

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Operating Systems		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	CET3101		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	
Administering Department	CET	College	ETC
Module Leader	Had yass kheer		e-mail
Module Leader's Acad. Title	assistant lecrurer	Module Leader's Qualification	Master's
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. This course includes the basic concepts of operating system components. 2. To develop problem-solving skills and understand process management, deadlocks, and synchronization. 3. To understand consists of memory management techniques. 4. This course deals with File system implementation. 5. It also includes a case study on the Linux operating system. 6. To understand the I/O device management principles. 7. To perform the disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, CSCAN, LOOK, CLOOK), and Disk Formatting.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Should understand: hardware components that must be managed by an operating system. 2. Describe need and role of operating system. 3. The concept of a process, the process life cycle, process states and state transitions, process control blocks (PCBs)/process descriptors. 4. How processors transition between processes via context switching. How interrupts enable hardware to communicate with software. How processes converse with one another via interprocess communication (IPC). 5. The motivation for creating threads. The similarities and differences between processes and threads. The various levels of support for threads. The life cycle of a thread. Thread signaling and cancellation. 6. The challenges of synchronizing concurrent processes and threads. Critical sections and the need for mutual exclusion. how to implement mutual exclusion primitives in software 7. How monitors synchronize access to data. How condition variables are used with monitors. Solutions for classic problems in concurrent programming such as readers and writers and circular buffer. 8. The problem of deadlock. The four necessary conditions for deadlock to exist. The problem of indefinite postponement. The notions of deadlock prevention, avoidance, detection and recovery. 9. Understand OS components such a scheduler, memory manager, file 10. System handlers and I/O device managers. 11. Analyze and criticize techniques used in OS components 12. Demonstrate and simulate algorithms used in OS components 13. Identify algorithms and techniques used in different components of Linux

Indicative Contents المحتويات الإرشادية	1. Operating System Overview teaching hours: 10 hrs 2. Process Management teaching hours: 10 hrs 3. Process Deadlocks teaching hours: 10 hrs 4. Memory Management teaching hours: 14 hrs 5. File Management teaching hours: 10 hrs 6. Device Management teaching hours: 10 hrs 7. Linux Case Study teaching hours: 10 hrs
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to An operating system that acts as an intermediary between the user of a computer and the computer hardware. The purpose of an operating system is to provide an environment in which a user can execute programs in a convenient and efficient manner.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (١٥) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٦٤	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٦١	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

		Number			Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1-4, LO #5-9
	Assignments	2	20% (10)	2, 12	LO #1,2, LO #3-10
	Report	1	10% (10)	continuous	
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-8
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Operating Systems Operating System Architectures, Definition, Two views of operating system, Evolution of operating system, Types of OS
Week 2	System Call, Handling System Calls, System Programs, Operating System Structures, The Shell, Open Source Operating Systems
Week 3	Process vs Program, Multiprogramming, Process Model, Process States, Process Control Block. Threads, Thread vs Process, User and Kernel Space Threads. Inter Process Communication, Race Condition, Critical Section
Week 4	Implementing Mutual Exclusion: Mutual Exclusion with Busy Waiting (Disabling Interrupts, Lock Variables, Strict Alteration, Peterson's Solution, Test and Set Lock), Sleep and Wakeup, Semaphore, Monitors, Message Passing, Classical IPC problems: Producer Consumer, Sleeping Barber, Dining Philosopher Problem.
Week 5	Process Scheduling: Goals, Batch System Scheduling (First-Come First-Served, Shortest Job First, Shortest Remaining Time Next), Interactive System Scheduling (Round-Robin Scheduling, Priority Scheduling, Multiple Queues), Overview of Real Time System Scheduling.
Week 6	Introduction, Deadlock Characterization, Preemptable and Non-preemptable Resources, Resource – Allocation Graph, Conditions for Deadlock.
Week 7	Midterm Exam
Week 8	Handling Deadlocks: Ostrich Algorithm, Deadlock prevention, Deadlock Avoidance, Deadlock Detection (For Single and Multiple Resource Instances), Recovery From Deadlock (Through Preemption and Rollback. Introduction, Monoprogramming vs. Multi-programming, Modelling Multiprogramming, Multiprogramming with fixed and variable partitions, Relocation and Protection. Memory management (Bitmaps & Linked-list), Memory Allocation Strategies.

