

Academic Program Description Form

University name: Tikrit University

Faculty/ Institute: College of computer science and mathematics

Scientific Department: Computer Science

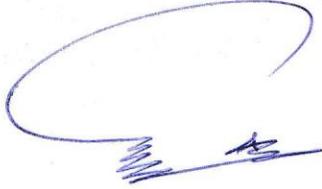
Academic or Professional program name: University Performance

Final certificate name: Bachelor`s

Academic System: Semester & Bologna system (first stage)

Description preparation date: 1/2/2026

File completion date: 1/3/2026



Signature:

Head of department name:

Date:

الأستاذ المساعد الدكتور  
محمد شاذل حميد  
رئيس قسم علوم الحاسوب

10/3/2026



Signature:

Scientific associate name: Majid Hamid Ali

Date:

10/3/2026

الأستاذ المساعد الدكتور  
ماجد حامد علي  
معاون العميد للشؤون العلمية والدراسات العليا

The file is checked by:

Department of Quality Assurance and University Performance

Director of Quality Assurance and University Performance Department:

Dr. Younis Abdulrazek Hussein

Date:

10/3/2026

Signature:



Approval of the dean

Asst. Prof. Dr. Mahmood M. Salih  
10/3/2026

الأستاذ المساعد الدكتور  
محمود مكي صالح علاوي  
عميد كلية علوم الحاسوب والرياضيات

## **1. Program Vision**

Providing distinguished academic programs in the field of computer science, both theoretical and applied, that comply with international standards of academic quality and meet the needs of the labor market. Encouraging and developing scientific research in the fields of computer science in general, and the fields of artificial intelligence, robotics, computational linguistics, and networks in particular.

## **2. Program Mission**

The mission of the department is to prepare students professionally and academically with high-quality education through a model program equipped with all the teaching and learning tools the student needs and a highly qualified academic staff. The ultimate mission of the department is to provide distinguished education and a suitable academic environment in the fields of computer science.

## **3. Program Objectives**

1. Providing modern and diverse educational programs in the fields of computer science, software and information technology, that meet international quality standards and keep pace with technical developments.
2. Graduating distinguished students with technical and creative skills and the ability to solve complex problems in the fields of computer science and software.
3. Providing an integrated educational environment based on the latest tools and technologies to improve
4. Supporting students and faculty members in adopting a culture of innovation and technological entrepreneurship, and encouraging the creation of innovative technical projects.
5. Providing distinguished graduate programs in software and computer science to qualify advanced academic and research competencies.
6. Instilling the values of integrity, credibility and social responsibility in all

aspects of education and scientific research.

7. Providing training programs and workshops to raise the efficiency of students, graduates and faculty members and enhance opportunities for continuous learning.

#### 4. Programmatic accreditation:

1. The student learns programming languages.
2. The ability to find scientific software solutions to community problems.
3. Develop the student's skills in building smart systems that depend on the basis of analysis and inference.
4. Provide the student with the basic rules in building software systems based on the basics of software engineering.
5. Increase the student's information on the basics of implementing software systems by understanding the mechanism of computer operation.

#### 5. Other external influences:

1. Through the scientific conference for students.
2. The quarterly scientific seminar of the department.
3. Discussion sessions for professors.
4. Research seminars.

Notes	Unit of study	Number of courses	Program Structure
	12	6	Institutional Requirements
	18	6	Faculty Requirements
	84	20	Department Requirements
	Completed	1	Summer Training
			Other

\* Notes can include whether the course is core or optional.

## 7. Program Description

Credit Hours			Course Name	Course Code	Level
Tut.	Lab	Theoretical			
2	2	2	Advanced Programming	TU010101113	Stage 1/Second Semester
	2	2	Algorithm design	TU010101111	Stage 1/Second Semester
		4	Theory of computation	TU010101114	Stage 1/Second Semester
	2	2	Logic Design	TU010101112	Stage 1/Second Semester
	2	2	Web Programming 1	TU010101115	Stage 1/Second Semester
		2	Arabic Language	UOT001	Stage 1/Second Semester
	2	2	Artificial intelligence	TU010101223	Stage 2/ Second Semester
	2	2	Relational databases and structured query language	TU010101225	Stage 2/ Second Semester
	-	2	English Language II	UOT021	Stage 2/ Second Semester
2	2	2	Visual programming	TU010101224	Stage 2/ Second Semester
	2	2	Statistics and probability	TU010101222	Stage 2/ Second Semester
		2	Arabic Language2	UOT011	Stage 2/ Second Semester
	2	2	Machine Learning	TU010101320	Stage 3/ Second Semester
	2	2	Compilers	TU010101321	Stage 3/ Second Semester
	2	2	Web Development Frameworks	TU010101322	Stage 3/ Second Semester
		2	Research Methodology	TU010101323	Stage 3/ Second Semester
	2	2	Internet of Things	TU010101324	Stage 3/ Second Semester
	2	2	Operating systems 2	TU010101325	Stage 3/ Second Semester
		4	Distributed systems	433ع	Stage 4/ Second Semester
	2	2	Computer Networks	342ع	Stage 4/ Second Semester
	2	2	Multimedia and Network Security	463ع	Stage 4/ Second Semester

	2	2	Data mining	432ç	Stage 4/ Second Semester
	2	2	Neural Networks	412ç	Stage 4/ Second Semester
	2	2	Graduation Project	492ç	Stage 4/ Second Semester

## 8. Expected Learning Outcomes of the Program

### Knowledge

1. Enable students to gain knowledge and understanding of computer basics
  2. Enable students to gain knowledge and understanding of computer applications
  3. Enable students to gain knowledge and understanding of computer programming
  4. Enable students to gain knowledge and understanding of computer networks
  5. Enable students to gain knowledge and understanding of multimedia
- Enable students to gain knowledge and understanding of data science and mining.

### Skills

#### Memorization and analysis skills

- Empowering students to obtain knowledge and understanding of computer programming
- The ability to remember information accurately and in an organized manner.
- The ability to retrieve information quickly and effectively when needed.
- The ability to prioritize activities and allocate time effectively.

#### Scientific skills

- Proficiency in different programming languages such as Java, C, C++, etc.
- Understanding the basic processes and concepts of software development in an effective and organized manner.
- Understanding how to build and manage information networks.
- Understanding security threats and how to protect data and networks from them.
- Learn artificial intelligence and machine learning and understand the models and algorithms used in developing intelligent systems.
- The ability to extract and analyze data effectively to obtain valuable insights.

	<ul style="list-style-type: none"> <li>• <b>Learn the basics of saving and viewing data using different databases.</b></li> <li>• <b>Web application development</b></li> </ul>
<b>Values</b>	
Learning Outcome Statement 4	Enable students to gain knowledge and understanding of computer networks
Learning Outcome Statement 5	Enable students to gain knowledge and understanding of multimedia
<b>9. Teaching and learning strategies:</b>	
<p>1- Providing students with the basics and additional topics related to the previous educational outcomes of skills to solve scientific problems.</p> <p>2- Solving a set of scientific examples by the academic staff.</p> <p>3- Asking students during the lecture to solve some scientific problems</p> <p>4. Visiting all scientific computer science laboratories by the academic staff.</p>	
<b>10. Evaluation methods:</b>	
<p>1- Standard Quality Systems (standards Quality)</p> <p>2- Daily exams with self-solved homework questions.</p> <p>3- Points for sharing questions for a competition related to the subject matter.</p> <p>4- Points for specific homework assignments.</p>	

## 11. The teaching staff

### The teaching staff members

ت	الاسم	الشهادة	اللقب العلمي	التخصص		اعداد الهيئة التدريسية
				عام	خاص	
				عام	خاص	محاضر
1.	محمود ماهر صالح علاوي الجبوري	دكتوراه	استاذ مساعد	علوم الحاسوب	ذكاء اصطناعي و تطبيقاته	ملك
2.	ماجد حامد علي جاسم	دكتوراه	استاذ مساعد	علوم حاسبات	تكنولوجيا المعلومات وتطبيقاتها	ملك
3.	محمد اكثم احمد الطه	دكتوراه	استاذ مساعد	علوم حاسبات	ذكاء اصطناعي و تطبيقاته	ملك
4.	مشاري عايد عسكر ملاش الشمري	دكتوراه	أستاذ	علوم الحاسوب	تكنولوجيا معالجة الإشارة الرقمية وتطبيقاتها	ملك
5.	ميثم مصطفى حمود جزاع المرعاوي	دكتوراه	استاذ	علوم حاسوب	امنية البيانات	ملك
6.	سعدى حمد ثلج احمد	دكتوراه	استاذ مساعد	علوم حاسبات	تكنولوجيا قواعد البيانات وتطبيقاتها	ملك
7.	فراس ليث خليل محمود	دكتوراه	استاذ مساعد	علوم حاسبات	تكنولوجيا المعلومات	ملك
8.	احمد محمد شريف عبد الله العباسي	دكتوراه	مدرس	اللغة العربية	الأدب العربي	ملك
9.	كمال مجيد وهاب	دكتوراه	مدرس	ادارة اعمال	الإدارة والتسويق	ملك
10.	همام نعمة حسين درويش الجبوري	دكتوراه	مدرس	هندسة كهرباء وحاسبات	شبكات الاتصالات	ملك
11.	محمود حسين علوان فرج العبيدي	دكتوراه	مدرس	ادارة اعمال	تسويق	ملك
12.	علي خلف مصطفى	دكتوراه	مدرس	ادارة اعمال	ادارة اعمال	ملك
13.	حارث عبدالله حسين عبدالله الجبوري	ماجستير	أستاذ	علوم الحاسوب	تكنولوجيا الويب وتطبيقاتها	ملك
14.	ارمانيسة نعمان حسون علي الكراعي	ماجستير	استاذ مساعد	علوم حاسوب	ذكاء اصطناعي	ملك
15.	نايف محمد حماش خلف	ماجستير	استاذ مساعد	علوم الحاسوب	تكنولوجيا المعلومات وتطبيقاتها	ملك
16.	سلوى خالد عبد اللطيف السالم	ماجستير	استاذ مساعد	علوم حاسبات	ذكاء اصطناعي	ملك
17.	محمد وليد نوفان عسكر التكريتي	ماجستير	استاذ مساعد	علوم حاسوب	معالجة صور	ملك
18.	وسام داود عبد الله خلف الجبوري	ماجستير	استاذ مساعد	علوم الحاسوب	شبكات وانترنت الاشياء وتطبيقاتها	ملك
19.	عمار فاروق عباس وهيب التكريتي	ماجستير	مدرس	هندسة حاسبات	الذكاء الاصطناعي وتطبيقاته	ملك
20.	حذيفة محمد كنوش حمد الجبوري	ماجستير	مدرس	علوم الحاسوب	الذكاء الاصطناعي وتطبيقاته	ملك
21.	مهند داود سلمان رومي الرومي	ماجستير	مدرس	علوم الحاسوب	الذكاء الاصطناعي وتطبيقاته	ملك
22.	اسراء رافع عبد القادر محمد الحديثي	ماجستير	مدرس	علوم حاسوب	ذكاء اصطناعي	ملك
23.	يحيى ليث خليل محمود الأمين	ماجستير	مدرس	علوم حاسوب	الذكاء الاصطناعي وتطبيقاته	ملك
24.	ريم ضياء اسماعيل هلال التكريتي	ماجستير	مدرس	علوم حاسوب	الذكاء الاصطناعي	ملك
25.	مصطفى لطيف فاضل لطيف جميلي	ماجستير	مدرس مساعد	علوم الحاسوب	علوم الحاسوب	ملك
26.	كهلان فائق حسن احمد	ماجستير	مدرس مساعد	علوم حاسوب	تقنيات الشبكات والاتصالات	ملك

## 11. The teaching staff

### The teaching staff members

ت	الاسم	الشهادة	اللقب العلمي	التخصص		اعداد الهيئة التدريسية
				عام	خاص	
					اللاسلكية	
.27	لؤي ابراهيم خلف عبد الله	ماجستير	مدرس مساعد	علوم حاسبات	نظم معلومات	ملك -
.28	عقبة سالم عطيه احمد الجبوري	ماجستير	مدرس	علوم حاسوب	الذكاء الاصطناعي	ملك -
.29	حسن ناجي علي سبع الشمري	ماجستير	مدرس مساعد	علوم حاسوب	علوم حاسبات	ملك -
.30	قيس عامر حميد محمد الناصري	ماجستير	مدرس	علوم حاسوب	الذكاء الاصطناعي	ملك -
.31	احمد فايق صابر عجوان المرسومي	ماجستير	مدرس	اللغة الانكليزية	طرائق تدريس	ملك -
.32	نبا احمد سعيد ابراهيم	ماجستير	مدرس مساعد	علوم حاسوب	علوم حاسبات	ملك -
.33	اسراء اكرم بشير محمود	ماجستير	مدرس مساعد	علوم حاسوب	علوم حاسبات	ملك -
.34	عمر عادل لبيب عبد اللطيف	ماجستير	مدرس مساعد	علوم حاسوب	علوم حاسبات	ملك -
.35	مهند حاتم رمضان قدوري	ماجستير	مدرس مساعد	علوم الحاسوب	علوم حاسبات	ملك -
.36	مروه حسن حديد خلف الجبوري	ماجستير	مدرس مساعد	علوم الحاسوب	علوم حاسبات	ملك -
.37	اسراء محمد احمد حسين البياتي	ماجستير	مدرس مساعد	علوم الحاسوب	علوم حاسبات	ملك -
.38	عدي وسمي عبود محمد	ماجستير	مدرس مساعد	علوم حاسوب	علوم حاسبات	ملك -
.39	سعاد محمد شكور	ماجستير	مدرس مساعد	علوم حاسوب	علوم حاسبات	ملك -
.40	رشا عبد الله يوسف	ماجستير	مدرس مساعد	علوم حاسوب	علوم حاسبات	ملك -
.41	معاذ فرمان اسماعيل	ماجستير	مدرس مساعد	علوم حاسوب	علوم حاسبات	ملك -
.42	نور وليد خالد	ماجستير	مدرس مساعد	علوم حاسوب	علوم حاسبات	ملك -
.43	محمد حميد عيسى	ماجستير	مدرس مساعد	ادارة اعمال	ادارة اعمال	ملك -

### Professional Development

#### Orientation of New The teaching staff

For visiting faculty, a specific process can be designed to guide and support them during their time at the college. The following is a brief description of the process used to guide visiting faculty:

- 1- Welcome and Orientation: Visiting faculty are warmly welcomed and provided with an orientation about the college's culture, policies, and resources. They

receive an introduction to the department they will be working with and are introduced to key staff and support personnel.

2- Integration: Visiting faculty are integrated into their department during their visit. They meet with department chairs, fellows, and administrative staff who brief them on departmental expectations, teaching assignments, research opportunities, and departmental initiatives.

3- Evaluation and Feedback: The department conducts periodic evaluations of faculty performance, providing constructive feedback to support their professional development. This evaluation process may include classroom observations, evaluation of research outputs, and discussions with the department chair and department chair.

4- Continuous Professional Development: Professional development ensures that visiting faculty members have continuous professional development opportunities. They are introduced to relevant workshops, training programs and conferences that match their areas of interest and expertise.

### **Professional development for teaching staff members**

The Professional Development Department plays an important role in facilitating the academic and professional development of faculty members within the college or department. The following is a brief description of the plan and arrangements for faculty development in areas such as teaching and learning strategies, assessment of learning outcomes, and professional development:

Teaching and Learning Strategies:

1- The department organizes workshops, seminars, and training courses that focus on effective teaching and learning strategies.

2- The department encourages the use of technology in the classroom and

provides support for integrating educational technologies into teaching practices.

Assessment of Learning Outcomes:

- 1- The department provides guidance and resources on designing assessments that align with learning outcomes and program objectives.
- 2- Faculty members receive training on various assessment methods.

Professional Development:

- 1- The department facilitates continuing professional development opportunities for faculty members.
- 2- The department organizes conferences, seminars, and guest lectures featuring lecturers in various academic disciplines.
- 3- Faculty members are encouraged to attend external professional development events.

Mentoring and Peer Collaboration:

- 1- The department promotes a culture of mentoring and collaboration among faculty members.
- 2- The department facilitates mentoring programs where experienced faculty members guide and support their colleagues, especially new faculty members.

**12. Acceptance criteria.**

For morning study:

Students are accepted through the central admission system and according to the instructions of the Iraqi Ministry of Higher Education and Scientific Research.

For evening study:

Students are accepted by applying to the college by submitting some required documents, and students are accepted based on the instructions and decisions of the Iraqi Ministry of Higher Education and Scientific Research.

