	- Talbi, E. G. (2009). <i>Metaheuristics: from design to implementation</i>. John Wiley & Sons. - Corne, D., Dorigo, M., Glover, F., Dasgupta, D., Moscato, P., Poli, R., & Price, K. V. (Eds.). (1999). <i>New ideas in optimization</i>. McGraw-Hill Ltd., UK.	No
Recommended Texts		
Websites	1. https://books.google.iq/books?hl=ar&lr=&id=SlSa6zi5XV8C&oi=fnd&pg=PR7&dq=talbi+for+metaheuristic&ots=-bYKyUmrJp&sig=a9nXzlhD7f-mz2FSIqTLqo0zjA0&redir_esc=y#v=onepage&q=talbi%20for%20metaheuristic&f=false. 2. https://dl.acm.org/doi/abs/10.5555/329055. 3. https://books.google.iq/books?hl=en&lr=&id=p7ZrlcnvmjUC&oi=fnd&pg=PR2&dq=optimization+problems+books&ots=RFYltGsy38&sig=UvQl4cCO0vBxXAT4SmHaYluXGmg&redir_esc=y#v=onepage&q=optimization%20problems%20books&f=false.	

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	Databases		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI29			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	UGx11 3	Semester of Delivery		
Administering Department	AI	College	Science	
Module Leader	Assiat. Lec. Husham Ibrahim Mahdi		e-mail	
Module Leader's Acad. Title	Assiat. Lec	Module Leader's Qualification	MS.C	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2025		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. Understand relational data model in terms of data structure, data integrity, and data manipulation. 2. Understand and create conceptual database models utilizing entity-relationship. 3. Design data structures that will limit redundancy and enforce data integrity while conforming to organizational requirements utilizing normalization methodology. 4. Understand the theory behind the relational data model as it applies to interactions with current database management systems. 5. Interpret a given data model to query the database and transform the data into information using SQL (Structured Query Language). 6. Implement a data model in a current RDBMS. 7. Create reports based on transactional data, including elements such as data groupings and summary values.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Apply the basic concepts of Database Systems and Applications. 2. Use the basics of SQL and construct queries using SQL in database creation and interaction. 3. Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system. 4. Analyze and Select storage and recovery techniques of database system.
Indicative Contents المحتويات الإرشادية	• Data definition and data Types • Specifying constraints (primary key, foreign key, referential integrity etc.) • Basic and complex retrieval queries • Aggregate functions • INSERT, DELETE, and UPDATE Statements • Using join and views

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The general teaching pedagogy includes class lectures, group discussions, case studies, guest lectures, research work; project work. assignments (theoretical and practical), and examinations (written and verbal), depending upon the nature of the topics. The teaching faculty will determine the choice of teaching pedagogy as per the need of topics.

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #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 Database Concepts
Week 2	Database Environment
Week 3	Relational Model
Week 4	Entity Relationship Model
Week 5	Introduction to SQL
Week 6	Basic SQL Tables
Week 7	DB Creation
Week 8	Data Modeling
Week 9	Constraints & Data Manipulation
Week 10	Database Design (Logical and Conceptual)

Week 11	Normalization Database Objects User Creation and Management
Week 12	Managing DB tables-Data Integrity
Week 13	Single and Multiple table queries
Week 14	Advanced Queries, Subqueries & Merge, and Introduction to Regular Expression Functions
Week 15	Project
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: install and configuration SQL server
Week 2	Lab 2: Design a Database and create required tables. For e.g. Bank, College Database
Week 3	Lab 3: Write the queries to implement the joins
Week 4	Lab 4: Converting ER Model to Relational Model using SQL
Week 5	Lab 5: Write the query for implementing the following functions: MAX (), MIN (), AVG (), COUNT ()
Week 6	Lab 6: Write the query to implement the concept of Integrity constraints
Week 7	Lab 7: Write the query to create the views