Week 9	Virtual memory: Paging, Page Table, Page Table Structure, Handling Page Faults, TLB's Page Replacement Algorithms: FIFO, Second Chance, LRU, Optimal, LFU, Clock, WS- Clock,
Week 10	Concept of Segmentation: Need of Segmentation, its Drawbacks, Segmentation with Paging(MULTICS).
Week 11	File Overview: File Naming, File Structure, File Types, File Access, File Attributes, File Operations, Single Level, two Level and Hierarchical Directory Systems, File System Layout.
Week 12	Implementing Files: Contiguous allocation, Linked List Allocation, Linked List Allocation using Table in Memory, Inodes. Directory Operations, Path Names, Directory Implementation, Shared Files
Week 13	Free Space Management: Bitmaps, Linked List
Week 14	Classification of IO devices, Controllers, Memory Mapped IO, DMA Operation, Interrupts, Goals of IO Software, Handling IO(Programmed IO, Interrupt Driven IO, IO using DMA), IO Software Layers (Interrupt Handlers, Device Drivers) . Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, CSCAN, LOOK, CLOOK), Disk Formatting (Cylinder Skew, Interleaving, Error handling), RAID.
Week 15	History, Kernel Modules, Process Management, Scheduling, Inter-process Communication, Memory Management, File System Management Approaches, Device Management Approaches.

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to Demonstration of basic Linux Commands
Week 2	Lab 2: Process creation and termination, thread creation and termination
Week 3	Lab 3: Simulation of IPC techniques
Week 4	Lab 4: Simulation process Scheduling algorithms
Week 5	Lab 5: Simulation of page replacement algorithms
Week 6	Lab 6: Simulation of File allocation techniques
Week 7	Lab 7: Simulate free space management techniques
Week 8	Lab 8: Simulation of disk scheduling algorithms

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the
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		Library?
Required Texts	Operating Systems (3rd Edition) 3rd Edition by Harvey M. Deitel (Author), Paul J. Deitel (Author), David R. Choffnes (Author)	Yes
Recommended Texts	Operating System Concepts Essentials Tenth Edition Avi Silberschatz Peter Baer Galvin Greg Gagne	yes
Websites		

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Control Engineering Fundamentals		Module Delivery	
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	CET3102			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	3	Semester of Delivery		5
Administering Department	CET	College	ETC	
Module Leader	Ahmed Mohsin		e-mail	ahmed.mohsin@ijsu.edu.iq
Module Leader's Acad. Title	lecturer	Module Leader's Qualification		MSc.
Module Tutor			e-mail	
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To define the control systems. 2. To develop mathematical models that accurately represent the behavior of the system 3. To simplify the representation of a control system. 4. To examine the system's behavior during the transient period and the steady state. 5. To design controllers that can manipulate the system or process to achieve desired objectives.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define the control system. 2. classify the different types of control systems. 3. Describe a physical system in terms of differential equations 4. Use Laplace Transform in solving differential equations of the Control System. 5. Derive Transfer Function for describing the work of servomotors. 6. Reduce a block diagram of multiple subsystems to a single block representing the Transfer Function of the system. 7. Understand steady state and transient time response analysis. 8. Find error Coefficients and steady-state error (e_{ss}) according to system type. 9. Find the time response of the 1st order system. 10. Find the time response of the 2nd order system. 11. Understand the effect of damping ratio ξ on 2nd order system. 12. Identify Transient response specifications. 13. Define PID controllers. 14. Reduce the effect of Steady-state error (e_{ss}) and settling time (T_s) on time response using PID controller.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: <u>Part A – Basics of Control Systems and Transfer Function</u> Control System definitions, Classification of Control Systems, Comparison of Open Loop and Closed Loop Control Systems, Use Laplace Transform in Control System, Mathematical Modelling of Control Systems: Electrical Systems and Mechanical Systems (Translational and Rotational), Servomotors, Rules of Block diagram reduction. [24 hrs]

	<u>Part B – Time Response Analysis of Control Systems</u> Definitions: time response, transient response and steady state response, standard test inputs, steady state analysis, static error coefficient method, analysis of type 0,1 and 2 systems, transient response analysis: 1st order and 2nd order systems. [30 hrs] PID controllers: PD controller, PI controller, PID controller and output derivative controller [20 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (١٥) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction – Basics of Control Systems
Week 2	Use of Laplace Transform in Control System
Week 3	Mathematical Modelling of Control System: Electrical System
Week 4	Mathematical Modelling of Control System: Translational Mechanical System
Week 5	Mathematical Modelling of Control System: Rotational Mechanical System
Week 6	Servomotors
Week 7	Block Diagram Reduction
Week 8	Mid-term Exam
Week 9	Time Response Analysis of Control Systems
Week 10	Analysis of Type 0, 1, and 2 systems
Week 11	Transient Response Analysis
Week 12	Analysis of 2 nd order system
Week 13	Transient response specifications
Week 14	PID controllers
Week 15	Rate feedback controller