**13. The most important sources of information about the program**

- 1- Methodological and support books
- 2- Lectures of the instructor

3- Internet for the purpose of obtaining research.

#### **14. Program Development Plan:**

Academic program development in colleges involves a systematic and collaborative approach. The following outlines an appropriate program development plan:

##### Needs Assessment:

- 1- Conduct a comprehensive needs assessment to identify gaps and opportunities in the academic landscape.
- 2- Analyze market trends, recruitment requirements, and industry requirements to align the program with current and future needs.

##### Faculty Development:

- 1- Provide faculty members with professional development opportunities, including workshops, conferences, and training programs.
- 2- Support faculty members in keeping up with developments in the field through research and scholarly activities.

##### Resource and Infrastructure Allocation:

- 1- Identify resource needs to implement the program effectively.
- 2- Allocate sufficient financial, technological, and human resources to support the program.
- 3- Ensure that the program has access to the necessary infrastructure, including classrooms, laboratories, equipment, and specialized facilities.

##### Cooperation and Partnerships:

- 1- Establish partnerships for internships, cooperative education programs, and research projects.
- 2- Leverage external expertise and resources to enhance the quality and relevance of the program.

##### Monitoring and Evaluation:

- 1- Develop a comprehensive evaluation plan to assess student learning outcomes and program effectiveness.
- 2- Use evaluation data to identify areas for improvement and make data-informed decisions to enhance the program.

Values				Skills				Knowledge				Course Name	Course Code	Year /Level
4ج	3ج	2ج	1ج	4ب	3ب	2ب	1ب	4ا	3ا	2ا	1ا			
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Advanced Programming	TU010101113	First stage Second Semester -2025 2026
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Algorithm design	TU010101111	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Theory of computation	TU010101114	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Logic Design	TU010101112	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Web Programming 1	TU010101115	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Arabic Language	UOT001	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Artificial intelligence	TU010101223	second stage Second Semester -2025 2026
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Relational databases and structured query language	TU010101225	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	English Language II	UOT021	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Visual programming	TU010101224	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Statistics and probability	TU010101222	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Arabic Language 2	UOT011	

✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Machine Learning	TU010103014	Third stage Second Semester -2025 2026
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Compilers	TU010101320	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Web Development Frameworks	TU010101321	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Research Methodology	TU010101322	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Internet of Things	TU010101323	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Operating systems 2	TU010101324	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Distributed systems	433ε	Fourth stage Second Semester -2025 2026
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Computer Networks	342ε	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Multimedia and Network Security	463ε	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Data mining	432ε	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Neural Networks	412ε	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Graduation Project	492ε	

\*Please tick the boxes corresponding to the individual learning outcomes of the programmer being assessed

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Advanced Programming	Module Delivery	
Module Type	Core	<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar	
Module Code			
ECTS Credits	6		
SWL (hr/sem)	148		
Module Level	1		
Administering Department	Computer Science	College	CCSM
Module Leader	Mohanad Hatem Ramadhan	e-mail	Mohanad.H.Ramadhan@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor		e-mail	
Peer Reviewer Name	Mohamed Aktham	e-mail	
Scientific Committee Approval Date	1/02/2026	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

#### Module Aims

#### أهداف المادة الدراسية

1. Understanding Advanced Data Structures: The module aims to provide students with a deep understanding of arrays, strings, and their manipulation techniques. Students will learn about multidimensional arrays, character arrays, and string handling functions.

2. Mastery of Pointers: The module aims to develop students' proficiency in using pointers in C++. Students will learn the concepts of memory addresses, pointer arithmetic, and dynamic memory allocation. They will understand how to manipulate data using pointers and how to utilize them for efficient memory management.

3. File Handling and Input/Output Operations: The module aims to introduce students to file handling concepts and techniques in C++. Students will learn how to read from and write to files, open and close files, handle file errors, and perform various input/output operations using file streams. They will understand file modes, buffering, and error handling.

4. File Management and Organization: The module aims to teach students how to manage and organize files effectively in C++. They will learn to create, modify, and delete files, organize file directories, and handle file-related operations. Students will understand the importance of file management in real-world programming scenarios.

5. Practical Application and Problem-Solving: Throughout the module, students will be exposed to practical programming exercises and problem-solving tasks. They will apply the concepts learned to solve real-world programming challenges, consolidating their understanding and enhancing their problem-solving skills.

By focusing on arrays, strings, pointers, and file handling in C++, this advanced programming module aims to provide students with a comprehensive understanding of these concepts and their practical application. Students will develop the skills necessary to manipulate complex data structures, handle files, and write efficient and reliable code.

<p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. Demonstrate an in-depth understanding of arrays, strings, pointers, and file handling concepts in C++.</li> <li>2. Apply advanced array operations, such as searching and sorting algorithms, and multidimensional arrays to solve programming problems.</li> <li>3. Manipulate strings effectively, including concatenation, substring extraction, searching, and sorting.</li> <li>4. Utilize pointers proficiently for data manipulation, including memory addresses, and pointer arithmetic</li> <li>5. Read from and write to files, perform input/output operations, and handle file-related errors using file streams in C++.</li> <li>6. Manage and organize files effectively, including creating, modifying, deleting, and organizing file directories.</li> <li>7. Apply efficient programming techniques, optimize code, and adhere to best practices for writing clean and readable code.</li> <li>8. Demonstrate problem-solving skills by applying the learned concepts to solve real-world programming challenges.</li> <li>9. Work collaboratively in teams, communicate effectively, and share knowledge and ideas related to advanced programming concepts.</li> <li>10. Adapt to new programming concepts and technologies beyond the scope of the course, building a foundation for lifelong learning in programming.</li> </ol> <p>These learning outcomes reflect the knowledge, skills, and competencies that students will acquire upon completing the advanced programming course. The outcomes emphasize both theoretical understanding and practical application, preparing students for real-world programming challenges and further studies in the field of computer science.</p>
<p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>	<ol style="list-style-type: none"> <li>1. Review of Basic Programming Concepts: <ul style="list-style-type: none"> <li>- Recap of fundamental programming concepts, including variables, data types, control structures, and functions.</li> </ul> </li> <li>2. Arrays: <ul style="list-style-type: none"> <li>- Multidimensional arrays</li> <li>- Array manipulation techniques</li> <li>- Searching and sorting algorithms</li> </ul> </li> <li>3. Strings: <ul style="list-style-type: none"> <li>- String manipulation and operations</li> <li>- String handling functions</li> </ul> </li> <li>4. Pointers: <ul style="list-style-type: none"> <li>- Introduction to pointers and their usage</li> <li>- Memory addresses and pointer arithmetic</li> <li>- Pointers to arrays</li> </ul> </li> </ol>

- |  |  |
|--|--|
|  | <p>5. Files:</p> <ul style="list-style-type: none"><li>- File handling concepts</li><li>- Reading from and writing to files</li><li>- File organization and management</li></ul> |
|--|--|

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

#### Strategies

1. Lectures: The instructor will deliver lectures to introduce and explain programming concepts, C++ syntax, and problem-solving techniques. This will provide students with a solid theoretical foundation.
2. Interactive Discussions: Engaging students in interactive discussions allows them to ask questions, seek clarifications, and participate actively in the learning process. Discussions can include reviewing code examples, discussing programming best practices, and exploring real-world applications of programming concepts.
3. Laboratory Sessions: Laboratory sessions are dedicated practical sessions where students apply the concepts learned in lectures to hands-on programming exercises. Key strategies for the laboratory sessions include:
  - a. Programming Exercises: Students will work on programming exercises and projects in the laboratory, providing them with practical experience in coding and problem-solving.
  - b. Guided Practice: Lab instructors or teaching assistants will be available to provide guidance, assistance, and immediate feedback on students' code. They can help students debug their programs, identify errors, and improve their coding skills.
  - c. Collaboration and Peer Learning: Students can collaborate with their peers in the laboratory, fostering teamwork and enabling knowledge sharing. Working together on programming tasks promotes discussions, problem-solving, and peer learning.

d. Equipment and Resource Access: The laboratory should provide access to computers, necessary software tools, programming references, and relevant online resources. This ensures that students have the necessary resources to complete their lab exercises and assignments effectively.

4. Programming Assignments: Assignments will be given to students to reinforce their understanding of programming concepts and encourage independent problem-solving. These assignments may involve implementing algorithms, designing software systems, or developing small-scale projects using C++.

5. Code Reviews and Feedback: The instructor will provide feedback on students' code, reviewing their solutions, and offering suggestions for improvement. This feedback will help students enhance their coding skills and adhere to best practices.

6. Office Hours and Individual Support: The instructor should be available for individual consultations and provide support to students who need additional help or guidance in understanding programming concepts or completing assignments.

### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	56	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	148		

### Module Evaluation

تقييم المادة الدراسية

	Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 11
	Assignments	4	20% (20)	7, 12
	Projects	1	20% (20)	5-14

	<b>Report</b>	1			
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	
	<b>Final Exam</b>	2hr	40% (40)	16	All
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
Week No.	Material Covered
Week 1	Recap of fundamental programming concepts, including variables, data types, control structures, and functions.
Week 2	Introduction to Arrays (Linear arrays)
Week 3	Searching and Sorting Linear Arrays
Week 4	Multidimensional Arrays and Square Arrays
Week 5	Multiplication of Two Arrays and Re-write TicTacToe game with Arrays
Week 6	Introduction to String and Its Operations
Week 7	More Examples on String
Week 8	Introduction to Pointers
Week 9	Pointer to Array and Pointer Arithmetic
Week 10	First Project Due (Reviewing and Comments)
Week 11	Introduction to Files and Directories
Week 12	Working with Text Files (Read, Write )
Week 13	Working with Binary Files
Week 14	Second Project Due (Students Presentations part1)
Week 15	Second Project Due (Students Presentations part1)

<b>Delivery Plan (Weekly Lab. Syllabus):</b> المنهاج الاسبوعي للمختبر:	
Week No.	Material Covered

<b>Week 1</b>	Getting used to CLI Interfaces and practicing some commands on PowerShell
<b>Week 2</b>	Running Examples on Array
<b>Week 3</b>	Practicing Arrays further (Searching)
<b>Week 4</b>	Practicing Arrays further (Sorting)
<b>Week 5</b>	Running Examples on 2D and Square Arrays
<b>Week 6</b>	Running Examples on Strings
<b>Week 7</b>	Searching in String
<b>Week 8</b>	Running Characters Frequency Example
<b>Week 9</b>	Running Examples on Pointers
<b>Week 10</b>	Running More Examples on Pointers
<b>Week 11</b>	Running Examples on Directories and Files
<b>Week 12</b>	Running More Examples on Files
<b>Week 13</b>	Running More Advanced Programs on Files
<b>Week 14</b>	Wrapping up
<b>Week 15</b>	Answering Students Questions and Extra Advising on Real World Application Programming

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
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<b>Required Texts</b>	Stroustrup, Bjarne - Programming_ principles and practice using C++-Addison-Wesley (2015)	Yes
<b>Recommended Texts</b>	Olsson, Mikael - C++20 Quick syntax reference: a pocket guide to the language, apis, and library	No
<b>Websites</b>		

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Algorithm Design		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code			
ECTS Credits	4		
SWL (hr/sem)	108		
Module Level	1	Semester of Delivery	
Administering Department	Computer Science	College	CCSM
Module Leader	Firas Layth	e-mail	
Module Leader's Acad. Title	Assistant Prof.	Module Leader's Qualification	PhD
Module Tutor		e-mail	
Peer Reviewer Name	Mahammed Aktham	e-mail	
Scientific Committee Approval Date	01/02/2026	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Aims</b> أهداف المادة الدراسية</p>	<p>The aim of this module is to introduce students to the fundamental concepts of algorithms, algorithm design, and problem-solving techniques. The module will cover various algorithmic paradigms, data structures, and analysis methods to equip students with the skills necessary for designing and analyzing algorithms effectively.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"><li>1. Understand the importance of algorithms in computer science and the significance of algorithmic problem-solving.</li><li>2. Design algorithms using flowcharts and pseudocode, and implement them using programming constructs such as flow control statements and loops.</li><li>3. Analyze the time and space complexity of algorithms using Big O notation and asymptotic analysis.</li><li>4. Implement and utilize basic data structures such as arrays, strings, stacks, and queues for algorithmic problem-solving.</li><li>5. Apply various sorting and searching algorithms, including bubble sort, selection sort, insertion sort, quicksort, mergesort, heapsort, linear search, binary search, depth-first search, and breadth-first search.</li><li>6. Utilize string algorithms for pattern matching and string manipulation tasks.</li><li>7. Demonstrate the ability to review and evaluate projects related to algorithm design and implementation.</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"><li>1. Introduction to algorithms: Understanding the role and significance of algorithms in computer science.</li><li>2. Algorithmic problem-solving: Exploring strategies and techniques for solving computational problems effectively.</li><li>3. Algorithm design: Drawing flowcharts and writing pseudocode to represent algorithmic solutions.</li><li>4. Flow control: Implementing flow control statements (if-else, switch-case) for decision-making in algorithms.</li><li>5. Loops: Utilizing loops for repetitive tasks, including counter and cumulative variables, and nested loops.</li><li>6. Complexity analysis: Analyzing the time and space complexity of algorithms using Big O notation and asymptotic analysis.</li><li>7. Basic data structures: Introduction to arrays, strings, stacks, and queues for storing and manipulating data.</li><li>8. Sorting algorithms: Implementing and analyzing sorting algorithms such as bubble sort, selection sort, insertion sort, quicksort, mergesort, and heapsort.</li><li>9. Searching algorithms: Implementing and analyzing searching algorithms such as linear search, binary search, depth-first search, and breadth-first search.</li></ol>

	<p>10. String algorithms: Exploring algorithms for pattern matching and string manipulation tasks.</p> <p>11. Reviewing students' projects: Providing feedback and evaluation on projects related to algorithm design and implementation.</p>
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## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p><b>Lectures:</b> Traditional lectures can be used to introduce key concepts, theories, and principles related to algorithms. Lectures should be interactive, incorporating examples, demonstrations, and real-world applications to illustrate abstract concepts effectively.</p> <p><b>Group Discussions:</b> Group discussions encourage collaborative learning and critical thinking. Students can discuss challenging topics, share insights, and work together to solve algorithmic problems. Group discussions also promote communication skills and teamwork.</p> <p><b>Problem-Solving Sessions:</b> Dedicated problem-solving sessions allow students to practice applying algorithmic techniques to solve a variety of problems. These sessions can involve solving algorithmic puzzles, coding challenges, and algorithm design exercises individually or in groups.</p> <p><b>Practical Coding Assignments:</b> Assigning practical coding assignments allows students to implement algorithms and data structures in programming languages of their choice. Through coding assignments, students gain hands-on experience with algorithm implementation, debugging, and optimization.</p> <p><b>Case Studies:</b> Case studies provide real-world examples of how algorithms are used to solve practical problems in various domains, such as finance, healthcare, and engineering. Analyzing case studies helps students understand the relevance and applicability of algorithms in different contexts.</p>
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## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	56	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.4

<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	108
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<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	#LO 1-3, #LO 5-8
	<b>Assignments</b>	2	10% (10)	7, 12	#LO 3-5, #LO 5-8
	<b>Projects</b>	1	10% (10)	continuous	
	<b>Report</b>	1	10% (10)	14	#LO 1-8
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	#LO 1-7
	<b>Final Exam</b>	2 hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
Week No.	Material Covered
<b>Week 1</b>	Importance of algorithms in computer science
<b>Week 2</b>	Importance of algorithmic problem-solving
<b>Week 3</b>	Algorithms Design Drawing Flowchart and Writing pseudocode
<b>Week 4</b>	Flow Control ( if-else ), (switch – case )
<b>Week 5</b>	Loops (counter and cumulative variables), Nested Loops
<b>Week 6</b>	Time complexity analysis (Big O notation), Space complexity analysis and Asymptotic analysis
<b>Week 7</b>	Midterm exam
<b>Week 8</b>	Basic Data Structures: Arrays, Strings, Stacks, Queues.
<b>Week 9</b>	Sorting Algorithms: Bubble sort, selection sort, insertion sort
<b>Week 10</b>	Sorting Algorithms: Quicksort, mergesort, heapsort
<b>Week 11</b>	Searching Algorithms: Linear search, binary search
<b>Week 12</b>	Searching Algorithms: Depth-first search, breadth-first search

<b>Week 13</b>	String Algorithms: Pattern matching algorithms
<b>Week 14</b>	String Algorithms: String manipulation techniques
<b>Week 15</b>	Reviewing Students' Projects

### Delivery Plan (Weekly Lab. Syllabus):

المنهاج الاسبوعي للمختبر:

<b>Week No.</b>	Material Covered
<b>Week 1</b>	<p>Introduction to Algorithm Design</p> <p>Overview of the course objectives and expectations</p> <p>Introduction to algorithm design methodologies</p> <p>Hands-on activity: Drawing flowcharts for simple algorithms</p> <p>Assignment: Practice drawing flowcharts for algorithmic problems</p>
<b>Week 2</b>	<p>Review of pseudocode and its importance in algorithm design</p> <p>Introduction to flow control statements (if-else, switch-case)</p> <p>Hands-on activity: Writing pseudocode for algorithmic problems</p> <p>Assignment: Implementing algorithms using flow control in a programming language</p>
<b>Week 3</b>	<p>Understanding loop structures and their importance in algorithms</p> <p>Hands-on activity: Implementing loops for counter and cumulative variables</p> <p>Introduction to nested loops</p> <p>Assignment: Solving algorithmic problems using nested loops</p>

<p><b>Week 4</b></p>	<p>Time Complexity Analysis</p> <p>Introduction to time complexity analysis using Big O notation</p> <p>Understanding the concept of asymptotic analysis</p> <p>Hands-on activity: Analyzing the time complexity of algorithms</p> <p>Assignment: Analyzing the time complexity of sorting algorithms</p>
<p><b>Week 5</b></p>	<p>Space Complexity Analysis</p> <p>Introduction to space complexity analysis</p> <p>Hands-on activity: Analyzing the space complexity of algorithms</p> <p>Assignment: Analyzing the space complexity of searching algorithms</p>
<p><b>Week 6</b></p>	<p>Basic Data Structures</p> <p>Introduction to arrays, strings, stacks, and queues</p> <p>Hands-on activity: Implementing basic data structures in a programming language</p> <p>Assignment: Implementing algorithms using basic data structures</p>
<p><b>Week 7</b></p>	<p>Sorting Algorithms</p> <p>Introduction to sorting algorithms: bubble sort, selection sort, insertion sort</p> <p>Hands-on activity: Implementing sorting algorithms</p> <p>Assignment: Comparing the performance of different sorting algorithms</p>
<p><b>Week 8</b></p>	<p>Sorting Algorithms (continued)</p> <p>Introduction to more advanced sorting algorithms: quicksort, mergesort, heapsort</p> <p>Hands-on activity: Implementing advanced sorting algorithms</p> <p>Assignment: Optimizing sorting algorithms for different datasets</p>

<p><b>Week 9</b></p>	<p>Searching Algorithms</p> <p>Introduction to searching algorithms: linear search, binary search</p> <p>Hands-on activity: Implementing searching algorithms</p> <p>Assignment: Analyzing the performance of searching algorithms</p>
<p><b>Week 10</b></p>	<p>Graph Algorithms</p> <p>Introduction to graph algorithms: depth-first search, breadth-first search</p> <p>Hands-on activity: Implementing graph traversal algorithms</p> <p>Assignment: Solving graph-related problems using depth-first search and breadth-first search</p>
<p><b>Week 11</b></p>	<p>String Algorithms</p> <p>Introduction to string matching algorithms</p> <p>Hands-on activity: Implementing pattern matching algorithms</p> <p>Assignment: Applying string manipulation techniques to solve algorithmic problems</p>
<p><b>Week 12</b></p>	<p>Review and Project Work</p>
<p><b>Week 13</b></p>	<p>Project Work and Consultation</p> <p>Project work: Students continue working on their projects</p> <p>Individual consultations with the instructor for project guidance and feedback</p>

<b>Week 14</b>	Project Presentation Preparation
	Preparation for project presentations
	Practice sessions for project presentations
	Final touches on project implementations and documentation
<b>Week 15</b>	Project Presentations

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Introduction to Algorithms, Third Edition By Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein	No
<b>Recommended Texts</b>	Introduction to Algorithmic Design and Analysis	No
<b>Websites</b>		

### Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
<b>Success Group (50 - 100)</b>	<b>A</b> - Excellent	امتياز	90 - 100	Outstanding Performance
	<b>B</b> - Very Good	جيد جدا	80 - 89	Above average with some errors
	<b>C</b> - Good	جيد	70 - 79	Sound work with notable errors
	<b>D</b> - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	<b>E</b> - Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX</b> - Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F</b> - 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	Supportive		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code			
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	
Administering Department	Computer Science	College	CCSM
Module Leader	Rasha Abdullah yousif	e-mail	Rasha.a.yousif@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	master
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	01/02/2026	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Aims</b> أهداف المادة الدراسية</p>	<p>Theory of computation is the theoretical study of capabilities and limitations of Computers (Theoretical models of computation). Providing students with:</p> <ol style="list-style-type: none"><li>1. Understand of basic concepts in the theory of computation through simple models of computational devices.</li><li>2. Apply models in practice to solving problems in diverse areas such as string searching, pattern matching, cryptography, and language design.</li><li>3. Understand the limitations of computing, the relative power of formal languages and the inherent complexity of many computational problems.</li><li>4. Be familiar with standard tools and notation for formal reasoning about machines and programs.</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>Upon successful completion of this module, students should be able to:</p> <p>Cognitive objectives:</p> <ol style="list-style-type: none"><li>1. Enabling the student to know and understand the theoretical principles of the programming process.</li><li>2. Enabling the student to know the intellectual framework of computer basics.</li><li>3. Enabling the student to know the practical applications of the programming foundation that the subject has.</li><li>4. Enabling the student to explain the steps of program implementation.</li></ol> <p>kills objectives for the course:</p> <ol style="list-style-type: none"><li>1. Designing basic diagrams for computational theoretical methods.</li><li>2. Writing algorithms.</li><li>3. Writing and implementing methods.</li><li>4. Following up on the implementation and planning of algorithms and discovering errors.</li></ol> <p>Teaching and learning methods, theoretical lectures, using projectors for clarification with illustrative examples, drawing diagrams that facilitate the process of understanding and conveying the idea to the student.</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>Focuses interest on studying how calculations and reasoning are performed in the context of computer systems.</p> <ol style="list-style-type: none"><li>1. Computing Paradigms: Paradigms such as the Turing machine, quantum computing are explored and used to analyze computational capabilities and limits.</li></ol>

	<ol style="list-style-type: none"> <li>2. <b>Description Languages:</b> Computational theory studies the languages and models that are used to describe and analyze computational operations, such as neural language and conditional language.</li> <li>3. <b>Computational complexity:</b> It is concerned with analyzing computer complexity and classifying problems according to their computational difficulty and the ability of computer systems to solve them.</li> <li>4. <b>Mental Machines:</b> Computational theory studies the relationship between computing and the human mind, and whether the mind can be represented and simulated by computational machines.</li> <li>5. <b>Artificial Intelligence:</b> Artificial intelligence is an important application of computational theory, where computational models are used to develop artificial intelligence systems capable of thinking and making decisions.</li> </ol>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<ol style="list-style-type: none"> <li>1. <b>Lectures:</b> The instructor will deliver lectures to introduce and explain programming concepts, C++ syntax, and problem-solving techniques. This will provide students with a solid theoretical foundation.</li> <li>2. <b>Interactive Discussions:</b> Engaging students in interactive discussions allows them to ask questions, seek clarifications, and participate actively in the learning process. Discussions can include reviewing code examples, discussing programming best practices, and exploring real-world applications of programming concepts.</li> <li>4. <b>Programming Assignments:</b> Assignments will be given to students to reinforce their understanding of programming concepts and encourage independent problem-solving. These assignments may involve implementing algorithms, designing software systems, or developing small-scale projects using C++.</li> <li>6. <b>Office Hours and Individual Support:</b> The instructor should be available for</li> </ol>

individual consultations and provide support to students who need additional help or guidance in understanding programming concepts or completing assignments.

### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	77	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	5.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	73	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	LO #1-4 , LO# 5-7
	<b>Assignments</b>	2	10% (10)	7, 12	LO #1-4 , LO# 5-7
	<b>Projects</b>	1	10% (10)	continuous	LO #1-7
	<b>Report</b>	1	10% (10)	14	LO # 4 - 7
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	LO # 1-6
	<b>Final Exam</b>	2 hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week No.	Material Covered
Week 1	Set, string, alphabet and language
Week 2	Regular expression
Week 3	Finite state automata, deterministic and nondeterministic finite state automata.
Week 4	Equivalence between deterministic and nondeterministic finite state automata

Week 5	Finite state automata with empty move.
Week 6	Equivalence of NFA with and without $\epsilon$ move
Week 7	The equivalence between Moore and Mealy machine
Week 8	Grammar, Chomsky hierarchy of languages.
Week 9	- The regular grammars and regular languages.
Week 10	- Closure properties of regular sets (union, concatenation and kleen closure).
Week 11	Regular expression, closure properties of regular languages (intersection, complementation and substitution)
Week 12	Decision procedures for regular sets (emptiness, finiteness, containment and equivalence).
Week 13	Context- free grammars and languages with their Properties.
Week 14	Context-free grammar without empty string production ( $\lambda$ -free grammar).
Week 15	Derivation trees.

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Introduction to Computer Theory 3 <sup>rd</sup> Edition michael sipser, USA, 2013. ISBN-13: 978-1-133-18779-0.	Yes
<b>Recommended Texts</b>	Introduction to Automata Theory, Languages, and Computation, 2/E, John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, Addison-Wesley 2001. ISBN 0-201-44124-1.	No
<b>Websites</b>		

### Grading Scheme

#### مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
<b>Success Group (50 - 100)</b>	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

	<b>D - Satisfactory</b>	متوسط	60 - 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 – 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	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	Core	<input type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code			
ECTS Credits	6		
SWL (hr/sem)	148		
Module Level	1		
Administering Department	Computer science	College	CCSM
Module Leader	Nayif M. Hamash	e-mail	
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	master
Module Tutor		e-mail	
Peer Reviewer Name	Ahmed Saadi Abdullah	e-mail	
Scientific Committee Approval Date	01/02/2026	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Aims</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"><li>1. To develop problem solving skills and understanding of logic design</li><li>2. Teaching students the computer numerical systems</li><li>3. Teaching the student the logic gates, their structure, and the truth table</li><li>4. Teaching the student the sequential logic circuits, their analysis and installation</li><li>5. Teaching students to design and analyze counters and registers and their types</li><li>6. Teaching the student the flip flop, its types, the state table and the state diagram</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"><li>1. Knowledge of logic circuits and their design and analysis of complex and synchronous</li><li>2. Install logical gates and configure logical circuits</li><li>3. Application of logical circuits and their use in random memory</li><li>4. Mastering the work of gates and logical circuits and methods of connecting them</li><li>5. Knowing ways to connect and deal with half Adder as well as full Adder and how to connect their logical circuits</li><li>6. Know how to connect and deal with half Subtract as well as full Subtract and how to connect their logical circuits</li><li>7. Know the logical structure of multiplexer and how to connect more than one multiplexer in one logical circuit</li><li>8. Knowledge of the logical structure of Flip_Flop of all kinds and how to connect more than one Flip_Flop in one logical circuit</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>Indicative content includes the following:</p> <p><u>Part A – Fundamental concepts</u></p> <p>Numerical systems and how to convert between them and algebraic and logical operations on them, study logical gates and study how to draw circles and form logical circles from these gates and how to write the expression through drawing [12 hours]</p> <p><u>Part B- Logic Expressions Simplify, Adder, Subtract</u></p> <p>The laws of Boolean algebra are studied to simplify Boolean expressions. The K_map method is also studied and applied to simplify Boolean expressions. The addition process is studied based on half Adder and full Adder, in addition to learning the subtraction process based on half subtract and full subtract. [16 hours]</p>

	<p><u>Part C- multiplexer ,Decoder</u></p> <p>A multiplexer, Demultiplexer and how to connect the function of each of them are studied, in addition to how to form multiplexers of large sizes from multiplexers of small sizes. Also, the decoder, encoder and how to connect their logical circuits are understood in detail, in addition to how to connect them together in one circuit. [16 hours]</p> <p><u>Part D- Flip flop types</u></p> <p>All types of flip-flops are studied and their work is explained in detail and how they work, as well as an explanation of the counter shift register [16 hours]</p>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	<p>This course is characterized by the fact that it needs a special approach based mainly on the development of engineering thinking and the mathematical approach to thinking. Teaching depends mainly on homework that is presented at the end of each week, and the student notes the interdependence between the topics of the series in this course, in addition to assigning the student (or a group of students) to write one report and present it as a seminar for the purpose of training in the use of scientific resources, in addition to Assigning the student with a set of practical experiments that he implements in the laboratory and others that are given as homework, which will help the student to understand more broadly how logical circuits work</p>		
<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	56	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	148		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to logic Design and numerical systems
Week 2	Convert between numerical system and mathematical operation on each system
Week 3	Logical gates and how to draw them, and draw logic expression
Week 4	Simplifying Boolean expressions based on the laws of Boolean algebra
Week 5	Simplify Boolean expressions based on K_map (sop) ,(pos)
Week 6	Using full Adder and half Adder in addition
Week 7	Use full subtract and half subtract in subtraction
Week 8	Learn how multiplexers and demultiplexers work and how to connect their logic circuits
Week 9	Learn the work of the decoder and encoder and how to connect their logic circuits
Week 10	Learn about the working of J-K flip flop
Week 11	Learn about the working of J-K flip flop
Week 12	Learn about the working of T flip flop and D flip flop
Week 13	Learn about the working shift Register
Week 14	Learn about the working counters
Week 15	Learn how to draw complex logical circuits consisting of a group of logical circuits that have been studied in previous lectures
Week 16	<b>Preparatory week before the final exam.</b>

**Delivery Plan (Weekly Lab. Syllabus): There is no Lab activities**

المنهاج الاسبوعي للمختبر:

	Material Covered
Week 1	Lab1_ introduction to Multimedia Logic and crocodile program
Week 2	Lab2_ How to draw logical gates and form logical circuits
Week 3	Lab3_ Simplify logical expressions and draw expressions before and after simplification, noting drawing outputs before and after simplification
Week 4	Lab4_ Draw circles, half subtract full Adder, Half Adder, full subtract and observe the results of addition and subtraction
Week 5	Lab5-Draw multiplexer, demultiplexer, decoder, encoder logic circuits and how to connect them together in one logical circuit
Week 6	Lab6-Draw Filp_Flops logic circuits
Week 7	Lab7-Dealing with shift register and counter

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	1. principle of logic design (2020)by (Qasim mohammed Hussein)	Yes
<b>Recommended Texts</b>	Digital logic and computer Design by Morris Mano	No
<b>Websites</b>	<a href="#">Digital Logic And Computer Design By M. Morris Mano (2nd Edition).pdf - Google Drive</a>	

## Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
<b>Success Group (50 - 100)</b>	<b>A</b> - Excellent	امتياز	90 - 100	Outstanding Performance
	<b>B</b> - Very Good	جيد جدا	80 - 89	Above average with some errors
	<b>C</b> - Good	جيد	70 - 79	Sound work with notable errors
	<b>D</b> - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	<b>E</b> - Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX</b> – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F</b> – 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 programming	Module Delivery	
Module Type	Core	<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code			
ECTS Credits	6		
SWL (hr/sem)	148		
Module Level	1		
Administering Department	Computer Science	College	CCSM
Module Leader	Harith A. Husain	e-mail	
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	master
Module Tutor		e-mail	
Peer Reviewer Name	Harith Abdullah	e-mail	
Scientific Committee Approval Date	1/02/2026	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Aims</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"><li>1- Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.</li><li>2- Develop skills in analyzing the usability of a web site.</li><li>3- Understand how to plan and conduct user research related to web usability.</li><li>4- Learn the core web technologies and programming languages that power the modern web. Starting with HTML and CSS and Javascript.</li><li>5- Learn some concepts in server-side programming using (PHP), along with MySQL database.</li><li>6- - Exploring how to create dynamic web applications that can process user data, store information, using content management systems (CMS).</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>Upon successful completion of this module, students should be able to:</p> <ol style="list-style-type: none"><li>1. Understand the fundamental concepts of web development: Gain a solid understanding of how the web works, including client-server architecture, HTTP protocols, and the role of web browsers.</li><li>2. Develop proficiency in HTML and CSS: Acquire the skills to create well-structured web pages using HTML markup, apply CSS styles for layout and design, and create responsive and visually appealing websites.</li><li>3. Understand JavaScript programming: Learn the essentials of JavaScript programming, including variables, data types, and operators.</li><li>4. Build dynamic web applications: Explore server-side programming using PHP. Understand how to process user data, connect to databases, and generate dynamic content.</li></ol>