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Connolly, T. and C. Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management," 6th edition, Pearson, 2014	Yes
Recommended Texts	Coronel, C. and S. Morris, "Database Systems: Design, Implementation, & Management," 12th edition, Cengage, 2016	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Advance Machine Learning		Module Delivery
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	TU-AI30		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	5
Administering Department	AI	College	Science
Module Leader	Lec. Dr. Qais Y. Hatam	e-mail	qais.yahya@uoturath.edu.iq
Module Leader's Acad. Title	Lec. Dr.	Module Leader's Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDC224	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	Throughout this advanced machine learning course, students will delve into a comprehensive range of topics to elevate their understanding and proficiency in the field. The objectives include mastering advanced machine learning techniques in which students will gain expertise in dimensionality reduction, feature extraction, and in-depth exploration of neural networks, allowing students to comprehend multilayer perceptrons. With this knowledge, they will be well-equipped to tackle complex machine learning projects. The syllabus also includes reinforcement learning principles, policy optimization, and an exploration of diverse machine learning applications, ensuring that students emerge with a profound understanding of advanced machine learning and neural networks.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: 1. Students will demonstrate a deep understanding of Support Vector Machines and will be capable of utilizing kernel methods to extend SVMs to more complex data. 2. Students will become skilled in various clustering techniques including K-Means. 3. Students will understand the importance of feature extraction and reduction in high-dimensional data and apply these methods effectively. 4. Students will master the foundations of artificial neural networks, including multilayer perceptrons (MLPs). 5. Students will understand the principles of reinforcement learning and Markov decision processes to solve complex problems. They will also explore policy optimization methods and actor-critic approaches.
Indicative Contents المحتويات الإرشادية	Kernel functions and non-linear classification. Spectral clustering and other advanced clustering algorithms. Principal Component Analysis (PCA) in-depth. Activation functions and backpropagation.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Hands-on Practical Exercises Case Studies and Real-World Examples Collaborative Learning Continuous Assessment and Feedback

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	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)	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	5% (5)	Continuous	All
	Report	1	5% (5)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	20% (20)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Artificial Neural Networks
Week 2	Multi-layer Perceptrons (MLPs)
Week 3	Support Vector Machine and Kernel Methods
Week 4	Ensemble Learning Approach
Week 5	Introduction to Unsupervised learning
Week 6	K-Means Clustering
Week 7	Spectral Clustering

Week 8	Principle Component Analysis (PCA)
Week 9	Advanced feature extraction techniques
Week 10	Advanced time series modeling techniques
Week 11	State space models and hidden Markov models
Week 12	Reinforcement Learning and Policy Optimization
Week 13	Markov decision processes (MDPs)
Week 14	Capstone Project
Week 15	Case Study + (Skill test)

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Set up the Python environment for neural networks and machine learning.
Week 2	Build and train MLPs for classification and regression tasks
Week 3	Build and train MLPs for classification and regression tasks
Week 4	Implement SVMs for classification problems. Experiment with different kernel functions.
Week 5	Implement SVMs for classification problems. Experiment with different kernel functions.
Week 6	Explore ensemble methods like bagging and boosting. Build and evaluate ensemble models.
Week 7	Explore ensemble methods like bagging and boosting. Build and evaluate ensemble models.
Week 8	Apply clustering algorithms to unlabeled data.
Week 9	Apply clustering algorithms to unlabeled data.
Week 10	Implement K-Means clustering on real-world datasets. Explore spectral clustering for non-linearly separable data.
Week 11	Implement K-Means clustering on real-world datasets. Explore spectral clustering for non-linearly separable data.
Week 12	Implement PCA for dimensionality reduction and data visualization.
Week 13	Implement PCA for dimensionality reduction and data visualization.
Week 14	Understand state space models and Hidden Markov Models (HMMs).