Delivery Plan (Weekly Lab. Syllabus)

المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to MATLAB Simulink
Week 2	Lab 2: Laplace Transform / Verifying Algebraic functions
Week 3	Lab 3: Laplace Transform / Verifying Sine functions
Week 4	Lab 4: Block Diagram Reduction
Week 5	Lab 5: Steady State Error
Week 6	Lab 6: 1 st Order System
Week 7	Lab 7: 2 nd Order System
Week 8	Lab 8: Proportional Controller/ P Controller Used in Closed-Loop DC Servo Motor Speed Control System
Week 9	Lab 9: Proportional Controller/ P Controller Used in Closed-Loop DC Servo Motor Position Control System
Week 10	Lab 10: Integral Controller/ I Controller Used in Closed-Loop DC Servo Motor Speed Control System
Week 11	Lab 11: Integral Controller/ I Controller Used in Closed-Loop DC Servo Motor Position Control System
Week 12	Lab 12: Derivative Controller/ D Controller Used in Closed-Loop DC Servo Motor Speed Control System
Week 13	Lab 13: Derivative Controller/ D Controller Used in Closed-Loop DC Servo Motor Position Control System
Week 14 & 15	Lab 14: PID Controller

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Modern Control Engineering, K. Ogata, 2010 Pearson Education	Yes
Recommended Texts	1 . Control Systems Engineering, U.A. Bakshi and S.C. Goyal, 2007 Technical Publications. 2 . Modern Control Systems, R. Dorf and R. Bishop, 2011 Pearson Education	No

Grading Scheme

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Digital Signal Processing		Module Delivery	
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	CET3103			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	3	Semester of Delivery	5	
Administering Department	CET	College	ETC	
Module Leader	Huda yaha maky		e-mail	
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification		
Module Tutor		e-mail		
Peer Reviewer Name		e-mail		
Scientific Committee Approval Date	29/10/2023	Version Number	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. Demonstrate an understanding of basic discrete-time systems, linearity, time-invariance, stability, impulse response and discrete convolution. 2. Implement discrete time systems, recursive and nonrecursive realizations. 3. Perform Z transform and finding the inverse Z transform including its properties. 4. Demonstrate an understanding of frequency analysis of both continuous and discrete signals. 5. Demonstrate an understanding of frequency response of linear time invariant systems. 6. Demonstrate an understanding of discrete Fourier transform, its properties and applications. 7. Design FIR and IIR digital filters.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. State, prove and apply Shannon's sampling theorem 2. Relate signal to noise ratio (SNR) to number of samples averaged in signal sampling and averaging systems 3. Implement sampling of continuous time signals and reconstruct them from their samples by choosing appropriate parameters and functions. 4. Change the sampling rate of discrete-time signals, avoiding folding effects. 5. Describe the fundamental properties of linear time invariant systems. 6. Analyze signals and systems in the discrete time domain. 7. Compute the frequency response of linear and time-invariant discrete-time systems, implement decomposition into a minimum-phase system and an all-pass system, and describe generalized linear-phase systems. 8. Implement discrete-time systems using various structures. 9. Understand the importance of the discrete Fourier transform and algorithms for its fast computation. 10. Analyze discrete-time signals in the frequency domain, using the windowing method as well as the time-dependent discrete Fourier transform, and reconstruct the signal with the overlap-sum algorithm. 11. Write down, state the properties of, and apply Fourier Transforms in DSP systems 12. Analyze and implement systems in the field of Z transformation. 13. Design basic finite impulse response (FIR) and infinite impulse response (IIR)