	<ol style="list-style-type: none"> <li>5. Work with databases: Gain familiarity with database management systems like MySQL. Learn how to design and create database schemas.</li> <li>6. Implement security measures: Understand common web security vulnerabilities and learn techniques to protect web applications from attacks.</li> <li>7. Problem-solving and debugging skills: Develop the ability to identify and fix common issues in web development through effective troubleshooting and debugging techniques.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"> <li>1- Introduction to Web Development <ul style="list-style-type: none"> <li>• Overview of web technologies and standards</li> <li>• Client-server architecture and HTTP protocols</li> <li>• Understanding web browsers and their rendering engines</li> <li>• HTML Fundamentals</li> </ul> </li> <li>2- Structure of HTML <ul style="list-style-type: none"> <li>• HTML tags and elements</li> <li>• Working with text, images, links, and lists</li> <li>• Creating forms for user input</li> <li>• Semantic HTML and accessibility best practices</li> </ul> </li> <li>3- CSS Styling <ul style="list-style-type: none"> <li>• CSS syntax and selectors</li> <li>• Box model and layout techniques</li> <li>• Applying styles to text, colors, backgrounds, and borders</li> <li>• CSS positioning and responsive design</li> <li>• CSS frameworks and libraries</li> </ul> </li> <li>4- JavaScript Basics <ul style="list-style-type: none"> <li>• Introduction to JavaScript and its role in web development</li> <li>• Variables, data types, and operators</li> </ul> </li> <li>5- Server-Side Programming <ul style="list-style-type: none"> <li>• Introduction to server-side programming languages (PHP)</li> </ul> </li> </ol>

	<ul style="list-style-type: none"> <li>• Handling user input and form data</li> <li>• Working with databases (MySQL)</li> <li>• Templates for dynamic content</li> <li>• Session management and user authentication</li> </ul> <p>6-Web Security</p> <ul style="list-style-type: none"> <li>• Common web security vulnerabilities</li> <li>• Guidelines and directions to protect the website</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<ol style="list-style-type: none"> <li>1. <b>Hands-on Practice:</b> This Encourage students to actively engage in hands-on coding exercises and projects. Providing them with opportunities to apply theoretical concepts in practical scenarios, allowing them to gain proficiency through practice.</li> <li>2. <b>Project-Based Learning:</b> Assigning projects that simulate real-world web development scenarios. This approach allows students to apply their knowledge and skills to create fully functional web applications, reinforcing their understanding and problem-solving abilities.</li> <li>3. <b>Code Review and Feedback:</b> Incorporating code review sessions where students can share their code and receive constructive feedback. This process helps students identify areas for improvement, learn best practices, and enhance their coding style and techniques.</li> <li>4. <b>Collaborative Learning:</b> Foster a collaborative learning environment where students can work together on group projects or problem-solving tasks. Encourage peer-to-peer discussions, code sharing, and knowledge exchange, as this can enhance understanding and expose students to diverse perspectives and solutions.</li> <li>5. <b>Online Resources and Documentation:</b> Introduce students to reputable online resources, documentation, and tutorials related to web development. Teaching students how to effectively search for solutions, read and understand documentation, and leverage online communities and forums for support and learning.</li> </ol>

	<p>6. <b>Practical Examples and Case Studies:</b> Provide practical examples and case studies that demonstrate the application of web programming concepts in real-world scenarios. This helps students relate theoretical concepts to practical use cases, enhancing their understanding and problem-solving abilities.</p> <p>7. <b>Regular Assessments and Feedback:</b> Conducting regular assessments, quizzes, and coding challenges to evaluate students' progress and understanding. Providing timely feedback to help students identify their strengths and areas that require improvement.</p> <p>8. <b>Continuous Learning and Exploration:</b> Encouragement students to stay updated with the latest trends, tools, and technologies in web development.</p> <p>9. <b>Office Hours and Individual Support:</b> The instructor should be available for individual consultations and provide support to students who need additional help or guidance in understanding programming concepts or completing assignments.</p>
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### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	56	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	148		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	
	<b>Assignments</b>	2	10% (10)	3, 12	
	<b>Projects</b>	1	10% (10)	8-14	
	<b>Report</b>				
<b>Summative</b>	<b>Midterm Exam</b>	2 hr	20% (20)	11	

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
Week No.	Material Covered
Week 1	Introduction web programming
Week 2	Internet and Intranet, Web application ,web page, website , Classifying websites
Week 3	Client side script and server side scrip, Introduction to HTML
Week 4	HTML tags and attributes
Week 5	HTML - Titles and headings
Week 6	HTML – Lists
Week 7	HTML Images
Week 8	HTML – Tables
Week 9	HTML Frame and Form
Week 10	Introduction to CSS
Week 11	Internal and external CSS
Week 12	Introduction to JavaScript
Week 13	JavaScript Variables, data types, and operators
Week 14	Server-Side Programming (PHP with MySQL)
Week 15	Content Management Systems (CMS), Security vulnerabilities

Delivery Plan (Weekly Lab. Syllabus):	
المنهاج الاسبوعي للمختبر:	
Week No.	Material Covered
Week 1	HTML tags and attributes
Week 2	HTML – Titles, headings and Lists

<b>Week 3</b>	HTML Images
<b>Week 4</b>	<b>HTML – Tables</b>
<b>Week 5</b>	HTML Frame and Form
<b>Week 6</b>	Internal CSS
<b>Week 7</b>	External CSS
<b>Week 8</b>	Creating web page structure using HTML tags
<b>Week 9</b>	JavaScript variables definitions, data types
<b>Week 10</b>	JavaScript operators
<b>Week 11</b>	Implementing interactivity and dynamic content on web pages
<b>Week 12</b>	Install WAMP server
<b>Week 13</b>	Work with MySQL database
<b>Week 14</b>	Content Management Systems (CMS): install Joomla
<b>Week 15</b>	Create dynamic website

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	None	
<b>Recommended Texts</b>	Jon, Duckett. "HTML and CSS: Design and Build Websites." (2016).	
<b>Websites</b>		

## 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
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**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		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar
Module Code			
ECTS Credits	6		
SWL (hr/sem)	148		
Module Level	2	Semester of Delivery	
Administering Department	Computer Science	College	CCSM
Module Leader	Qabas Amer Hameed	e-mail	Qabas.a.hameed@tu.edu.iq
Module Leader's Acad. Title	lecturer	Module Leader's Qualification	Master
Module Tutor		e-mail	
Peer Reviewer Name	Dr. Mohamed Aktham	e-mail	
Scientific Committee Approval Date	1/02/2026	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Aims</b> أهداف المادة الدراسية	<ul style="list-style-type: none"><li>• Understanding the concept of AI and its applications</li><li>• Understanding the problem state space and problem-solving.</li><li>• Implementing and employing intelligent search methods to solve problems that are not solved with traditional methods.</li><li>• Using Heuristics in games.</li><li>• Understanding the difference between blind search and heuristics search</li><li>• To enable the learner to understand the basics of machine learning.</li></ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"><li>• Understand the definition and application of AI</li><li>• Understand the basic syntax and semantics of Python programming language.</li><li>• Analyze and solve problems using Python programming.</li><li>• Develop the student's thinking skills and the ability to analyze problems using logical programming principles.</li><li>• Develop skills in debugging and testing AI search strategies in Python programming language.</li><li>• Providing the learner with the necessary skills to be able to build a learning model.</li></ul>
<b>Indicative Contents</b> المحتويات الإرشادية	<ul style="list-style-type: none"><li>• Fundamentals of AI</li><li>• Problem in AI (Problem state space, Search space, and Problem-solving)</li><li>• AI search taxonomy</li><li>• Blind search algorithms</li><li>• Heuristic search algorithms</li><li>• the basics of machine learning</li></ul>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p>1. Lectures: The instructor will deliver lectures to introduce and explain the definition of Artificial intelligence (AI), its applications, problem-solving techniques, types of search algorithms in AI, and the basic principles related to machine learning. This will provide students with a solid theoretical</p>
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foundation.

2. **Interactive Discussions:** Engaging students in interactive discussions allows them to ask questions, seek clarifications, and participate actively in learning. Discussions can include AI search algorithm examples, discussing practically how to program these algorithms, and exploring real-world applications of AI concepts.

3. **Laboratory Sessions:** Laboratory sessions are dedicated practical sessions where students apply the concepts learned in lectures to hands-on programming exercises. Key strategies for the laboratory sessions include:

a. **Programming Exercises:** Students will work on programming exercises and projects in the laboratory, providing them with practical experience in coding AI projects.

b. **Guided Practice:** Lab instructors or teaching assistants will be available to provide guidance, assistance, and immediate feedback on students' code. They can help students debug their programs, identify errors, and improve their coding skills.

c. **Collaboration and Peer Learning:** Students can collaborate with their peers in the laboratory, fostering teamwork and enabling knowledge sharing. Working together on programming AI tasks promotes discussions, problem-solving, and peer learning.

d. **Equipment and Resource Access:** The laboratory should provide access to computers, necessary software tools, programming references, and relevant online resources. This ensures that students have the necessary resources to complete their lab exercises and assignments effectively.

4. **Programming Assignments:** Assignments will be given to students to reinforce their understanding of how to program search strategies of AI and encourage independent problem-solving. These assignments may involve implementing algorithms, designing software systems, or developing small-scale projects using Python.

5. **Code Reviews and Feedback:** The instructor will provide feedback on students' code, reviewing their solutions, and offering suggestions for improvement. This feedback will help students enhance their coding skills and

adhere to best practices.

6. Office Hours and Individual Support: The instructor should be available for individual consultations and provide support to students who need additional help or guidance in understanding completing assignments.

### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	56	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	148		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	
	<b>Assignments</b>	4	20% (20)	7, 12	
	<b>Projects</b>	1	20% (20)	9-14	
	<b>Report</b>	1			
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	
	<b>Final Exam</b>	2hr	40% (40)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week No.	Material Covered
<b>Week 1</b>	AI Fundamental definitions, some techniques used today in AI, Some Applications of A
<b>Week 2</b>	Problem spaces; problem-solving by search
<b>Week 3</b>	Brute-force search (depth-first, breadth-first)
<b>Week 4</b>	Iterative deep DFS, Uniform cost first search

<b>Week 5</b>	Heuristic search (hill-climbing, best first search)
<b>Week 6</b>	A* algorithm
<b>Week 7</b>	Dijkstra algorithm
<b>Week 8</b>	Two-player games (minimax search, alpha-beta pruning)
<b>Week 9</b>	Introduction to Machine Learning
<b>Week 10</b>	Main Steps of ML
<b>Week 11</b>	<b>Midterm Exam</b>
<b>Week 12</b>	Supervised learning, Unsupervised learning, Reinforcement learning
<b>Week 13</b>	Methods for evaluating machine learning algorithms
<b>Week 14</b>	Project Due (Students Presentations part1)
<b>Week 15</b>	Project Due (Students Presentations part2)

### Delivery Plan (Weekly Lab. Syllabus):

المنهاج الاسبوعي للمختبر:

Week No.	Material Covered
<b>Week 1</b>	Introduction to the basics of Python programming Language
<b>Week 2</b>	Introduction to the basics of Python programming Language
<b>Week 3</b>	Introduction to the basics of Python programming Language
<b>Week 4</b>	Running Examples of depth-first search
<b>Week 5</b>	Running Examples of breadth-first search
<b>Week 6</b>	Running examples of Uniform cost first search
<b>Week 7</b>	Running Examples of Best First Search

<b>Week 8</b>	Running Examples of A* search algorithm
<b>Week 9</b>	Running Examples of the Dijkstra Algorithm
<b>Week 10</b>	Exploring Python Libraries for ML: Discuss libraries like Numpy
<b>Week 11</b>	Exploring Python Libraries for ML: pandas
<b>Week 12</b>	Exploring Python Libraries for ML: matplotlib
<b>Week 13</b>	Exploring Python Libraries for ML: SciPy
<b>Week 14</b>	Exploring Python Libraries for ML: scikit-learn
<b>Week 15</b>	Answering students' questions and reviewing previous topics.

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>	"Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig (2020, 4th Edition) 2. "Artificial Intelligence: Structures and Strategies for Complex Problem Solving" by George F. Luger (2021, 7th Edition)	<b>No</b>
<b>Recommended Texts</b>	Dimitris Varkas and Ioannis Pl. Vlashavos, " Artificial Intelligence for Advanced Problem-Solving Technique", published in the USA by Information science reference (an imprint of "IGI" Global),2008.	No
<b>Websites</b>		

## Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
<b>Success Group (50 - 100)</b>	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
<b>Fail Group (0 – 49)</b>	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	Relational databases and structured query language		Module Delivery
Module Type	Core		<input type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code			
ECTS Credits	6		
SWL (hr/sem)	148		
Module Level	1	Semester of Delivery	
Administering Department	Computer Science	College	CCSM
Module Leader	Mustafa Lateef Fadhil	e-mail	Mustafa.l.fadhil@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	Master
Module Tutor		e-mail	
Peer Reviewer Name	Mohamed Aktham	e-mail	
Scientific Committee Approval Date	1/02/2026	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Relational databases and structured query language	Semester	
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

#### Module Aims

#### أهداف المادة الدراسية

1. Understanding Relational databases and structured query language: The module aims to provide students with a deep understanding of relational databases, structured query language, and their manipulation techniques. Students will learn about data modeling using the entity–relationship (ER) model.
  2. Mastery of Entity: The module aims to develop students' proficiency in using entity diagram in Microsoft SQL Server. Students will learn the concepts of Entity Types, Entity Sets, Attributes, and Keys.
  3. Data Handling and Structured SQL Query Operations: The module aims to introduce students to file handling concepts and techniques in relational database. Students will learn how to Relationship Types, Relationship Sets, Roles, and Structural Constraints.
  4. Data Management and Organization: The module aims to teach students how to manage and organize data effectively in database. They will learn to create, update, and delete data, organize data directories, and handle data-related operations. Students will understand the importance of data management in real-world database scenarios.
  5. Practical Application and Problem-Solving: Throughout the module, students will be exposed to practical The Enhanced Entity–Relationship (EER) Model exercises and problem-solving tasks. They will apply the concepts learned to solve real-world programming challenges, consolidating their understanding and enhancing their problem-solving skills.
- By focusing on the relational algebra, relational calculus and data handling in Microsoft SQL server, this advanced module aims to provide students with a comprehensive understanding of these concepts and their practical application. Students will develop the skills necessary to manipulate complex data , handle data, and write efficient and reliable code.

<p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. Demonstrate an in-depth understanding of Relational Database Design by ER- and EER-to-Relational Mapping and data handling concepts in SQL.</li> <li>2. Apply advanced operations, such as Update Operations, Transactions, and Dealing with Constraint Violations.</li> <li>3. Manipulate Relational Calculus like Unary Relational Operations, Binary Relational Operations and Relational Algebra Operations from Set Theory.</li> <li>4. Utilize pointers proficiently for data manipulation, including memory addresses, and pointer arithmetic</li> <li>5. Manage and organize data effectively, including creating, updating, deleting, and organizing data directories.</li> <li>6. Apply efficient programming techniques, optimize code, and adhere to best practices for writing clean and readable code.</li> <li>7. Demonstrate problem-solving skills by applying the learned concepts to solve real-world programming challenges.</li> <li>8. Work collaboratively in teams, communicate effectively, and share knowledge and ideas related to advance programming concepts.</li> <li>9. Adapt to new programming concepts and technologies beyond the scope of the course, building a foundation for lifelong learning in programming.</li> </ol> <p>These learning outcomes reflect the knowledge, skills, and competencies that students will acquire upon completing the advanced programming course. The outcomes emphasize both theoretical understanding and practical application, preparing students for real-world programming challenges and further studies in the field of computer science.</p>
<p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>	<ol style="list-style-type: none"> <li>1. Review of Basic Database Concepts: <ul style="list-style-type: none"> <li>- Recap of fundamental database concepts, including variables, data types, control structures, and functions.</li> </ul> </li> <li>2. Data Modeling Using the Entity–Relationship (ER) Model: <ul style="list-style-type: none"> <li>- Using High-Level Conceptual Data Models for Database Design</li> <li>- A Sample Database Application</li> <li>- Entity Types, Entity Sets, Attributes, and Keys</li> <li>- Relationship Types, Relationship Sets, Roles, and Structural Constraints</li> <li>- Weak Entity Types</li> </ul> </li> <li>3. The Enhanced Entity–Relationship (EER) Model: <ul style="list-style-type: none"> <li>- Subclasses, Super classes, and Inheritance</li> <li>- Specialization and Generalization</li> </ul> </li> <li>4. Relational Model Concepts: <ul style="list-style-type: none"> <li>- Domains, Attributes, Tuples, and Relations</li> </ul> </li> </ol>

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<b>Learning and Teaching Strategies</b> <b>استراتيجيات التعلم والتعليم</b>	
<b>Strategies</b>	<p>1. Lectures: The instructor will deliver lectures to introduce and explain database concepts, SQL syntax, and techniques. This will provide students with a solid theoretical foundation.</p> <p>2. Interactive Discussions: Engaging students in interactive discussions allows them to ask questions, seek clarifications, and participate actively in the learning process. Discussions can include reviewing code examples, discussing database best practices, and exploring real-world applications of database concepts.</p> <p>3. Laboratory Sessions: Laboratory sessions are dedicated practical sessions where students apply the concepts learned in lectures to hands-on database exercises. Key strategies for the laboratory sessions include:</p> <ul style="list-style-type: none"> <li>a. Programming Exercises: Students will work on database exercises and projects in the laboratory, providing them with practical experience in coding and problem-solving.</li> <li>b. Guided Practice: Lab instructors or teaching assistants will be available to provide guidance, assistance, and immediate feedback on students' code. They can help students debug their programs, identify errors, and improve their coding skills.</li> <li>c. Collaboration and Peer Learning: Students can collaborate with their peers in the laboratory, fostering teamwork and enabling knowledge sharing. Working together on programming tasks promotes discussions, problem-solving, and peer learning.</li> </ul>

d. Equipment and Resource Access: The laboratory should provide access to computers, necessary software tools, programming references, and relevant online resources. This ensures that students have the necessary resources to complete their lab exercises and assignments effectively.