	Implement HMMs for sequential data analysis. Experiment with policy optimization algorithms. Solve simple MDP problems and apply RL techniques.
Week 15	Understand state space models and Hidden Markov Models (HMMs). Implement HMMs for sequential data analysis. Experiment with policy optimization algorithms. Solve simple MDP problems and apply RL techniques.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Machine Learning Algorithms	No
Recommended Texts	Machine Learning Concepts	No
Websites		

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Information Retrieval		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI31			
ECTS Credits	6			
SWL (hr/sem)	125			
Module Level	UGx11 3	Semester of Delivery		6
Administering Department	AI	College	College of Science	
Module Leader	Assist. Lec. Bushra Rabeea Nada		e-mail	bushra.rabeea@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec	Module Leader's Qualification	Ms.C.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	1/9/2025		Version Number	1.0

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	AIDC214, AIDC223		Semester	3, 4
Co-requisites module	None		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Understand the Fundamental Concepts: Gain a deep understanding of the fundamental concepts of information retrieval. • Text Processing and Indexing: Learn the principles of text processing, tokenization, and indexing to effectively. • Retrieval Models: Explore various retrieval models, such as Boolean, Vector Space, Probabilistic, and Language Models. • Evaluation Techniques: Become proficient in evaluating the performance of information retrieval systems, including the use of metrics like Precision, Recall, MAP, and NDCG. • Query Formulation: Learn how to formulate effective search queries and understand the query expansion. • Information Retrieval in Diverse Domains: Explore the application of information retrieval techniques in various domains
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completing the course, students should be able to: • Explain Key Concepts: Articulate the key concepts of information retrieval, including indexing, retrieval models, and evaluation metrics. • Design and Build Indexes: Create and optimize inverted indexes for text data, applying text processing techniques. • Be able to Select and Apply Retrieval Models: Choose appropriate retrieval models (e.g., Boolean, Vector Space, or Language Models). • Evaluate Retrieval Systems: Measure and evaluate the performance of information retrieval systems using metrics like Precision, Recall, MAP, and NDCG. • Formulate Effective Queries: Formulate search queries that are precise and relevant to the information needs, and apply query expansion
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Information Retrieval: focus on classical information techniques, including text processing, tokenization, and many other techniques.[15 hrs] Index Construction and Compression: The course will emphasize rigorous Index on construction process: sorting and merging. Techniques for index compression (e.g., delta encoding, variable byte encoding). Inverted index design and optimization for efficient retrieval.. [15 hrs] Assignments and homework: Assignments and homework will be distributed during the course. Unless otherwise is stated, all homework should be performed individually by students. The default time for submitting any homework is one week (they should be submitted before the beginning of the next lecture). All assignments and homework assignments have to be submitted in a printed well-organized form. [15 hrs]

	All students should participate in different presentations about different subjects. [10 hrs] Different topics will be discussed with students where they will be asked to search over the web for and try to prepare a reports for every topic they asked to provide. [8 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Provide regular lectures to introduce and explain key concepts and theories in information retrieval. 2. Practical Demonstrations: Conduct hands-on demonstrations to show students how to implement various information retrieval techniques, such as text processing, indexing, and query processing. 3. Group Discussions: Encourage group discussions to promote critical thinking and application of concepts. 4. Problem-Solving Exercises: Assign problem-solving exercises and practical tasks that require students to apply information retrieval techniques to solve real problems. 5. Homework Assignments: Assign regular homework exercises to reinforce learning and assess individual understanding of the material. 6. In-Class Quizzes: Administer in-class quizzes or short assessments to gauge students' comprehension of recent lectures or readings.