	filters.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Introduction to DSP</u> Introduction to DSP, discrete signals and their properties. In addition, the concept of frequency in continuous time and discrete time signals. [5 hrs] <u>Discrete systems</u> Discrete systems, linear time-invariant systems, convolution theorem; Digital Signal Processing (DSP) is concerned with the processing of signals that are represented as sequences of finite-precision numbers. [10 hrs] <u>Sampling and reconstruction of analogue signals</u> Review of continuous-time signal and system analysis using Fourier ; Ideal impulse sampling and reconstruction of bandlimited signals; digital to analogue conversion, and practical considerations. [10 hrs] <u>Discrete-time sequences</u> Discrete-time signals and systems, linearity, time-invariance, stability, causality; discrete-time convolution, linear constant-coefficient difference equations, magnitude and phase response. [5 hrs] <u>The Discrete Fourier Transform</u> The discrete Fourier transform (DFT); properties of the DFT; circular convolution; linear convolution via the DFT and the overlap-add method; the radix-2 decimation-in-time fast Fourier transform (FFT) algorithm. [10 hrs] <u>The z-transform and its properties</u> The z-transform, region of convergence for the z-transform, inverse z-transform, z-transform properties. [10 hrs] <u>FIR filter design</u> Generalized linear-phase causal FIR filters; FIR linear-phase filter design using the window method; frequency-sampling design of FIR filters. [10 hrs] <u>IIR filter design</u> IIR filter design using the bilinear transformation; Filter design by impulse invariance response. [10 hrs]

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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
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	Report	1	10% (10)	13	LO # 1-11
Summative assessment	Midterm Exam	2 hr	10% (10)	6	LO # 1-5
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Signals, Systems and signal processing Basic element of digital signal processing, Advantages of digital over analog signal processing, Classification of Signals
Week 2	The Concept of frequency in Continuous and Discrete – time signals Continuous – time sinusoidal signals, Discrete – time sinusoidal signals, Harmonically related complex exponential.
Week 3	Analog –to-digital and digital-to-analog conversions Sampling of analog signals, The sampling theorem, Quantization and conversion, Digital-to-analog conversion, Analog-to-digital conversion.
Week 4	Analysis of digital signals and systems.
Week 5	Convolution in discrete time systems
Week 6	Mid-term Exam
Week 7	DE convolution in discrete time systems
Week 8	Discrete-time systems Input/output description of systems, Block diagram representation of discrete-time systems, Classification of discrete-time system, Correlation of discrete-time signals, Properties of correlation.
Week 9	Time domain to frequency domain conversion Discrete-Fourier transform
Week 10	Fast-Fourier transform
Week 11	The Z-transform Direct Z-transform
Week 12	Inverse Z-transform, Properties of the Z-transform.
Week 13	Analogue Filtering versus Digital filtering
Week 14	Design methods of FIR Filters
Week 15	Design Methods of IIR Filters

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Discrete and Continuous-Time Signals.
Week 2	Lab 2: Discrete-Time Systems.
Week 3	Lab 3: Frequency Analysis.
Week 4	Lab 4: Sampling and Reconstruction.
Week 5	Lab 5: Discrete Fourier Transform.
Week 6	Lab 6: The Z-transform.
Week 7	Lab 7: Digital Filter Design.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Digital Signal Processing by John Proakis & D. G. Manolakis, 4/E. Pearson, 2006.	Yes
Recommended Texts	Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.	No
Websites	https://www.youtube.com/watch?v=6dFnpz_AEyA&list=PL9567DFCA3A66F299	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
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	C - Good	جيد	70 - 79	Sound work with notable errors
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Digital Controllers		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	CET3104		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	5
Administering Department	CET	College	ETC
Module Leader	Akram Kadhim meshait	e-mail	ms202210716@iips.edu.iq
Module Leader's Acad. Title	Assist Lecturer	Module Leader's Qualification	MSc
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To know the types of microcontrollers and its architecture 2. To understand the difference between the microcontroller and microprocessor 3. dealing with the internal parts of microcontrollers 4. programming the PIC microcontrollers 5. connect the microcontrollers with peripherals to input and output the information 6. Implement interrupts in programs 7. Programming the PIC with the peripherals devices
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how integrated circuits and microcontrollers works. 2. Known the advantages of using Microcontrollers and Microprocessors. 3. Summarize what is meant by a Peripheral Interface Controller. 4. Describe the PIC Microcontroller. 5. Known type and function of register and SFR in Microcontroller. 6. Explain the A/D (Analog-to-Digital) Converter. 7. Discuss Capture, Compare, and Pulse width modulation modules in PIC microcontrollers. 8. Define and implement interrupts in programs. 9. Explain serial communication systems. 10. Identify how the Oscillator works in an electric circuit. 11. Programming the microcontroller, outputting data/signals, reading data/signals, and character LCD. 12. Application projects of microcontrollers.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. --Introduction to Introduction to Microcontrollers, Integrated Circuits, General Organization of PIC Microcontrollers: Pins Properties, Registers & Special Function registers, Ports (Input / Output), and Power Supply. Microcontroller Pins Features. The memory unit (ROM, Masked ROM, OTP ROM, UV EPROM, and EEPROM Memory). RAM memory and Flash memory. [15 hrs] --Central Processor Unit (CPU). Interrupt (example of interrupt in a microcontroller). Arithmetical Logical Unit (ALU). Instruction Decoder. Accumulator. Bus (Address Bus and Data Bus). [10 hrs] --Serial Communication, Baud rate, I2C Protocol, SPI (Serial Peripheral Interface), and UART (Universal Asynchronous Receiver/Transmitter) [15 hrs]