4. Programming Assignments: Assignments will be given to students to reinforce their understanding of database programming concepts and encourage independent problem-solving. These assignments may involve implementing sql query, designing database systems and tables.

5. Code Reviews and Feedback: The instructor will provide feedback on students' code, reviewing their solutions, and offering suggestions for improvement. This feedback will help students enhance their coding skills and adhere to best practices.

6. Office Hours and Individual Support: The instructor should be available for individual consultations and provide support to students who need additional help or guidance in understanding database programming concepts or completing assignments.

### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	56	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	148		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	
	<b>Assignments</b>	4	20% (20)	7, 12	
	<b>Projects</b>	1	20% (20)	5-14	
	<b>Report</b>	1			
<b>Summative</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	

assessment	Final Exam	2hr	40% (40)	16	All
Total assessment			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
Week No.	Material Covered
Week 1	Recap of fundamental database concepts, including variables, data types, control structures, and functions.
Week 2	Data Modeling Using the Entity–Relationship (ER) Model
Week 3	Using High-Level Conceptual Data Models for Database Design
Week 4	A Sample Database Application
Week 5	Relationship Types, Relationship Sets, Roles, and Structural Constraints
Week 6	Weak Entity Types
Week 7	The Enhanced Entity–Relationship (EER) Model
Week 8	ER Diagrams, Naming Conventions, and Design Issues
Week 9	Example of Other Notation: UML Class Diagrams
Week 10	The Enhanced Entity–Relationship (EER) Model
Week 11	Constraints and Characteristics of Specialization and Generalization Hierarchies
Week 12	Modeling of UNION Types Using Categories
Week 13	The Relational Data Model and Relational Database Constraints
Week 14	Second Project Due (Students Presentations part1)
Week 15	Second Project Due (Students Presentations part1)

<b>Delivery Plan (Weekly Lab. Syllabus):</b> المنهاج الاسبوعي للمختبر:	
Week No.	Material Covered
Week 1	Modeling of UNION Types Using Categories

<b>Week 2</b>	Running Examples on Unary Relational Operations: SELECT and PROJECT
<b>Week 3</b>	Relational Algebra Operations from Set Theory: <b>The UNION, INTERSECTION, and MINUS Operations</b>
<b>Week 4</b>	<b>Binary Relational Operations:</b> <b>JOIN and DIVISION</b>
<b>Week 5</b>	Running Examples on unary and binary
<b>Week 6</b>	Running Examples on set theory
<b>Week 7</b>	Additional Relational Operations
<b>Week 8</b>	Examples of Queries in Relational Algebra
<b>Week 9</b>	The Tuple Relational Calculus
<b>Week 10</b>	Running More Examples on Tuple Variables and Range Relations
<b>Week 11</b>	Running Examples on Database and tables
<b>Week 12</b>	Running More Examples on database
<b>Week 13</b>	Running More Advanced Programs on data
<b>Week 14</b>	Wrapping up
<b>Week 15</b>	Answering Students Questions and Extra Advising on Real World Application Programming

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Elmasri, R. (2021). Fundamentals of database systems seventh edition.	Yes
<b>Recommended Texts</b>		No
<b>Websites</b>		

## Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors
	<b>C - Good</b>	جيد	70 - 79	Sound work with notable errors
	<b>D - Satisfactory</b>	متوسط	60 - 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	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(3)	Module Delivery	
Module Type	s	<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code			
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	3		
Administering Department		College	
Module Leader	Ahmed Faeq	e-mail	
Module Leader's Acad. Title	Asst. lecturer	Module Leader's Qualification	master
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	1/2/2026	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"><li>1. To be able to speak English fluently and accurately.</li><li>2. To think in English and then speak.</li><li>3. To be able to talk in English.</li><li>4. To be able to compose freely and independently in speech and writing.</li><li>5. To be able to read books with understanding.</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <ol style="list-style-type: none"><li>1. To address grammar issues that students encounter in their daily speech, writing, reading and listening</li><li>2. To address the issue of grammatical errors that affect effective communication</li><li>3. To improve your reading skills through the practice of vocabulary enrichment, reading comprehension exercises, speed reading strategies, written responses, discussions, and reflections</li><li>4. Recognize the structure and organization of paragraphs,</li><li>5. Use strategies to think critically about reading and use appropriate technology to enhance reading comprehension, reading speed, and vocabulary development</li><li>6. Develop the writing skill.</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <p>Introduction, Study material review [1 hr]</p> <p>Grammar: Have (got) to, practices. Should/must, questions and answers. Reading. Vocabulary: words that go together, everyday English at the doctors. [6hrs]</p> <p>Time and conditional clauses, practices (when, as soon as). listening and speaking/ life in 2050, Reading and speaking/ the world's first megalopolis. Vocabulary: Hot verbs/ take- get- do and make. [7 hrs]</p> <p>Grammar: verb patterns and infinitives, practices. Vocabulary: -ed/ -ing adjective, reading about (Into the wild). Expressions about exclamations with so and such. [8 hrs]</p> <p>Grammar: actives and passives voice, practices. Verbs and nouns that go together, practices. Reading: about the discovery of DNA., expressions</p>

	about(notices). [6 hrs]
	Review the study units. [2 hrs]

<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<ul style="list-style-type: none"> <li>- The main strategy that will be adopted in developing the four skills: The skill of speaking, The skill of reading, The skill of writing, The skill of listening, Also, enable the students for the use of grammar correctly,</li> </ul>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	32	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>50</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative</b>	<b>Quizzes</b>	3	15% (15)	3,6 and 10	LO #1, #2 and #4

<b>assessment</b>	<b>Assignments</b>	3	15% (15)	2,8 and 12	LO #3, #5 and #6
	<b>Report</b>	1	10% (10)	13	LO #2, #4 and #6
<b>Summative assessment</b>	<b>Midterm Exam</b>	1hr	10% (10)	7	LO #1 - #5
	<b>Final Exam</b>	2hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	<b>Material Covered</b>
<b>Week 1</b>	Introduction: about study materials of Headway Pre-intermediate Plus.
<b>Week 2</b>	Grammar: Have (got) to, practices.
<b>Week 3</b>	Should/must, questions and answers. Reading.
<b>Week 4</b>	Vocabulary: words that go together, everyday English at the doctors.
<b>Week 5</b>	Grammar: verb patterns and infinitives, practices.
<b>Week 6</b>	Time and conditional clauses, practices (when, as soon as). listening and speaking/ life in 2050.
<b>Week 7</b>	Mid-term Exam
<b>Week 8</b>	Reading and speaking/ the world's first megalopolis.
<b>Week 9</b>	Vocabulary: Hot verbs/ take- get- do and make.
<b>Week 10</b>	Vocabulary: -ed/ -ing adjective, reading about (Into the wild).
<b>Week 11</b>	Expressions about exclamations with so and such.
<b>Week 12</b>	Grammar: actives and passives voice, practices.
<b>Week 13</b>	Verbs and nouns that go together, practices.
<b>Week 14</b>	Reading: about the discovery of DNA., expressions about(notices).
<b>Week 15</b>	Study material review
<b>Week 16</b>	<b>Preparatory week before the final Exam</b>

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

	<b>Material Covered</b>
<b>Week 1</b>	None
<b>Week 2</b>	None

<b>Week 3</b>	None
<b>Week 4</b>	None
<b>Week 5</b>	None
<b>Week 6</b>	None
<b>Week 7</b>	None

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>	Headway pre-intermediate plus student's book(John and Lize Soars)	Yes
<b>Recommended Texts</b>	Headway pre-intermediate plus work's book	Yes
<b>Websites</b>	<a href="https://7esl.com/">https://7esl.com/</a> , <a href="https://worldenglishblog.com/hasnt-vs-doesnt-have-pdf/">https://worldenglishblog.com/hasnt-vs-doesnt-have-pdf/</a>	

<b>Grading Scheme</b> مخطط الدرجات				
<b>Group</b>	<b>Grade</b>	<b>التقدير</b>	<b>Marks %</b>	<b>Definition</b>
<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors
	<b>C - Good</b>	جيد	70 - 79	Sound work with notable errors
	<b>D - Satisfactory</b>	متوسط	60 - 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	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	Visual Programming		Module Delivery
Module Type		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar	
Module Code			
ECTS Credits			
SWL (hr/sem)	148		
Module Level	2		
Administering Department	Computer Science	College	CCSM
Module Leader	Israa Rafea Abdulkader	e-mail	Israa.R.Abdalkader@tu.edu.iq
Module Leader's Acad. Title	lecture	Module Leader's Qualification	Master
Module Tutor		e-mail	
Peer Reviewer Name	Mohamed Aktham	e-mail	
Scientific Committee Approval Date	1/02/2026	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"><li>1. Abstraction: hiding the implementation details and showing only functionality to the user.</li><li>2. Encapsulation: data hiding.</li><li>3. Polymorphism: the ability to take more than one form.</li><li>4. Inheritance: objects of one class acquire the properties of objects of another class.</li></ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"><li>1. Codes basic programs in java programming language</li><li>2. Introduction (Object Oriented Programming Characteristics, OOP Definition, OOP Concepts, Differences from Procedure Oriented Programming (POP)).</li><li>3. Classes and Objects (methods, properties).</li><li>4. Constructors and Destructors.</li><li>5. Inheritance (Single Inheritance, Multilevel Inheritance) and Polymorphism (Function Overloading, Operator Overloading, Virtual Function).</li><li>6. Abstract Classes and Methods, Sealed Classes and Interfaces, Generic types and methods and collection class.</li></ol>
<b>Indicative Contents</b> المحتويات الإرشادية	Basics of java Characteristics of Object-Oriented Programming Classes and Objects Working with Constructors Data Members Using Static Variables & Understanding Scope Overloading Inheritance Exceptions and Errors

## Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

<b>Strategies</b>	<ol style="list-style-type: none"><li>1. Lectures: The instructor will deliver lectures to introduce and explain programming concepts, java syntax, and problem-solving techniques. This will provide students with a solid theoretical foundation.</li><li>2. Interactive Discussions: Engaging students in interactive discussions allows</li></ol>
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them to ask questions, seek clarifications, and participate actively in the learning process. Discussions can include reviewing code examples, discussing programming best practices, and exploring real-world applications of programming concepts.

3. Laboratory Sessions: Laboratory sessions are dedicated practical sessions where students apply the concepts learned in lectures to hands-on programming exercises. Key strategies for the laboratory sessions include:

a. Programming Exercises: Students will work on programming exercises and projects in the laboratory, providing them with practical experience in coding and problem-solving.

b. Guided Practice: Lab instructors or teaching assistants will be available to provide guidance, assistance, and immediate feedback on students' code. They can help students debug their programs, identify errors, and improve their coding skills.

c. Collaboration and Peer Learning: Students can collaborate with their peers in the laboratory, fostering teamwork and enabling knowledge sharing. Working together on programming tasks promotes discussions, problem-solving, and peer learning.

d. Equipment and Resource Access: The laboratory should provide access to computers, necessary software tools, programming references, and relevant online resources. This ensures that students have the necessary resources to complete their lab exercises and assignments effectively.

4. Programming Assignments: Assignments will be given to students to reinforce their understanding of programming concepts and encourage independent problem-solving. These assignments may involve implementing algorithms, designing software systems, or developing small-scale projects using java .

5. Code Reviews and Feedback: The instructor will provide feedback on students' code, reviewing their solutions, and offering suggestions for improvement. This feedback will help students enhance their coding skills and adhere to best practices.

6. Office Hours and Individual Support: The instructor should be available for

	individual consultations and provide support to students who need additional help or guidance in understanding programming concepts or completing assignments.
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### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	56	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	148		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	
	<b>Assignments</b>	4	20% (20)	7, 12	
	<b>Projects</b>	1	20% (20)	9-14	
	<b>Report</b>	1			
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	
	<b>Final Exam</b>	2hr	40% (40)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week No.	Material Covered
<b>Week 1</b>	Recap of fundamental programming concepts, including variables, data types, control structures Using Java language
<b>Week 2</b>	Introduction to method(function)
<b>Week 3</b>	Mathematical Functions and Class Character
<b>Week 4</b>	Introduction to String and methods

<b>Week 5</b>	Introduction to Arrays (Linear arrays) and Searching and Sorting Linear Arrays
<b>Week 6</b>	Multidimensional Arrays and Square Arrays
<b>Week 7</b>	Introduction (Object Oriented Programming Characteristics, OOP Definition, OOP Concepts, Differences from Procedure Oriented Programming (POP)).
<b>Week 8</b>	Classes and Objects (methods, properties).
<b>Week 9</b>	Polymorphism (Overloading and Overriding Methods) & Constructors.
<b>Week 10</b>	Inheritance (Single Inheritance, Multilevel Inheritance).
<b>Week 11</b>	<b>Midterm Exam</b>
<b>Week 12</b>	Abstract Classes and Methods, Interfaces, Generic types and methods..
<b>Week 13</b>	Array List Class
<b>Week 14</b>	Project Due (Students Presentations part1)
<b>Week 15</b>	Project Due (Students Presentations part2)

### Delivery Plan (Weekly Lab. Syllabus):

المنهاج الاسبوعي للمختبر:

Week No.	Material Covered
<b>Week 1</b>	Getting used to java netbeans Interfaces and practicing some commands
<b>Week 2</b>	Running Examples on method
<b>Week 3</b>	Running examples on Mathematical Functions and Class Character
<b>Week 4</b>	Running Examples on Strings
<b>Week 5</b>	Practicing Arrays further (Searching and Sorting)
<b>Week 6</b>	Running Examples on 2D and Square Arrays
<b>Week 7</b>	Running Examples on Object Oriented Programming Characteristics

<b>Week 8</b>	Running Examples Classes and Objects (methods, properties).
<b>Week 9</b>	Running Examples on Overloading , Overriding Methods and Constructors.
<b>Week 10</b>	Running More Examples on Inheritance (Single Inheritance, Multilevel Inheritance).
<b>Week 11</b>	Running Examples on classes
<b>Week 12</b>	Running More Examples on Abstract Classes and Methods, Interfaces, Generic types and methods.
<b>Week 13</b>	Running examples on Array List Class
<b>Week 14</b>	Running programs of advanced of class
<b>Week 15</b>	Answering students' questions and reviewing previous topics.