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	35	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	3	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.	2	10% (10)	Continuous	All
	Report	2	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Information Retrieval
Week 2	Boolean retrieval
Week 3	The term vocabulary and postings list: - Document delineation and character sequence decoding - Obtaining the character sequence in a document 19 - Choosing a document unit
Week 4	Determining the vocabulary of terms: - Tokenization. - Dropping common terms: stopwords. - Normalization (equivalence classing of terms). - Stemming and lemmatization.
Week 5	Faster postings list intersection via skip pointers Positional postings and phrase queries - Biword indexes - Positional indexes - Combination schemes
Week 6	Dictionaries and tolerant retrieval Search structures for dictionaries Wildcard queries General wildcard queries

	• k-gram indexes for wildcard queries
Week 7	Midterm
Week 8	Spelling correction: • Implementing spelling correction. • Forms of spelling correction. • Edit distance. • k-gram indexes for spelling correction • Context sensitive spelling correction
Week 9	Index construction • Hardware basics • Blocked sort-based indexing • Single-pass in-memory indexing • Distributed indexing • Dynamic indexing
Week 10	Index compression • Statistical properties of terms in information retrieval • Heaps' law: Estimating the number of terms. • Zipf's law: Modeling the distribution of terms. • Dictionary compression. • Dictionary as a string
Week 11	Postings file compression • Variable byte codes
Week 12	Scoring, term weighting and the vector space model • Parametric and zone indexes • Weighted zone scoring • Learning weights The optimal weight g
Week 13	Term frequency and weighting • Inverse document frequency

	Tf-idf weighting
Week 14	The vector space model for scoring Dot products Queries as vectors
Week 15	Final Exam
Week 16	Recap for the final course exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Information retrieval Tools and Packages (e.g. NLTK, Scikit and many others)
Week 2	Text tokenization and Word Count
Week 3	Text Cleaning and Stemming
Week 4	Building an Inverted Index
Week 5	Building a Web Crawler
Week 6	Web Search Project
Week 7	Query Expansion and Relevance Feedback

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"An Introduction to Information Retrieval" by Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze.	Yes
Recommended Texts	"Information Retrieval: Algorithms and Heuristics" by David A. Grossman, Ophir Frieder, and J. Munson. "Search Engines: Information Retrieval in Practice" by Bruce Croft, Donald Metzler, and Trevor Strohman.	Yes
Websites	https://nlp.stanford.edu/IR-book/pdf/irbookprint.pdf	

Grading Scheme

مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Web Application		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	TU-AI32			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	UGx11 3	Semester of Delivery		
Administering Department	AI	College	College of Science	
Module Leader	Assist. Lec. Husham Ibrahim Mahdi		e-mail	
Module Leader's Acad. Title	Assist. Lec	Module Leader's Qualification	MS.C.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	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. Create a basic PHP script. 2. Execute a PHP script. 3. Send data to the Web browser. 4. Write comments in PHP. 5. Demonstrate how to use variables. 6. Work with string variables, including concatenation and a few string functions. 7. Work with numeric variables, including arithmetic and formatting. 8. Work with constants. 9. Know how PHP treats the two quotation mark types differently. 10. Recognize common escape sequences. 11. Implement some basic debugging techniques
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enhanced User Experience: Web applications are designed to provide an intuitive and user-friendly experience for visitors or users. 2. Increased Accessibility: Web applications can be accessed from anywhere with an internet connection, making them highly accessible to users across different devices and platforms. 3. Improved Efficiency and Productivity: Web applications can automate and streamline various business processes, leading to improved efficiency and productivity. 4. Scalability and Flexibility: Web applications can be designed and developed to accommodate growth and changing business needs. 5. Cost-effectiveness: Compared to traditional software applications, web applications can be more cost-effective in terms of development, deployment, and maintenance. 6. Data Analysis and Insights: Web applications can collect and analyze user data, providing valuable insights into user behavior, preferences, and patterns.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A: Web Application Development</u> Web application: present the concept of web application and explain the introduction of the PHP and functions. [15 hrs]