	--Oscillator. Timers, using interrupt in timer operating, Watchdog Timer. Counters [10 hrs] --Revision problem classes [5 hrs] --A/D (Analog-to-Digital) Converter, procedure takes place in the A/D converter module, overall plan of ADC, ADRESH, and ADRESL Registers, A/D Acquisition Requirements , ADCON0 Register & ADCON1 Register, Reference Volts. CCP Modules (Capture, Compare, and Pulse width modulation in PIC microcontrollers [19 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in learning and developing their skills in microcontrollers and logic thinking, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering the type of lab experiments involving assignments and project design activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (١٥) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to the microcontroller, the difference between MP and Microcontroller
Week 2	The architecture of PIC Microcontroller
Week 3	General Organization of PIC, Registers & Special Function registers
Week 4	Memory Units and CPU
Week 5	I/O ports of the Microcontroller
Week 6	Serial communication, Oscillator, and Timer/Counters
Week 7	Baud rate
Week 8	Programming the Microcontroller
Week 9	Midterm Exam
Week 10	outputting data/signals, Reading data/signals , Character LCD
Week 11	A/D converter & Analog Module
Week 12	On-Chip CCP (Capture, Compare & PWM)
Week 13	Microcontroller Interrupts Programming
Week 14	EEPROM Programming
Week 15	Application projects of Microcontroller

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to Micro C with a simple program
Week 2	Lab 2: Counter and Flash LED
Week 3	Lab 3: program using Micro C to count from increasing and decreasing
Week 4	Lab 4: Seven Segment
Week 5	Lab 5: LCD & Switch
Week 6	Lab 6: program using Micro C to input analog signal and read data
Week 7	Lab 7: EEPROM to read and write data.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	PIC Microcontrollers: An Introduction to Microelectronics, Martin P. Bates. Teach Yourself PIC Microcontrollers, M. Amer Iqbal Qureshi	Yes
Recommended Texts	Interfacing PIC Microcontrollers to Peripheral Devices:2011,	No
Websites		

Grading Scheme

مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Digital Communications		Module Delivery	
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	CET3105			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	3	Semester of Delivery	5	
Administering Department	CET	College	EETC	
Module Leader	Basim sbah		e-mail	
Module Leader's Acad. Title	Assist. lect		Module Leader's Qualification	M.Sc.
Module Tutor			e-mail	
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0	

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

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

	- Pulse Amplitude Modulation (PAM), Pulse width and Pulse Position (10 hr) - Source Coding Techniques Modulation (24 hr) - Baseband modulation (Digital Modulation), (30 hr)
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (١٥) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

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

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Fourier series and Fourier Transform , Spectrum analysis of signal
Week 2	Pulse Amplitude Modulation
Week 3	Pulse Position Modulation (PPM)
Week 4	Pulse Code Modulation
Week 5	Digital Time Division Multiplexing (TDM)
Week 6	Delta Modulation (DM)

Week 7	Amplitude shift key (ASK)
Week 8	Phase Shift Key (PSK)
Week 9	Frequency Shift Key (FSK)

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

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	RealTime Systems		Module Delivery
Module Type	E		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	CET3106		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	5
Administering Department	CET	College	EETC
Module Leader	Muhannad Razzaq	e-mail	
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	PhD
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To teach the students about Real-time scheduling and schedulable analysis. 2. To enable the students to Formally specify and verify the timing constraints 3. Design methods for real-time systems 4. Development and implementation of new techniques to advance the state-of-the-art real-time systems research.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• correctly and precisely reason about times, events, and action • list and reason about the sources of error and inexactitude in time interval measurement, execution time prediction, and scheduling • empirically estimate the accuracy of a real time clock • measure the execution time of a piece of code • empirically estimate the accuracy and overhead of a real-time scheduler • describe and apply commonly used abstract models and terminology for real-time scheduling and resource management • recognize, classify, and formulate the hard and soft timing requirements of a software system • select an appropriate software architecture and combination of scheduling techniques to satisfy a set of timing requirements • understand and apply the proofs of the fundamental theorems of deadline and fixed priority real-time scheduling • carry out schedulability analysis using deadline and fixed-priority approaches • implement a set of tasks with periodic and aperiodic timing requirements, using C threads and a real-time variant of the Linux operating system • evaluate the suitability of an operating system for real-time applications
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part-A [20 Hrs] Introduction to RTS: what is system, what is RT, what is the concept of time in systems, classification, specs of each type, how and when,