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Herbert Scildt, Java The complete reference Eleventh edition	No
<b>Recommended Texts</b>		No
<b>Websites</b>		

### Grading Scheme

مخطط الدرجات

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

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

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Probability and Statistics		Module Delivery
Module Type		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code			
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	UG I	Semester of Delivery	2
Administering Department	Computer Science	College	CSM
Module Leader	Kahlan Faiq Hasan	e-mail	<a href="mailto:kahlan.aljuburi@tu.edu.iq">kahlan.aljuburi@tu.edu.iq</a>
Module Leader's Acad. Title	Teacher Assistant	Module Leader's Qualification	Ms
Module Tutor	Rafal Salih	e-mail	<a href="mailto:Rafalsaleh@tu.edu.iq">Rafalsaleh@tu.edu.iq</a>
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	1/2/2026	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	1. Mathematics for Computer Science 2. Calculus 3. Linear Algebra 4. Discrete Mathematics 5. Introduction to Programming	Semester	
Co-requisites module	1. Artificial Intelligence and Machine Learning	Semester	

	<ol style="list-style-type: none"> <li>2. <b>Data Science and Big Data</b></li> <li>3. Algorithms and Optimization</li> <li>4. Computer Vision and Image Processing</li> <li>5. Cryptography and Network Security</li> <li>6. Computer Networks and Distributed Systems</li> <li>7. Wireless Communication and Signal Processing</li> <li>8. Queuing Theory in Network Design</li> <li>9. Network Simulations</li> <li>10. Internet of Things (IoT) and Sensor Networks</li> </ol>		
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<b>Module Aims, Learning Outcomes and Indicative Contents</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
<b>Module Objectives</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. Clarification of the fundamental concepts of probability.</li> <li>2. Understanding Bayes' theorem and conditional probability.</li> <li>3. Learning about discrete distributions and how to find expectation and variance.</li> <li>4. Understanding continuous distributions and how to find expectation and variance, as well as studying the associated theorems.</li> <li>5. Studying probability mass function (PMF), probability density function (PDF), cumulative distribution function (CDF).</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. The student should state the basic definitions.</li> <li>2. Introduction and basic definitions of the topic of probability.</li> <li>3. Distinguish between the probability mass function (PMF), probability density function (PDF), cumulative distribution function (CDF) with various examples.</li> <li>4. Understand the joint random variables and dependent and independent random variables.</li> </ol>

	<p>5. Recognize discrete distributions, their types, and study examples with theorems on expectation and variance.</p> <p>6. Student can compute conditional probabilities based on the definition of conditional probability</p> <p>7. Understand the continuous distributions and their types.</p> <p>8. To be able to distinguish between discrete distributions and continuous distributions.</p> <p>9. To be able to distinguish between discrete random variables and continuous random variables.</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>1. Introduction and basic definitions of the topic of probability.</p> <p>2. Study of Bayes' theorem and conditional probability.</p> <p>3. Understanding discrete distributions and their types.</p> <p>4. Studying examples of discrete distributions with theorems on expectation and variance.</p> <p>5. Understanding continuous distributions, with focus on the normal and standard normal distributions, accompanied by examples.</p>

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

<p><b>Strategies</b></p>	<p>The primary strategy to be adopted in delivering this unit is to encourage students to engage in exercises while simultaneously enhancing and expanding their critical thinking skills. This will be achieved through interactive classes and tutorials, as well as by considering types of simple experiments that involve some sampling activities of interest to students.</p>
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### Student Workload (SWL)

#### الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

<p><b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل</p>	78	<p><b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا</p>	5.2
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<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b> التقييم التكويني	<b>Quizzes</b>	10	20% (20)	3-14	
	<b>Assignments</b>	2	10% (10)	6 , 12	
	<b>Projects / Lab.</b>				
	<b>Report</b>				
<b>Summative assessment</b> التقييم التلخيصي	<b>First Midterm Exam</b>	2hr	10% (10)	6	
	<b>Second Midterm</b>	2hr	10% (10)	12	
	<b>Final Exam</b>	3hr	50% (50)	16	
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	<b>Material Covered</b>
<b>Week 1</b>	<b>Module 1</b> <ul style="list-style-type: none"> <li>- Introduction to statistics and probability</li> <li>- Importance of statistics in computer science.</li> <li>- Fundamental concepts: population, sample, parameters.</li> <li>- Mean, Median, Mode.</li> <li>- Application examples in computer science.</li> </ul>

<b>Week 2</b>	<b>Module 1</b> <ul style="list-style-type: none"> <li>- Probability space</li> <li>- Kolmogorov's axioms</li> <li>- Conditional probability</li> </ul>
<b>Week 3</b>	<b>Module 1</b> <ul style="list-style-type: none"> <li>- Independence</li> <li>- The law of total probability</li> <li>- Bayes' rule</li> </ul>
<b>Week 4</b>	<b>Module 1</b> <ul style="list-style-type: none"> <li>- Random variables (discrete, continuous, mixed)</li> <li>- Probability Mass Function (pmf)</li> </ul>
<b>Week 5</b>	<b>Module 1</b> <ul style="list-style-type: none"> <li>- Cumulative Distribution Function (cdf)</li> <li>- Probability Distribution Function (pdf)</li> </ul>
<b>Week 6</b>	<b><i>First MIDTERM EXAMINATION</i></b>
<b>Week 7</b>	<b>Module 1</b> <ul style="list-style-type: none"> <li>- Expected value, moments</li> <li>- Variance, and standard deviation</li> <li>- Conditional Distributions and Moments</li> </ul>
<b>Week 8</b>	<b>Module 1</b> Important distributions: Definitions, Parameters, and Properties. <ul style="list-style-type: none"> <li>- Discrete Uniform</li> <li>- Bernoulli</li> <li>- Binomial</li> </ul>
<b>Week 9</b>	<b>Module 1</b> Important distributions: Definitions, Parameters, and Properties. <ul style="list-style-type: none"> <li>- Geometric</li> <li>- Poisson</li> <li>- Continuous Uniform</li> </ul>
<b>Week 10</b>	<b>Module 1</b> Important distributions: Definitions, Parameters, and Properties. <ul style="list-style-type: none"> <li>- Exponential</li> <li>- Gaussian</li> </ul>
<b>Week 11</b>	<b><i>Second MIDTERM EXAMINATION</i></b>
<b>Week 12</b>	<b>Module 2</b> Bounding Properties <ul style="list-style-type: none"> <li>- Markov inequality</li> <li>- Chebyshev inequality</li> <li>- Chernoff bounds</li> </ul>
<b>Week 13</b>	<b>Module 2</b> Random Vectors <ul style="list-style-type: none"> <li>- Joint pmf</li> <li>- Marginal pmf</li> </ul>

	<ul style="list-style-type: none"><li>- Conditional Distributions</li><li>- Independence of random variables</li></ul>
<b>Week 14</b>	<b>Module 2</b> <ul style="list-style-type: none"><li>- Joint moments of random vectors</li><li>- Correlation, Covariance</li></ul>
<b>Week 15</b>	<b>Module 2</b> <ul style="list-style-type: none"><li>- Correlation Coefficient</li><li>- Correlation and Covariance matrices</li></ul>
<b>Week 16</b>	<b><i>Final Examination</i></b>

## Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

Material Covered			
Week 1	<b>Introduction to MATLAB for Probability and Statistics</b> <ul style="list-style-type: none"> <li>• Setting up the environment</li> <li>• Basic operations and commands</li> </ul>	Week 8	<b>EXAM</b>
Week 2	<b>Introduction to MATLAB for Probability and Statistics</b> <ul style="list-style-type: none"> <li>• Setting up the environment</li> <li>• Basic operations and commands</li> </ul>	Week 9	<b>Random Variables and Simulations</b> <ul style="list-style-type: none"> <li>• Defining and working with discrete and continuous random variables</li> <li>• Simulating random experiments</li> </ul>
Week 3	<b>Descriptive Statistics with MATLAB</b> <ul style="list-style-type: none"> <li>• Calculating mean, median, and mode</li> <li>• Visualizing data distributions and their functions</li> </ul>	Week 10	<b>Random Variables and Simulations</b> <ul style="list-style-type: none"> <li>• Defining and working with discrete and continuous random variables</li> <li>• Simulating random experiments</li> </ul>
Week 4	<b>Descriptive Statistics with MATLAB</b> <ul style="list-style-type: none"> <li>• Calculating mean, median, and mode</li> <li>• Visualizing data distributions and their functions</li> </ul>	Week 11	<b>Random Variables and Simulations</b> <ul style="list-style-type: none"> <li>• Defining and working with discrete and continuous random variables</li> <li>• Simulating random experiments</li> </ul>
Week 5	<b>Probability Distributions in MATLAB</b> <ul style="list-style-type: none"> <li>• Generating and plotting common probability distributions (e.g., POISSON, EXPONENTIAL, NORMAL)</li> <li>• Calculating probabilities pdf and cdf</li> </ul>	Week 12	<b>Random Variables and Simulations</b> <ul style="list-style-type: none"> <li>• Defining and working with discrete and continuous random variables</li> <li>• Simulating random experiments</li> </ul>
Week 6	<b>Probability Distributions in MATLAB</b> <ul style="list-style-type: none"> <li>• Generating and plotting common probability distributions (e.g., POISSON, EXPONENTIAL, NORMAL)</li> <li>• Calculating probabilities pdf and cdf</li> </ul>	Week 13	<b>A comprehensive review</b>

<b>Week 7</b>	<b>Probability Distributions in MATLAB</b> <ul style="list-style-type: none"> <li>Generating and plotting common probability distributions (e.g., POISSON, EXPONENTIAL, NORMAL)</li> <li>Calculating probabilities pdf and cdf</li> </ul>	<b>Week 14</b>	<b>EXAM</b>
		<b>Week 15</b>	<b>A comprehensive review</b>

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	Text	Available in the Library?
<b>Required Texts</b> النصوص المطلوبة	- Probability, Statistics, and Random Processes for Electrical Engineering Alberto Leon-Garcia Pearson, 3 <sup>rd</sup> Edition	NO
<b>Recommended Texts</b>	- Introduction to probability models, Sheldon M. Ross, 9 <sup>th</sup> Edition - Intuitive Probability and Random Processes using MATLAB, Steven Kay	No
<b>Websites</b>	<a href="https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/">https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/</a>	

<b>Grading Scheme</b> مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition

<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance أداء مذهل
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors فوق المتوسط مع بعض الأخطاء
	<b>C - Good</b>	جيد	70 - 79	Sound work with notable errors العمل السليم مع أخطاء ملحوظة
	<b>D - Satisfactory</b>	متوسط	60 - 69	Fair but with major shortcomings عادل ولكن مع نواقص كبيرة
	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria العمل يلبي الحد الأدنى من المعايير
<b>Fail Group (0 - 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded مطلوب المزيد من العمل ولكن الائتمان الممنوح
	<b>F – Fail</b>	راسب	(0-44)	Considerable amount of work required قدر كبير من العمل المطلوب

**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			
<b>Module Title</b>	Machine Learning	<b>Module Delivery</b>	
<b>Module Type</b>	Core	<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar	
<b>Module Code</b>			
<b>ECTS Credits</b>	4		
<b>SWL (hr/sem)</b>	148		
<b>Module Level</b>	2		
<b>Administering Department</b>	Computer Science	<b>College</b>	CCSM
<b>Module Leader</b>	Armaneesa Naaman Hasoon	<b>e-mail</b>	armaneesa@tu.edu.iq
<b>Module Leader's Acad. Title</b>	Assistant Professor	<b>Module Leader's Qualification</b>	Master
<b>Module Tutor</b>		<b>e-mail</b>	
<b>Peer Reviewer Name</b>	Dr. Mohammed Aktham	<b>e-mail</b>	
<b>Scientific Committee Approval Date</b>	1/02/2026	<b>Version Number</b>	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	Artificial intelligence	<b>Semester</b>	
<b>Co-requisites module</b>	Python Calculus, Probability	<b>Semester</b>	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
<b>Module Aims</b> أهداف المادة الدراسية	<ul style="list-style-type: none"> <li>• Understand the term machine learning and its applications</li> <li>• Understand the steps of machine learning.</li> <li>• Study the types of learning</li> <li>• Solve problems that traditional methods cannot solve.</li> </ul>

	<ul style="list-style-type: none"> <li>• Understand the methods of obtaining and processing data</li> <li>• Understand the methods of extracting features</li> <li>• Train and evaluate machine learning models</li> </ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>• Understand the definition and applications of machine learning</li> <li>• Understand data processing methods.</li> <li>• Develop the student's thinking skills and the ability to build a machine learning model used for prediction or classification</li> <li>• Provide the learner with the skills necessary to be able to evaluate the performance of the machine learning model and apply it in real-time</li> </ul>
<b>Indicative Contents</b> المحتويات الإرشادية	<ul style="list-style-type: none"> <li>• Machine Learning Basics</li> </ul>

<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<p>1 .Lectures: The instructor will give lectures to introduce and explain the definition of machine learning methods and their applications.</p> <p>2 .Interactive discussions: Engaging students in interactive discussions allows them to ask questions, seek clarification, and actively participate in learning. Discussions can include examples of machine learning algorithms, discuss how these algorithms are programmed in practice, and explore real-world applications of AI concepts.</p> <p>3 .Lab: Lab sessions are dedicated, hands-on sessions where students apply the concepts they have learned in lectures to practical programming exercises. Key strategies for lab sessions include:</p> <p>a. Programming exercises: Students will work on programming exercises and projects in the lab, providing them with hands-on experience in programming machine learning projects.</p> <p>b. Guided training: Lab instructors or teaching assistants will be available to provide guidance, assistance, and immediate feedback on students' code. They can help students debug their programs, identify errors, and improve their coding skills.</p> <p>c. Collaboration and peer learning: Students can collaborate with their peers in the lab, promoting teamwork and enabling knowledge sharing. Working together on machine learning project programming assignments promotes discussion, problem solving, and peer learning.</p>

D. Access to Equipment and Resources: The lab should provide access to computers, necessary software tools, programming references, and relevant online resources. This ensures that students have the resources needed to complete lab exercises and assignments effectively.

4 .Programming Assignments: Students will be given assignments to enhance their understanding of how to program machine learning models to encourage independent problem solving. These assignments may include implementing algorithms, designing software systems, or developing small-scale projects using Python.

5 .Code Reviews and Feedback: The instructor will provide feedback on students' code, review their solutions, and make suggestions for improvement. This feedback will help students improve their coding skills and adhere to best practices.

6 .Office Hours and Individual Support: The instructor should provide individual consultations and support for students who need additional help or guidance in understanding and completing assignments.

#### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	56	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	148		

#### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	
	<b>Assignments</b>	4	20% (20)	7, 12	
	<b>Projects</b>	1	20% (20)	9-14	
	<b>Report</b>	1			
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	
	<b>Final Exam</b>	2hr	40% (40)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week No.	Material Covered
Week 1	Introduction to machine learning
Week 2	Steps of a Machine Learning Model in Detail
Week 3	Performance evaluation metrics for machine learning methods
Week 4	Regression models
Week 5	Simple linear regression
Week 6	Multi-linear regression.
Week 7	Polynomial linear regression
Week 8	Mid Exam
Week 9	Classification Models: Logistic Regression
Week 10	Decision tree
Week 11	Random forest
Week 12	Support vector machine
Week 13	Clustering: Introduction to Clustering, K-Means, Hierarchical Clustering
Week 14	Project Due (Students Presentations part1)
Week 15	Project Due (Students Presentations part2)

### Delivery Plan (Weekly Lab. Syllabus):

المنهاج الاسبوعي للمختبر:

Week No.	Material Covered
Week 1	Introduction to the basics of preprocessing a dataset
Week 2	Introduction to the basics of Evaluation ml models
Week 3	Build a <a href="#">Simple Linear Regression</a> using Scikit-learn.
Week 4	Build a <a href="#">multivariable linear Regression</a> using Scikit-learn.
Week 5	Build a <a href="#">polynomial regression</a> using Scikit-learn.

<b>Week 6</b>	Build a <a href="#">logistic regression classifier</a> using Scikit-learn.
<b>Week 7</b>	Build a <a href="#">Decision tree classifier</a> using Scikit-learn.
<b>Week 8</b>	Build a <a href="#">Random Forest classifier</a> using Scikit-learn.
<b>Week 9</b>	Build a <a href="#">Support vector machine classifier</a> using Scikit-learn.
<b>Week 10</b>	Build a <a href="#">K-Means clustering method</a> using Scikit-learn.
<b>Week 11</b>	Build a <a href="#">hierarchical clustering</a> using Scikit-learn.
<b>Week 12</b>	Build a <a href="#">hierarchical clustering</a> using Scikit-learn.
<b>Week 13</b>	Quiz
<b>Week 14</b>	Answering students' questions and reviewing previous topics.
<b>Week 15</b>	Answering students' questions and reviewing previous topics.