	Requirements Gathering and Analysis: showing the identifying the goals and objectives of the web application , understanding the target audience and user requirements.[15 hrs] MySQL: Introduction to MySQL and how to connect to the database. Also describe MySQL Queries and how it works. After that explain the advanced PHP .[15 hrs] Different topics will be discussed with student where they will be asked to search over web for and try to prepare a report for every topic they asked to provide. [15 hrs] Showing applying methods of inserting CSS to the HTML and Designing and applying styling tables and explain how inserting JavaScript code and dealing HTML by JavaScript.[15 hrs] Part B: Lab HTML: showing Creating the HTML files and writing basic script and executing HTML tags then , how we can Creating HTML forms to collect data.[10 hrs] There are going to be many assignments during the lab.[8 hrs] .
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Online Courses and Tutorials: Utilize online courses, tutorials, and video lectures to provide structured learning materials. 2. Interactive Coding Exercises: Incorporate interactive coding exercises and challenges to reinforce concepts and provide hands-on practice.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem)	100		

الحمل الدراسي الكلي للطالب خلال الفصل	
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Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	5% (5)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	5% (5)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	15% (15)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	15% (15)	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 on Web Hosts.
Week 2	Introduction to PHP.
Week 3	Programming with PHP.
Week 4	Functions in PHP.
Week 5	Data Validation (Server Side).
Week 6	First exam.
Week 7	Introduction to MySQL.
Week 8	Connecting to the Database.
Week 9	MySQL Queries.
Week 10	MySQL Queries.
Week 11	Operation on MySQL.
Week 12	Advanced PHP.
Week 13	Second Exam.
Week 14	Students team research projects (reports and presentations).
Week 15	Students team research projects (reports and presentations)
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Creating the HTML files and writing basic script.
Week 2	Creating the HTML files and writing basic script.
Week 3	Executing HTML tags.
Week 4	Executing HTML tags.
Week 5	Creating HTML forms to collect data.
Week 6	Creating HTML forms to collect data.
Week 7	Inserting CSS to HTML and Dealing with inline style.
Week 8	Inserting CSS to HTML and Dealing with inline style.
Week 9	Quiz and in lab script writing.
Week 10	Quiz and in lab script writing.
Week 11	Applying methods of Inserting CSS to the HTML and Designing and applying styling tables.
Week 12	Applying methods of Inserting CSS to the HTML and Designing and applying styling tables.
Week 13	Inserting JavaScript code and Dealing html by JavaScript
Week 14	Inserting JavaScript code and Dealing html by JavaScript
Week 15	Preparation for the final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	PHP and MySQL for Dynamic Web Sites 4th Edition.	Yes
Recommended Texts	PHP and MySQL for Dynamic Web Sites 4th Edition.	Yes
Websites	https://www.academia.edu/40707720/PHP_and_MySQL_for_Dynamic_Web_Sites_Fourth_Edition	

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	Metaheuristic		Module Delivery
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	TU-AI33		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	UGx11 3	Semester of Delivery	
Administering Department	AI	College	Science
Module Leader	Lec. Dr. Qais Y. Hatam	e-mail	qais.yahya@uoturath.edu.iq
Module Leader's Acad. Title	Lec. Dr	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDC225	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	- Understand the concepts and terms and consider joining student groups related to optimization, algorithms, or AI to further the new knowledge about meta-heuristics algorithms. - Investigate whether the program offers research opportunities in meta-heuristics and if faculty members have expertise in this area. Research experience can enhance your understanding and skill set. - Prepare application materials for all metaheuristic. Be sure to highlight your interest in meta-heuristics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	- Apply meta-heuristic techniques to solve complex optimization problems. - Select appropriate meta-heuristic algorithms for specific problem domains. - Perform parameter tuning and optimization to enhance algorithm performance. - Apply meta-heuristics to solve real-world optimization problems in various domains, such as logistics, finance, engineering, and healthcare.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Metaheuristic provides a snapshot of the key topics and concepts covered in a Metaheuristic module, offering a blend of theoretical understanding and practical application. Assignments and homework: Assignments and homework will be distributed during the course. Unless otherwise is stated, all homework should be performed individually by students. The default time for submitting any homework is one week (they should be submitted before the beginning of the next lecture). All assignments and homework assignments have to be submitted in a printed well-organized form. [15 hrs] All students should participate in different presentations about different subjects. [10 hrs] Different topics will be discussed with students where they will be asked to search over the web for and try to prepare a reports for every topic they asked to provide. [8 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The general teaching pedagogy includes class lectures, group discussions, case studies, guest lectures, research work; project work. Assignments (theoretical and practical), and examinations (written and verbal), depending upon the nature of the topics. The teaching faculty will determine the choice of teaching pedagogy as per the need of topics.