	Part-B [20Hrs] Scheduling: the concept of scheduling, types, clock, priority, aperiodic, sporadic tasks, resource access, resource control Part-C [20 Hrs] Multi-processor scheduling: coordination, resource sharing, temporal constraints. Part-D [10 hrs] RTOS, Datastores, timers, kernels
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.
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Student Workload (SWL)

الحمل الدراسي للطالب موزع على (١٥) اسبوع

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.26
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to RTs
Week 2	Hard Versus Soft Real-Time Systems
Week 3	A Reference Model of Real-Time Systems
Week 4	Commonly Used Approaches to Hard Real-Time Scheduling
Week 5	Clock-Driven Scheduling
Week 6	Priority-Driven Scheduling of Periodic Tasks
Week 7	Midterm Exam
Week 8	Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems. Resources and Resource Access Control
Week 9	Clock sync, timers, Kernels
Week 10	RT in distributed Systems
Week 11	Scheduling in multi-processors
Week 12	Clock Sync.
Week 13	Hardware, timers, Kernels
Week 14	RTOS
Week 15	Real Time data stores

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Arduino UC
Week 2	Static loops
Week 3	Dynamic loops
Week 4	Watchdog
Week 5	Timers
Week 6	Arduino RTOS
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	Network app (client)
Week 12	Network app (server)
Week 13	Network app (UDP)
Week 14 & 15	Proto-typing

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Real-Time Systems, Jane W. S. Liu, 2000	NO
Supporting Texts		No
Online resource	https://www.youtube.com/watch?v=yShUSwskUNA&list=PL1iLu2CSC9EU4mMByEhBp9CcYgAliDs_v https://personal.utdallas.edu/~cxl137330/courses/fall13/RTS/RTS.html http://www.cs.fsu.edu/~baker/realtime/syllabus.html#Objectives	

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Advanced Control Systems		Module Delivery	
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	CET3201			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	3	Semester of Delivery		6
Administering Department	CET	College	ETC	
Module Leader	Ahmed Mohsin		e-mail	ahmed.mohsin@ijsu.edu.iq
Module Leader's Acad. Title	lecturer	Module Leader's Qualification		MSc.
Module Tutor			e-mail	
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CET3102	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. To define the stability analysis techniques applicable to control systems. 2. To develop problem-solving skills and an understanding of different stability criteria. 3. To understand the principles and conditions under which a system is stable or unstable. 4. To introduce students to stability margins, such as gain margin and phase margin. 5. To emphasize the importance of stability in feedback control systems. 6. To highlight the relationship between stability and system performance.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define poles and zeros of a transfer function. 2. Analyze the stability of the control system from the pole-zero plot. 3. Analyze the stability of the control system using Routh-Hurwitz criteria. 4. Identify the special cases of Routh's criterion. 5. Sketch the locus of roots in the s-plane as a parameter is varied. 6. Obtain $G(s)H(s)$ from characteristic equation 7. Comment on the stability of the system based on the complete Root Locus. 8. Solve Root Locus problems. 9. Define the frequency response of a system. 10. Use the logarithmic scales. 11. Identify the standard factors of $G(j\omega)H(j\omega)$. 12. Plot a graph of the system's frequency response using a Bode plot. 13. Comment on the stability of the system based on the Bode plot. 14. Obtaining the Transfer function from the Bode plot
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Stability of Control System</u> Poles and zeros of a transfer function, pole-zero plot, stability condition about s-plane, Hurwitz's criterion, Routh's stability criterion, special cases of Routh's criterion: special case 1 and special case 2. [10 hrs] Revision problem classes [6 hrs] <u>Part B – Root Locus Method</u> Definition of Root Locus, Rules of construction of Root Locus, General steps to solve the problem in Root Locus, obtaining $G(s)H(s)$ from the characteristic equation. [14

	hrs]. Revision problem classes [8 hrs] <u>Part C – Bode Plot Method</u> Basics of frequency domain analysis, Magnitude plot, Phase angle plot, Logarithmic scales, frequency domain O.L.T.F., standard factors of $G(j\omega)H(j\omega)$, steps to sketch the Bode plot, stability analysis using Bode plot. [16 hrs] Revision problem classes [8 hrs] Transfer function from Bode plot [8 hrs]
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.
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Student Workload (SWL)