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 1st Edition by Aurélien Géron (Author), 2017.	No
<b>Recommended Texts</b>		
<b>Websites</b>		

### Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks	Definition
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			(%)	
<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 – 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 – 89	Above average with some errors
	<b>C - Good</b>	جيد	70 – 79	Sound work with notable errors
	<b>D - Satisfactory</b>	متوسط	60 – 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 – 59	Work meets minimum criteria
<b>Fail Group (0 – 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	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	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code			
ECTS Credits			
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	
Administering Department	Computer Science	College	Computer Science and Mathematics
Module Leader	Lecturer. Mohanad Dawood Salman	e-mail	<a href="mailto:mohanaddawoodalroomi@tu.edu.iq">mohanaddawoodalroomi@tu.edu.iq</a>
Module Leader's Acad. Title	Lecturer.	Module Leader's Qualification	M.S.C
Module Tutor	Assistant Lec.: Luay Ibrahim Klalif	e-mail	<a href="mailto:luay.i.khalaf@tu.edu.iq">luay.i.khalaf@tu.edu.iq</a>
Peer Reviewer Name	Mohamed Aktham	e-mail	
Scientific Committee Approval Date	1/2/2026	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Basic and advanced programming language Computational theory Computer architecture	Semester	1 2 2
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Aims</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> <li>5. Student be able to Identify principles, techniques and tools for compilers of programming languages.</li> <li>6. Student be able to design a compiler for a (simplified) (programming) language.</li> <li>7. Student know how to use compiler construction tools, such as generators of scanners and parsing.</li> <li>8. Student be familiar with assembly code and virtual machines.</li> <li>9. Be able to define LL(1), LR(1), and SLR(1) grammars</li> <li>10. Student be familiar with compiler analysis and optimization techniques.</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p style="text-align: center;"><b>After completing this module, a student should be able to:</b></p> <ol style="list-style-type: none"> <li>1. Understand the principles guiding all aspects of the compilation process.</li> <li>2. Recognize the function of each of the fundamental components of a conventional compiler.</li> <li>3. Demonstrate familiarity with compiler front-end concepts, such as lexical analysis, syntactic analysis, semantic analysis, type checking, symbol tables, and so on.</li> <li>4. Identify the type of compiler errors that appear during programming and analyze the errors.</li> <li>5. Review and practical application of the C++ programming language.</li> <li>6. Finally, the student will build the front-end parts of his or her own compiler using a higher language.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <p><u>Part A - Front End</u></p> <ul style="list-style-type: none"> <li>- Compiler phases and overall working, Scanners (Regular Expressions, NFA/DFA, Scanner Generators). [10 hrs]</li> <li>- Parsers (Grammars, Ambiguity Removal, LL, LR, and other deterministic parsing).[10 hrs]</li> <li>- Semantic Analysis (Symbol Tables, Syntax Driven Analysis, Type Systems, Attribute Grammars). [10 hrs]</li> </ul> <p>Revision problem classes [5 hrs]</p> <p><u>Part C –Middle End</u></p> <ul style="list-style-type: none"> <li>- Intermediate Forms, Syntax Directed Translation, Translation of: Expressions, Control Structures and Back-patching, Function and Procedure Calls, Runtime Organization. [10 hrs]</li> </ul> <p>Revision problem classes [5 hrs]</p> <p><u>Part B - Back-end</u></p>

	<ul style="list-style-type: none"> <li>- Code optimization: code is made shorter and simpler by combining steps or removing unnecessary steps which lead to the generation of optimized code. . [10 hrs]</li> <li>- Code generation: converts the intermediate code or the optimized code into the target language. Usually, the target language is the machine code. [5 hrs]</li> <li>- Selected, allocated all available memory and registers, then run to process inputs and provide results. [5 hrs]</li> </ul>
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## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<ul style="list-style-type: none"> <li>• Using active learning: This type of learning includes engaging learners in active and interactive learning processes, such as discussions, practical experiments, educational games, and knowing the students' scientific level by evaluating their test results.</li> <li>• Software project: Emphasize design patterns, teamwork, and programming methodology by constructing a compiler to meet assigned specifications.</li> <li>• Technology-based learning: includes the use of technology in learning and teaching processes, such as the use of multimedia, educational applications, and online educational platforms. Technology can help improve access to knowledge and enhance interaction and engagement.</li> <li>• Application of theory: Emphasize the role of theory to enable automation of compiler tasks, and illustrate the limitations of that theory.</li> </ul>
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## Student Workload (SWL)

### الحمل الدراسي للطلاب

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	75	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	5
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	50	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	3.3
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	125		

## Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	5, 9,12	LO #1-4
	Assignments	5	10% (10)	4,5,8,9,12	LO # 2- 5
	Projects / Lab.	1	10% (10)	Continuous	
	Report	0			
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	▪ Programming languages. Introduction to compiler.
Week 2	▪ Language-processing system (Compilation). The Structure of Compiler.
Week 3	▪ The phases of compiler design.
Week 4	▪ Lexical analysis phase. Type of errors for Lexical analysis phase
Week 5	▪ Syntax definition. Context free grammar.
Week 6	▪ Parsing tree & Leftmost and Rightmost derivations.
Week 7	▪ Mid-term Exam
Week 8	▪ syntax analysis phase.
Week 9	▪ Problems of compiler for syntax analysis phase. ▪ regular expression and Regular Definitions
Week 10	▪ Top –down parsing .
Week 11	▪ bottom up parsing.
Week 12	▪ Ambiguous Grammars
Week 13	▪ Parser generators.
Week 14	▪ Exam Parser generators.
Week 15	▪ Semantic analysis phase. ▪ Type of errors for semantic analysis.
Week 16	▪ Preparatory week before the final Exam

## Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1 , 2	Lab 1: Array characters in C++ and related functions. String characters in C++ and related functions.
Week 3 , 4	Lab 2: program Lexical analysis phase of second tasks.
Week 5 , 6	Lab 3: program to delete comment in one line. program to delete to comment in more lines. program of compaction of consecutive white spaces into one.
Week 6	Lab 4: program to build the Lexemes table.
Week 7	Mid-term Exam
Week 8 , 9	Lab 5: Programs of transition diagram
Week 10 , 11 , 12 , 13	Lab 6: Program checks keywords. Program checks identifiers. Program check the number. Program checks mathematical operations. Program check the number. Program checks mathematical operations.
Week 14 , 15	Type Checking
Week 16	Preparatory week before the final Exam.

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Basics of Compiler Design, Torben E. Mogensen, 2009.	Yes
Recommended Texts	Compilers , principles , Techniques and tools by Aho,Lam, Sethi and Ullman, 2 <sup>nd</sup> Ed. Addison – Wesely , 2006. ++C من البداية إلى البرمجة الكيانية ، الدكتور المهندس. نضال خضير العبادي .(2011)	Yes
Websites	<ul style="list-style-type: none"> <li><a href="http://lectures.iugaza.edu.ps/playlist/145/%D8%AA%D8%B5%D9%85%D9%8A%D9%85-%D8%A7%D9%84%D9%85%D8%AA%D8%B1%D8%AC%D9%85%D8%A7%D8%AA-compiler-design">http://lectures.iugaza.edu.ps/playlist/145/%D8%AA%D8%B5%D9%85%D9%8A%D9%85-%D8%A7%D9%84%D9%85%D8%AA%D8%B1%D8%AC%D9%85%D8%A7%D8%AA-compiler-design</a></li> </ul>	

## Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
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<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors
	<b>C - Good</b>	جيد	70 - 79	Sound work with notable errors
	<b>D - Satisfactory</b>	متوسط	60 - 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	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	Operating System 2		Module Delivery
Module Type	Core		<input type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code			
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1	Semester of Delivery	
Administering Department	Computer Science	College	CCSM
Module Leader	Ayad Ahmed Yass	e-mail	ayad.a.yass@tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Phd
Module Tutor	Huthifa Mohammed	e-mail	huthife@tu.edu.iq
Peer Reviewer Name	Mahammed Aktham	e-mail	
Scientific Committee Approval Date	1/2/2026	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	Understanding basics of Operating system	Semester	2

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Aims</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"><li>1. To describe the advance of computer systems</li><li>2. To describe the services an operating system provides to users, processes, and other systems.</li><li>3. To develop students' understanding skills for various operating system</li><li>4. To help students to deal with computer components.</li><li>5. To provide students with hands-on experience in Linux command line</li><li>6. To advance the students skills to working with scripting to deal with operating system.</li><li>7. To enhance students' ability to troubleshooting operating system problems.</li><li>8. To level up the students' skills so they be able to enter the market places since the OS consider the most required in most organizations</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>Upon successful completion of this module, students should be able to:</p> <ol style="list-style-type: none"><li>1. Demonstrate a solid understanding of the fundamental principles and concepts of operating system.</li><li>2. to help the student to understand the components and security of the operating system.</li><li>3. At this point, the student will be able to deal with different operating system</li><li>4. Enhance the operating system components and avoid the security issues</li><li>5. Student able to work with Linux command as the Linux is the most required in the market nowadays</li><li>6. Less work and increase productivity by learning the scripting</li><li>7. fixing and troubleshooting all OS related issues</li><li>8. leveling up the skills means now the students can enter any market place without hesitating</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"><li>1- To describe the basic organization of computer systems.</li><li>2- To describe the services an operating system provides to users, processes, and other systems</li><li>3- To discuss the various ways of structuring an operating system</li><li>4- To introduce the notion of a process and a thread</li></ol>

	<p>5- To introduce CPU scheduling, which is the basis for multi programmed operating systems</p> <p>6- To develop a description of deadlocks</p>
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<p><b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم</p>
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<p><b>Strategies</b></p>	<p>1. Lectures: The instructor will deliver lectures to introduce and explain operating concepts, like processes, threads, memory management, file systems, and system calls.</p> <p>2. Interactive Discussions: Engaging students in interactive discussions allows them to ask questions, seek clarifications, and participate actively in the learning process. Discussions can include reviewing code examples, discussing database best practices, and exploring real-world applications of operating system</p> <p>3. Laboratory Sessions: Laboratory sessions are dedicated practical sessions where students apply the concepts learned in lectures to hands-on database exercises. Key strategies for the laboratory sessions include:</p> <ul style="list-style-type: none"> <li>a. Linux Exercises: Students will work on linux exercises and projects in the laboratory, providing them with practical experience in command line and problem-solving.</li> <li>b. Guided Practice: Lab instructors or teaching assistants will be available to provide guidance, assistance, and immediate feedback on students' skills They can help students debug their scripting, identify errors, and improve their command line skills.</li> <li>c. Collaboration and Peer Learning: Students can collaborate with their peers in the laboratory, fostering teamwork and enabling knowledge sharing. Working together on Linux tasks promotes discussions, problem-solving, and peer learning.</li> <li>d. Equipment and Resource Access: The laboratory should provide access to computers, necessary software tools, programming references, and relevant online resources. This ensures that students have the necessary resources to complete their lab exercises and assignments effectively.</li> </ul>
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	<p>4. command line Assignments: Assignments will be given to students to reinforce their understanding of command line concepts and encourage independent problem-solving. These assignments may involve implementing scripting.</p> <p>5. Reviews and Feedback: The instructor will provide feedback on students' scripting, reviewing their solutions, and offering suggestions for improvement. This feedback will help students enhance their coding skills and adhere to best practices.</p> <p>6. Office Hours and Individual Support: The instructor should be available for individual consultations and provide support to students who need additional help or guidance in understanding command concepts or completing assignments.</p>
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### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	93	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	7.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	200		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	#LO 1-3, #LO 5-8
	<b>Assignments</b>	2	10% (10)	7, 12	#LO 3-5, #LO 5-8
	<b>Projects</b>	1	10% (10)	continuous	
	<b>Report</b>	1	10% (10)	14	#LO 1-8
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	#LO 1-7
	<b>Final Exam</b>	2 hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week No.	Material Covered
Week 1	Process Synchronization Part1
Week 2	Process Synchronization Part2
Week 3	Critical Section Problems part1
Week 4	Critical Section Problems part2
Week 5	Deadlock
Week 6	Method of Handling Deadlock
Week 7	Deadlock Avoidance part1
Week 8	Deadlock Avoidance part2
Week 9	Deadlock Detection part1
Week 10	Deadlock Detection part2
Week 11	Main Memory Part1
Week 12	Main Memory Part2
Week 13	Segmentation
Week 14	Segmentation and Memory Allocation
Week 15	Reviewing Students' Projects

## Delivery Plan (Weekly Lab. Syllabus):

المنهاج الاسبوعي للمختبر:

Week No.	Material Covered
Week 1	Introduction about the advance Linux usage
Week 2	Advance Linux Commands
Week 3	Explain about the App that using Linux
Week 4	Introduction about the bash scripting

<b>Week 5</b>	Linux Shell Scripting
<b>Week 6</b>	How to use shell scripting
<b>Week 7</b>	Advance shell scripting command
<b>Week 8</b>	Linux command line
<b>Week 9</b>	Shell Scripting Excursion
<b>Week 10</b>	Installing software in Linux
<b>Week 11</b>	Understanding Linux logs
<b>Week 12</b>	Identifying issues from the logs
<b>Week 13</b>	Shell scripting comparisons with normal command line
<b>Week 14</b>	Troubleshooting issues
<b>Week 15</b>	Applying instructor's feedback on students' projects

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<i>Abraham Silberschatz</i> (2022). Operating System Concept nine edition.	Yes
<b>Recommended Texts</b>		
<b>Websites</b>		

## 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	Multimedia and Network Security		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code			
ECTS Credits			
SWL (hr/sem)	148		
Module Level	4	Semester of Delivery	
Administering Department	Computer Science	College	CCSM
Module Leader	Maath Frman Ismaeel	e-mail	Maath.f.ismaeel@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	MSc.
Module Tutor		e-mail	
Peer Reviewer Name	Mohamed Aktham	e-mail	
Scientific Committee Approval Date	02/01/2026	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Aims</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"><li>1. <b>Foundational Network Defense:</b> To establish a deep understanding of network security principles, focusing on the protection of data integrity, confidentiality, and availability across different network infrastructures.</li><li>2. <b>Authentication &amp; Identity Management:</b> To evaluate and implement robust methods for key distribution and user authentication to ensure only authorized entities access network resources.</li><li>3. <b>Infrastructure &amp; Cloud Protection:</b> To analyze the security challenges unique to modern environments, including <b>Cloud Security</b>, <b>Wireless Networks</b>, and <b>Network Access Control (NAC)</b>.</li><li>4. <b>Protocol Analysis:</b> To master the technical specifics of transport-level security (TLS/SSL) and IP-level security (IPsec) to secure communication channels.</li><li>5. <b>Multimedia Data Security:</b> To introduce the concepts of multimedia security, moving beyond standard text-based encryption to handle the complexities of image, audio, and video data.</li><li>6. <b>Information Hiding Techniques:</b> To differentiate between and apply the principles of <b>Steganography</b> (hiding the existence of a message) and <b>Digital Watermarking</b> (protecting ownership and integrity).</li><li>7. <b>Practical Security Programming:</b> To develop hands-on proficiency using <b>Python</b> for security tasks, including network reconnaissance, key exchange, and the algorithmic implementation of watermarking.</li><li>8. <b>Media Authentication &amp; Copyright:</b> To explore the technical methods used for embedding and extracting watermarks in various media types (Grey/Color images, Audio, and Video) for copyright protection.</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"><li>1. <b>Analyze Network Vulnerabilities:</b> Explain the fundamental threats to network security and the mechanisms used to defend against unauthorized access and data breaches.</li><li>2. <b>Evaluate Authentication Frameworks:</b> Compare various methods for <b>Key Distribution</b> and <b>User Authentication</b>, identifying the most secure protocols for different network environments.</li><li>3. <b>Appraise Cloud and Wireless Security:</b> Critically assess the unique security risks associated with <b>Cloud Computing</b> and <b>Wireless Networks</b>, including</li></ol>