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Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	108	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	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 for Metaheuristics
Week 2	Basic principles of optimization methods (Metaheuristics)
Week 3	Main common concepts for Metaheuristics
Week 4	The back propagation learning procedure, derivation of the BP algorithm, Back propagation training algorithm.
Week 5	Objective Function
Week 6	Parameter Tuning

Week 7	Mid-term Exam
Week 8	Single Solution & Population solution-based Metaheuristics
Week 9	Evolutionary Algorithms (Global Search), Genetic algorithm, Ant colony Algorithm
Week 10	Type of operators, population, selection, crossover rate, mutation rate
Week 11	Common Concepts of Evolutionary Algorithms
Week 12	Application of GA and other algorithms, Advantage and Disadvantage of GA
Week 13	Local search Algorithms - Tabu search operators - Simulated Annealing - GD - HC
Week 14	- Swarm Optimization Algorithms - PSO - BA - GSO - FA
Week 15	Parallel search (Multi population) & Multi objective search in Metaheuristic
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction for Metaheuristics Code
Week 2	Heuristic search code (real problem)
Week 3	Metaheuristic problem independent high-level strategy
Week 4	Greedy Heuristic code – local optimum
Week 5	Simulated annealing adds randomness (stopping condition)
Week 6	Tabu search (memory)
Week 7	Variable Neighborhood search (VNS)
Week 8	Population based approaches (Genetic Algorithm (GA)) and Memetic Algorithm (MA)
Week 9	Nature inspired metaheuristics (Swarm algorithms) such as (PSO, BAT, FS, FA, GSO, Bee,....)

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

Required Texts	Talbi, E. G. (2009). <i>Metaheuristics: from design to implementation</i> . John Wiley & Sons. Malik, H., Iqbal, A., Joshi, P., Agrawal, S., & Bakhsh, F. I. (Eds.). (2021). <i>Metaheuristic and evolutionary computation: algorithms and applications</i> (Vol. 916). Berlin/Heidelberg, Germany: Springer.	No
Recommended Texts		
Websites	https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=METAHEURISTIC+book&btnG=	

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	Deep Learning		Module Delivery
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	TU-AI34		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	3	Semester of Delivery	6
Administering Department	AI	College	Science
Module Leader	Lec. Dr. Qais Y. Hatam	e-mail	qais.yahya@uoturath.edu.iq
Module Leader's Acad. Title	Associate Professor	Module Leader's Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/09/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	AIDC316	Semester	5
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The aim of this module is to provide students with a comprehensive understanding of Deep Learning, a subfield of Artificial Intelligence that focuses on training neural networks with multiple layers. Students will learn the theoretical foundations of Deep Learning, explore various architectures, and gain practical experience in implementing Deep Learning models. The module aims to equip students with the necessary skills to apply Deep Learning techniques to solve real-world problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: 1- Understand the fundamental concepts and principles of Deep Learning. 2- Gain knowledge of different Deep Learning architectures and their applications. 3- Develop skills in implementing and training Deep Learning models. 4- Evaluate and interpret the performance of Deep Learning models. 5- Apply Deep Learning techniques to solve real-world problems. 6- Stay updated with the latest advancements and trends in Deep Learning.
Indicative Contents المحتويات الإرشادية	Overview of neural networks and their limitations. Historical development and milestones in Deep Learning. Deep Learning applications in various domains. Neural Network Fundamentals Perceptrons and activation functions. Transfer learning techniques and their advantages. Metrics for evaluating classification and regression models. Attention mechanisms and Transformer models. Hands-on exercises using Deep Learning frameworks (e.g., TensorFlow, PyTorch). Building and training Deep Learning models on real-world datasets. Fine-tuning and optimizing Deep Learning models.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Hands-on Practical Exercises Case Studies and Real-World Examples Collaborative Learning Continuous Assessment and Feedback