الحمل الدراسي للطالب موزع على (١٥) اسبوع

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Stability of Control Systems
Week 2	Routh-Hurwitz Criterion
Week 3	Special Cases of Routh's Criterion
Week 4	Root Locus Method
Week 5	Rules of Root Locus
Week 6	Solve Root Locus Problems
Week 7	Stability Analysis Using Root Locus
Week 8	Mid-term Exam
Week 9	Stability Analysis Using Bode plot
Week 10	Basics of Frequency Domain Analysis
Week 11	Bode Plot Method
Week 12	Bode Plot of Standard Factors of $G(j\omega)H(j\omega)$
Week 13	Stability Analysis Using Bode plot
Week 14	Transfer Function from Bode Plot
Week 15	Design of control systems and Compensation concepts.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: introduction to MATLAB commands
Week 2 , 3 & 4	Lab 2: Responses to different input signals
Week 5 , 6 & 7	Lab 3: Pole- Zero Plot and stability analysis
Week 8 , 9, 10 & 11	Lab 4: Root locus in MATLAB
Week 12 ,13 , 14 & 15	Lab 5: Bode plot in MATLAB

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Modern Control Engineering, K. Ogata, 2010 Pearson Education	Yes
Recommended Texts	1 . Control Systems Engineering, U.A. Bakshi and S.C. Goyal, 2007 Technical Publications. 2 . Modern Control Systems, R. Dorf and R. Bishop, 2011 Pearson Education	No

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Computer Network Fundamentals		Module Delivery	
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	CET3202			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	3	Semester of Delivery		6
Administering Department	CET	College	ETC	
Module Leader	Ali Abd		e-mail	ali_abd@ijsu.edu.iq
Module Leader's Acad. Title	Asst. Lect		Module Leader's Qualification	
Module Tutor			e-mail	
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date	29/10/2023		Version Number	1.0

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. Understand the Basics of Networking: The module aims to provide students with a solid foundation in the fundamental concepts, principles, and components of computer networking. 2. Understand the purpose and importance of computer networks, network architectures, and network protocols. 3. Explore Network Infrastructure: The module aims to familiarize students with different types of networks, such as Local Area Networks (LANs) and Wide Area Networks (WANs). 4. Explore various network devices and technologies used in building and managing networks. 5. Network Addressing and Subnetting Skills: The module aims to enable students to comprehend IP addressing, subnetting, and related concepts. 6. Network Standards and Protocols: The module aims to introduce students to network standards and protocols established by organizations such as IEEE, IETF, and ISO
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the data communications, networking, protocols and standards, and networking models and how to create a data flow. 2. Understand the Data communications between remote parties can be achieved through a process called networking. 3. Understand the fundamental concepts and principles of computer networks, including network architectures, protocols, and models (such as OSI and TCP/IP). 4. Identify and describe the different network components and their functions, including routers, switches, firewalls, access points, and network cables. 5. Explain the relationship between data, which are created by a device, and electromagnetic signals, which are transmitted over a medium. 6. Explain the basics of network addressing, including IP addressing, subnetting, and the use of subnet masks. 7. Demonstrate knowledge of commonly used network protocols, such as IP, TCP, UDP, ICMP, and DNS, and understand their roles in network communication. 8. Analyze and describe different network topologies and architectures, including star, bus, ring, and mesh networks. 9. Understand the fundamentals of network security, including common threats, encryption techniques, firewalls, and best practices for securing