	<p>the implementation of effective Access Control Lists (ACLs).</p> <ol style="list-style-type: none"> <li>4. <b>Deconstruct Security Protocols:</b> Explain the inner workings of <b>Transport-Level Security (TLS)</b> and <b>IP Security (IPsec)</b>, detailing how they provide end-to-end encryption and data integrity.</li> <li>5. <b>Distinguish Multimedia Protection Techniques:</b> Differentiate between <b>Steganography</b> (hiding information) and <b>Digital Watermarking</b> (protecting ownership) across various media types like image, audio, and video.</li> <li>6. <b>Formulate Media Security Strategies:</b> Design theoretical models for embedding and extracting watermarks to ensure copyright protection and content authentication.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p><b>Foundations and Identity Management</b></p> <ul style="list-style-type: none"> <li>• <b>Security Architecture:</b> The OSI Security Architecture, security attacks (passive vs. active), and security services/mechanisms.</li> <li>• <b>Key Distribution:</b> Symmetric key distribution using Key Distribution Centers (KDC); Asymmetric key distribution and Public Key Infrastructure (PKI).</li> <li>• <b>Authentication Protocols:</b> Kerberos, X.509 Directory Authentication service, and federated identity management.</li> </ul> <p><b>Access Control and Modern Infrastructure</b></p> <ul style="list-style-type: none"> <li>• <b>Network Access Control (NAC):</b> Elements of a NAC system, EAP (Extensible Authentication Protocol), and IEEE 802.1X port-based authentication.</li> <li>• <b>Cloud Security:</b> Cloud computing service models (SaaS, PaaS, IaaS); Cloud security risks and countermeasures; Data protection in the cloud.</li> </ul> <p><b>Network Layer &amp; Transport Security</b></p> <ul style="list-style-type: none"> <li>• <b>Transport-Level Security:</b> SSL/TLS architecture, TLS Handshake Protocol, Heartbeat Protocol, and HTTPS.</li> <li>• <b>Wireless Security:</b> IEEE 802.11i wireless LAN security, WPA2/WPA3 protocols, and common wireless threats (Evil Twin, War Driving).</li> <li>• <b>IP Security (IPsec):</b> IPsec documents, Encapsulating Security Payload (ESP), Authentication Header (AH), and Tunnel vs. Transport modes.</li> </ul> <p><b>Multimedia Concepts and Steganography</b></p> <ul style="list-style-type: none"> <li>• <b>Digital Media Fundamentals:</b> Characteristics of digital images, audio, and video; Redundancy and human perception (HVS/HAS).</li> <li>• <b>Steganography:</b> The prisoner’s problem; Spatial domain techniques (Least Significant Bit - LSB); Transform domain techniques (DCT/DWT basics); Steganalysis (detecting hidden messages).</li> </ul> <p><b>Digital Watermarking and Copyright</b></p> <ul style="list-style-type: none"> <li>• <b>Watermarking Principles:</b> Requirements (Invisibility, Robustness, Capacity); Fragile vs. Robust watermarks.</li> </ul>

	<ul style="list-style-type: none"> <li>• <b>Application-Specific Watermarking:</b> <ul style="list-style-type: none"> <li>○ <b>Image Watermarking:</b> Embedding marks in different color spaces (RGB vs. YCbCr).</li> <li>○ <b>Audio Watermarking:</b> Echo hiding, phase coding, and spread spectrum.</li> <li>○ <b>Video Watermarking:</b> Motion vector watermarking and inter-frame/intra-frame embedding.</li> </ul> </li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<p><b>Teaching Strategies:</b></p> <ol style="list-style-type: none"> <li>1- Interactive Lectures: Incorporate multimedia elements into lectures to demonstrate concepts visually and engage students effectively.</li> <li>2- Hands-on Labs: Provide hands-on lab exercises where students can practice implementing security measures in multimedia networks.</li> <li>3- Group Projects: Assign group projects that require students to analyze and propose solutions for multimedia security issues in network environments.</li> <li>4- Peer Teaching: Encourage students to teach each other about specific topics related to multimedia security and networks.</li> </ol> <hr/> <p><b>A- Learning Strategies:</b></p> <ol style="list-style-type: none"> <li>1- Active Learning: Encourage students to actively engage with the material through discussions, hands-on activities, and problem-solving tasks.</li> <li>2- Visual Aids: Use multimedia presentations, videos, and diagrams to help students visualize complex concepts.</li> <li>3- Collaborative Learning: Foster collaboration among students through group projects and discussions on multimedia security topics.</li> <li>4- Practice Exercises: Offer practice exercises and quizzes to reinforce learning and assess understanding.</li> </ol>

	<p>5- Real-world Applications: Connect theoretical concepts to real-world applications of multimedia security and networks to demonstrate their relevance.</p> <p>6- Feedback Mechanisms: Provide timely feedback on assignments and assessments to help students track their progress and improve their understanding.</p> <p>7- Continuous Assessment: Implement regular assessments to gauge student comprehension and adjust teaching strategies as needed.</p>
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### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	56	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	148		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	
	<b>Assignments</b>	4	20% (20)	7, 12	
	<b>Projects</b>	1	20% (20)	5-14	
	<b>Report</b>	1			
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	
	<b>Final Exam</b>	2hr	40% (40)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week No.	Material Covered
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Week 1	Introduction to Network security
Week 2	Key Distribution & User Authentication
Week 3	Network Access Control
Week 4	Cloud Security
Week 5	Transport-Level Security
Week 6	Transport-Level Security(cont.)
Week 7	Wireless Network Security
Week 8	Wireless Network Security(cont.)
Week 9	IP Security
Week 10	IP Security(cont.)
Week 11	Introduction of Multimedia
Week 12	Multimedia Security Concepts
Week 13	Steganography Concepts
Week 14	Digital Watermarking
Week 15	Digital Watermarking(cont.)

### Delivery Plan (Weekly Lab. Syllabus):

المنهاج الاسبوعي للمختبر:

Week No.	Material Covered
Week 1	Introductory Lecture to python
Week 2	Network Reconnaissance
Week 3	Key Exchange
Week 4	Authentication
Week 5	Access Control Lists
Week 6	Analyzing TLS
Week 7	Exam
Week 8	Introduction to Steganography
Week 9	Steganography-Embedding Grey Image in color image
Week 10	Steganography-Embedding Grey Image in color image (Cont.)
Week 11	Introduction to Digital Watermarking

Week 12	Digital Watermarking (Same size)
Week 13	Digital Watermarking (Different size)
Week 14	Audio Watermarking
Week 15	Video Watermarking

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<p>Stallings, William. "Network security essentials: applications and standards." (2014).</p> <p>Shih F.Y. (Ed.) - Multimedia Security: Watermarking, Steganography, and Forensics 2012.</p>	
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	Data Mining		Module Delivery
Module Type	Core		<input type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code			
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1	Semester of Delivery	
Administering Department	Computer Science	College	CCSM
Module Leader	Hasan Naji Ali	e-mail	hasan@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	Msc
Peer Reviewer Name	Mahammed Aktham	e-mail	
Scientific Committee Approval Date	1/2/2026	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	Understanding basics of Data Mining	Semester	2

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Aims</b> أهداف المادة الدراسية	<ul style="list-style-type: none"><li>• Introduce students to the concept of Data Mining and its importance in decision support.</li><li>• Explain the Knowledge Discovery in Databases (KDD) process.</li><li>• Enable students to use classification algorithms.</li><li>• Study clustering algorithms.</li><li>• Understand association rules.</li><li>• Analyze time-series data and forecasting.</li><li>• Train students to use practical tools such as Python and RapidMiner.</li><li>• Prepare students for the job market in data analysis and artificial intelligence.</li></ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"><li>• Explain fundamental Data Mining concepts and distinguish them from Machine Learning and Statistics.</li><li>• Apply classification algorithms such as KNN, Decision Tree, and Naïve Bayes.</li><li>• Apply clustering algorithms such as K-means.</li><li>• Extract association rules using the Apriori algorithm.</li><li>• Evaluate model performance using Accuracy, Precision, and Recall.</li><li>• Preprocess and clean data before analysis.</li><li>• Implement real-world data analysis projects using Python.</li><li>• Present professional analytical reports.</li></ul>
<b>Indicative Contents</b> المحتويات الإرشادية	<ul style="list-style-type: none"><li>• Introduction to Data Mining and its relation to KDD.</li><li>• Data Preprocessing.</li><li>• Classification.</li><li>• Decision Trees.</li><li>• K-Nearest Neighbors algorithm.</li><li>• Clustering.</li><li>• Association Rules.</li><li>• Model Evaluation.</li><li>• Data Mining applications in banking, marketing, cybersecurity, and healthcare.</li></ul>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<ul style="list-style-type: none"><li>• Theoretical lectures explaining concepts and algorithms.</li><li>• Interactive discussions on real-world applications.</li><li>• Practical lab sessions using Python (Pandas, Scikit-learn, Matplotlib).</li><li>• Analysis of real datasets such as Iris, Titanic, and Market Basket datasets.</li><li>• Group projects analyzing real datasets.</li></ul>
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- Preparation and presentation of analytical reports.

### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	93	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	7.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	200		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	#LO 1-3, #LO 5-8
	<b>Assignments</b>	2	10% (10)	7, 12	#LO 3-5, #LO 5-8
	<b>Projects</b>	1	10% (10)	continuous	
	<b>Report</b>	1	10% (10)	14	#LO 1-8
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	#LO 1-7
	<b>Final Exam</b>	2 hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week No.	Material Covered
Week 1	Concept of Data
Week 2	Introduction to Data Mining
Week 3	KDD Process
Week 4	Data Preprocessing
Week 5	Data Cleaning & Transformation
Week 6	Classification Overview
Week 7	Decision Tree

<b>Week 8</b>	KNN
<b>Week 9</b>	Midterm Review
<b>Week 10</b>	Naïve Bayes
<b>Week 11</b>	Association Rules
<b>Week 12</b>	Apriori Algorithm
<b>Week 13</b>	Model Evaluation
<b>Week 14</b>	Data Warehouse
<b>Week 15</b>	Reviewing Students' Projects

<b>Delivery Plan (Weekly Lab. Syllabus):</b> المنهاج الاسبوعي للمختبر:	
<b>Week No.</b>	
<b>Week 1</b>	Install Python and Jupyter
<b>Week 2</b>	Using Pandas
<b>Week 3</b>	Reading Datasets
<b>Week 4</b>	Data Processing
<b>Week 5</b>	Normalization
<b>Week 6</b>	Apply KNN
<b>Week 7</b>	Model Evaluation
<b>Week 8</b>	K-means
<b>Week 9</b>	Association Rules
<b>Week 10</b>	Apply Decision Tree

<b>Week 11-14</b>	Practical Project
<b>Week 15</b>	Project Presentations

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>	<i>Abraham</i> Silberschatz (2022). Operating System Concept nine edition.	Yes
<b>Recommended Texts</b>	Introduction to Data Mining – Pang-Ning Tan	
<b>Websites</b>		

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Neural Networks	Module Delivery	
Module Type	Core	<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar	
Module Code			
ECTS Credits			
SWL (hr/sem)	148		
Module Level	4		
Administering Department	Computer Science	College	CCSM
Module Leader	Salwa Khalid Abdulateef	e-mail	Khalid.salwa@tu.edu.iq
Module Leader's Acad. Title	Asst. Prof.	Module Leader's Qualification	MSc.
Module Tutor		e-mail	
Peer Reviewer Name	Mohamed Aktham	e-mail	
Scientific Committee Approval Date	02/01/2026	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Machine learning, Artificial intelligent	Semester	
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Aims</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> <li>9. learning the types of neural networks.</li> <li>10. Knowing how these neural networks work, especially by linking them to practical life.</li> <li>11. Knowing the problems that appear in neural networks and ways to solve them.</li> <li>12. The student can be ability to write programs for neural networks.</li> <li>13. The ability to use neural networks in some research</li> <li>14. Learning how to choose the best network for your algorithm.</li> <li>15. A detailed explanation of algorithms and how to program them.</li> <li>16. Teaching the student to calculate the complexity time of the algorithm.</li> <li>17. Encouraging the student to be creative and think about the specialization projects and keep pace with the development taking place in this field.</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. The student is supposed to understand how to start building simple algorithms and know the language of building algorithms (pseudo code).</li> <li>2. Build basic causal skills in creating and proving the correctness of algorithms and programs.</li> <li>3. Build skills in analyzing data and acquiring knowledge</li> <li>4. Build skills in how to choose appropriate solutions for some problems and assign the best algorithms to solve them</li> <li>5. Enabling students to think and analyze mathematical topics.</li> <li>6. Enabling students to think and analyze topics related to algorithms.</li> <li>7. Giving the learner the skills to be able to build a neural network</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"> <li>1. Review of Basic Programming Concepts: - Cv2, Pandas, Numpy, Keras, and Matplot.</li> <li>2. overview on Fundamentals of artificial neural networks Theory of Neural Networks (NN) Neural Networks Applications and properties</li> <li>3. Types of activation functions such as sigmoid, relu and others</li> <li>4. Models of Neuron</li> <li>5. Logical Operations: such as AND, OR, and XOR.</li> <li>6. Types of learning Supervised, unsupervised</li> <li>7. Network Architectures Signal layer and Multiple Layers of Neurons,</li> <li>8. Perceptron and Recurrent (Feedback) Networks , Learning algorithm</li> </ol>

	<p>9. Explain Backpropagation Neural Networks algorithms and programming.</p> <p>10. Explain Hopfield Network algorithms mathematical and programming.</p> <p>-</p>
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<p><b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم</p>
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<p><b>Strategies</b></p>	<p>1. Lectures: The instructor will deliver lectures to introduce and explain neural network concepts, and problem-solving techniques. This will provide students with a solid theoretical foundation.</p> <p>2. Interactive Discussions: Engaging students in interactive discussions allows them to ask questions, seek clarifications, and participate actively in the learning process. Discussions can include reviewing code examples, discussing programming best practices, and exploring real-world applications of programming concepts.</p> <p>3. Laboratory Sessions: Laboratory sessions are dedicated practical sessions where students apply the concepts learned in lectures to hands-on programming exercises. Key strategies for the laboratory sessions include:</p> <ul style="list-style-type: none"> <li>a. Programming Exercises: Students will work on programming exercises and projects in the laboratory, providing them with practical experience in coding and problem-solving.</li> <li>b. Guided Practice: Lab instructors or teaching assistants will be available to provide guidance, assistance, and immediate feedback on students' code. They can help students debug their programs, identify errors, and improve their coding skills.</li> <li>c. Collaboration and Peer Learning: Students can collaborate with their peers in the laboratory, fostering teamwork and enabling knowledge sharing. Working together on programming tasks promotes discussions, problem-solving, and peer learning.</li> </ul> <p>4. Code Reviews and Feedback: The instructor will provide feedback on</p>
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students' code, reviewing their solutions, and offering suggestions for improvement. This feedback will help students enhance their coding skills and adhere to best practices.

### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	56	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	148		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 11	
	<b>Assignments</b>	4	20% (20)	7, 12	
	<b>Projects</b>	1	20% (20)	5-14	
	<b>Report</b>	1			
<b>Summative assessment</b>	<b>Midterm Exam</b>	2 hr	10% (10)	11	
	<b>Final Exam</b>	2hr	40% (40)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week No.	Material Covered
Week 1	<b>History and Fundamentals of artificial neural networks</b>
Week 2	<b>Theory of Neural Networks (NN)</b>
Week 3	<b>Neural Networks Applications and properties</b>
Week 4	<b>Types of activation functions</b>
Week 5	<b>Exam1</b>
Week 6	<b>Models of Neuron</b>

Week 7	Logical Operations
Week 8	Types of learning
Week 9	Exam2
Week 10	Network Architectures
Week 11	Multiple Layers of Neurons,
Week 12	Perceptron and Recurrent (Feedback) Networks , Learning algorithm
Week 13	Backpropagation Neural Networks
Week 14	Backpropagation Neural Networks
Week 15	Hopfield Network

<b>Delivery Plan (Weekly Lab. Syllabus):</b> المنهاج الاسبوعي للمختبر:	
Week No.	Material Covered
Week 1	Explaining the basics of programming in python
Week 2	Explaining the libraries in python
Week 3	Activation functions
Week 4	Activation functions
Week 5	Neural Network Toolbox
Week 6	Weights
Week 7	How can build a simple neural network
Week 8	can build a single layer neural network
Week 9	can build a multi layers neural network

<b>Week 10</b>	perceptron algorithm use to solve a simple classification logical-AND problem.
<b>Week 11</b>	perceptron algorithm use to solve a simple classification logical-OR problem.
<b>Week 12</b>	perceptron algorithm use to solve a simple classification logical- XOR problem.
<b>Week 13</b>	Back propagation learning algorithm
<b>Week 14</b>	Hopfield learning algorithm
<b>Week 15</b>	Examples

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>		
<b>Recommended Texts</b>	<ol style="list-style-type: none"> <li>1 Deep Learning for Vision Systems by MOHAMED ELGENDY: Manning Publications, 2020 .</li> <li>2 Neural Networks: Tricks of the Trade by G. Montavon, G. Orr, K.R. Muller, (Springer, New York, 2012</li> <li>3 Neural Networks and Deep Learning: by Charu C. Aggarwal, 2018 textbook</li> <li>4 An Introduction to Machine Learning, by Miroslav Kubat , Springer International Publishing AG 2017, DOI 10.1007/978-3-319-63913-0.</li> </ol>	
<b>Websites</b>	<ul style="list-style-type: none"> <li>• <a href="https://www.ibm.com/topics/neural-networks">https://www.ibm.com/topics/neural-networks</a>.</li> <li>• <a href="https://en.wikipedia.org/wiki/Neural_network">https://en.wikipedia.org/wiki/Neural_network</a></li> </ul>	

## 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