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	108	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	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	5% (5)	Continuous	All
	Report	1	5% (5)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	20% (20)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	1. Introduction to Deep Learning a. Definition and Overview b. Applications of Deep Learning c. Difference between Machine Learning and Deep Learning
Week 2	2. Foundations of Neural Networks a. Perceptrons

	b. Activation Functions c. Multi-Layer Perceptrons (MLP) d. Backpropagation Algorithm
Week 3	3. Optimization Techniques a. Gradient Descent b. Stochastic Gradient Descent c. Mini-Batch Gradient Descent d. Adaptive Learning Rate Methods (Adam, RMSprop, etc.)
Week 4	4. Regularization and Normalization a. L1 & L2 Regularization b. Dropout c. Batch Normalization d. Data Augmentation
Week 5	5. Convolutional Neural Networks (CNNs) a. Architecture of CNNs b. Convolution and Pooling c. Implementation of CNNs d. Applications: Image Classification, Object Detection, etc.
Week 6	6. Recurrent Neural Networks (RNNs) a. Architecture of RNNs
Week 7	7. Long Short-Term Memory (LSTM) - Gated Recurrent Units (GRU) - Applications: Time Series Prediction, Natural Language Processing, etc.
Week 8	- Midterm Exam
Week 9	9. Advanced Deep Learning Models a. Transformer Models b. BERT and GPT c. Attention Mechanisms d. Generative Models: Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs)
Week 10	10. Transfer Learning and Fine-tuning a. Concepts of Transfer Learning b. Pre-trained Models c. Fine-tuning Strategies
Week 11	11. Practical Implementation and Frameworks a. TensorFlow and Keras b. PyTorch c. Model Deployment
Week 12	12. Special Topics a. Reinforcement Learning

	• b. Self-Supervised Learning • c. Multimodal Learning
Week 13	• 13. Ethical Considerations and Bias in AI • a. Ethical Concerns in Deep Learning • b. Bias and Fairness • c. Privacy and Security in AI
Week 14	• 14. Project Work • a. Define a Problem Statement • b. Collect and Preprocess Data • c. Implement a Deep Learning Model • d. Evaluate Performance and Make Improvements
Week 15	• 15. Successful Case Studies

Lab Plan (Weekly Syllabus) المنهاج الاسبوعي العملي	
	Material Covered
Week 1	Applications of Deep Learning using Python
Week 2	The implementation of Perceptrons, Activation Functions, Multi-Layer Perceptrons (MLP), Backpropagation Algorithm
Week 3	Examples of Optimization Techniques: Gradient Descent, Stochastic Gradient Descent, Mini-Batch Gradient Descent, Adaptive Learning Rate Methods (Adam, RMSprop, etc.)
Week 4	Case studies on Regularization and Normalization • a. L1 & L2 Regularization • b. Dropout • c. Batch Normalization • d. Data Augmentation
Week 5	Tutorial on Convolutional Neural Networks (CNNs) with some Applications: Image Classification, Object Detection, etc.
Week 6	Tutorial on Recurrent Neural Networks (RNNs) • Applications: Time Series Prediction, Natural Language Processing, etc.
Week 7	Case studies on ML methods
Week 8	-
Week 9	Tutorial on Advanced Deep Learning Models • a. Transformer Models • b. BERT and GPT • c. Attention Mechanisms

	d. Generative Models: Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs)
Week 10	Tutorial on Transfer Learning and Fine-tuning a. Concepts of Transfer Learning b. Pre-trained Models c. Fine-tuning Strategies
Week 11	Practical Implementation and Frameworks a. TensorFlow and Keras b. PyTorch c. Model Deployment
Week 12	Project Work a. Define a Problem Statement b. Collect and Preprocess Data
Week 13	Project Work a. Define a Problem Statement b. Collect and Preprocess Data c. Implement a Deep Learning Model d. Evaluate Performance and Make Improvements
Week 14	Successful Case Studies
Week 15	Successful Case Studies

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Machine Learning Algorithms	No
Recommended Texts	Machine Learning Concepts	No
Websites		

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

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Computer Security		Module Delivery
Module Type	C		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☒ Practical ☐ Seminar
Module Code	TU-AI35		
ECTS Credits	5		
SWL (hr/sem)	150		
Module Level	UGx11 3	Semester of Delivery	
Administering Department	AI	College	College of Science
Module Leader	Assist. Lec. Bushra Rabeea Nada	e-mail	bushra.rabeea@uoturath.edu.iq
Module Leader's Acad. Title	Assist. Lec	Module Leader's Qualification	MS.C
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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 explore the concepts of information security attacks, services, and mechanism. 2. To make students familiar with the basic concepts of applied cryptography, including classical cryptography and modern secret key cryptography. 3. To explain the mathematical foundation of modern cryptography, especially number theory and finite fields. 4. To highlight the practical applications and modes of operation of block ciphers.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completing the module, the student should be able to: 1. Describe the basic mathematical and technical issues relating to information security. 2. Learning how to leverage these concepts to protect computers from external threats. 3. Interpret how technology affects the design of symmetrical systems, especially block ciphers. 4. Use rigorous mathematical formulations of symmetric cryptography to spot weaknesses in designs. 5. Demonstrate skills in using classical ciphers for encryption and decryption. 6. Demonstrate skills in using some basic cryptanalysis techniques related to classical cryptography.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Computer Security: focus on classical and symmetric key cryptography, including block ciphers and their modes of operation.[15 hrs] The course will emphasize rigorous mathematical formulations of security goals and aim to train students in spotting weaknesses in designs. This is generally regarded by undergraduates as a challenging course. It is mainly theoretical and mathematical in nature and calls for the ability to understand abstract concepts. [15 hrs] Assignments and homework: Assignments and homework will be distributed during the course. Unless otherwise is stated, all homework should be performed individually by students. The default time

	for submitting any homework is one week (they should be submitted before the beginning of the next lecture). All assignments and homework assignments have to be submitted in a printed well-organized form. [15 hrs] All students should participate in different presentations about different subjects. [10 hrs] Different topics will be discussed with students where they will be asked to search over the web for and try to prepare a reports for every topic they asked to provide. [8 hrs]
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	1. Directing students with inferential questions during lectures and assigning them to research the answers through internet searches. 2. Prohibiting the exchange of solutions among students in groups by changing the assignments from one group to another. 3. Encouraging students to attend theoretical lectures by conducting daily exams.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	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	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11

assessment	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 and Historical Notes.
Week 2	Classical Encryption Techniques.
Week 3	Substitution Ciphers
Week 4	Transposition Ciphers and.
Week 5	Encryption Machines.
Week 6	Block Ciphers.
Week 7	The Data Encryption Standard.
Week 8	DES Cryptanalysis.
Week 9	Groups, Rings, and Fields.
Week 10	Modular Arithmetic.
Week 11	Polynomial Arithmetic.
Week 12	Finite Fields of the Form $GF(2^n)$.
Week 13	AES: The Advanced Encryption Standard and AES Strength
Week 14	sing Block, Stream Ciphers and Modes of Operation.
Week 15	Review All Topics.
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	William Stallings, Cryptography and Network Security: Principles and Practice, 5/E.	Yes
Recommended Texts	William Stallings, Cryptography and Network Security: Principles and Practice, 5/E ISBN-10: 0136097049 ISBN-13: 9780136097044 Publisher: Prentice Hall Copyright: 2011 (3rd or 4th editions of this text are also sufficient)	Yes
Websites	https://www.amazon.com/Cryptography-Network-Security-Principles-Practice/dp/0136097049 .	

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