	networks. 10. Configure and troubleshoot basic network settings, including IP addressing, subnetting, and network connectivity. 11. Explain the importance of network standards and protocols in ensuring interoperability and compatibility in network environments. 12. Demonstrate an understanding of network performance factors and techniques for optimizing network performance, including bandwidth management and Quality of Service (QoS) implementation. 13. Apply critical thinking and problem-solving skills to analyze and troubleshoot common network issues, such as network connectivity problems and network performance degradation. 14. Work effectively as a team member in network-related activities, demonstrating communication and collaboration skills. Demonstrate practical skills in configuring and managing network devices, such as routers, switches, and wireless access points.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. introduction to Computer Networks: 6 hrs Definition and purpose of computer networks : 6 hrs Network types and topologies : 6 hrs Network components and their functions : 6 hrs Network models: OSI and TCP/IP : : 12 hrs Network Devices and Infrastructure : 6 hrs Routers, switches, and hubs : 6 hrs Network interfaces and media : 6 hrs Network cables and connectors : 6 hrs Network architectures: LAN, WAN, MAN : 6 hrs Network Addressing and Subnetting : 6 hrs IPv4 and IPv6 addressing : 6 hrs Subnet masks and subnetting techniques : 6 hrs IP address allocation and management : 4 hrs

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

Student Workload (SWL) الحمل الدراسي للطالب موزع على (١٥) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (5)	3, 11	LO #1, 2, LO# 3-10
	Assignments	2	10% (5)	4, 12	LO# 1-3, LO# 3-11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	15	LO # 1-13
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Networking, definition and purpose of computer networks
Week 2	Basic Concepts of Networking, Line configuration
Week 3	Transmission MOD
Week 4	Categories of Networks
Week 5	The OSI Model ,data protocol unit
Week 6	Main functions of the OSI Layers, TCP/IP Protocol Suite , IP address concept.
Week 7	Midterm Exam
Week 8	classes
Week 9	Subnetting
Week 10	Networking and Internetworks Devices
Week 11	Guided Transmission Media
Week 12	Unguided Transmission media
Week 13	Multiplexing technique
Week 14	FDM,TDM, and CDM
Week 15	Relationship between data, which are created by a device, and electromagnetic signals, which are transmitted over a medium.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Network ,Familiarization with the lab environment and tools
Week 2	Lab 2: Introduction to Networking Equipment familiarization with network devices such as routers, switches, and hubs.
Week 3	Lab 3: Connecting and configuring network devices.
Week 4	Lab 4: Network Cabling and Connections

Week 5	Lab 5: Configuring and troubleshooting Ethernet connections
Week 6	Lab 6: IP Addressing and Subnetting , assigning IP addresses to network devices.
Week 7	Lab 7: Network Configuration and Troubleshooting

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	" TCP/IP Protocol Suite" Fourth Edition Behrouz A. Forouzan	NO
Recommended Texts	"Data Communications and Networking", Fourth Edition by Behrouz A. Forouzan	No
Websites		

Grading Scheme

مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Database Systems		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	CET3203		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	6
Administering Department	CET	College	ETC
Module Leader	Huda Yass Khodair	e-mail	
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	PhD
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. To learn the theory of the database. 2. To understand The Entity Relationship Model. 3. To Introduce SQL and SQL and relational database concepts. 4. To understand the Constraints imposed in a database. 5. Learn about Boolean Operators in SQL. 6. Learn about Normalization of a database. Learn about Storage and Query Processing, transaction, and recovery.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To learn the theory of the database. 2. To understand The Entity Relationship Model. 3. To Introduce SQL and SQL and relational database concepts. 4. To understand the Constraints imposed in a database. 5. Learn about Boolean Operators in SQL. 6. Learn about Normalization of a database. Learn about Storage and Query Processing, transaction, and recovery.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part-A [15 Hrs] Introduction to the theory: What is the benefit of using a database versus a shared file system? What is Data models and the relational database system? Data independence versus data-dependent data and how a database addresses these two issues. The Three-level Architecture and why it is necessary. What are the characteristics of each of these levels and the role of the database administrator in establishing the separation of these levels? What is database management systems, its components and how they work together? Part-B [20Hrs] The Entity Relationship Model: ER diagrams, resolution of M:N relationships, and Table Instance Charts (TICs). Translations of TICs into relational tables. Introduction to SQL and relational database concepts: Relations and attributes. Candidate and primary keys. Foreign keys and why they are necessary. Introduction to relational operators and how they are applied. Creating and deleting tables. Constraints imposed in a database: Updating and deleting rows in a table using the UPDATE TABLE, DELETE TABLE, and the DROP TABLE command with and without constraints. Implementation of the Selection and Projection operators. Ordering the results of a table according to a given attribute in ascending or

	descending orders. Part-C [20 Hrs] Boolean Operators in SQL: pattern matching using the LIKE clause, % and underscore characters. Arithmetic Operations and use of built-in functions in SQL. Introduction to Group functions using the Group by clause and additional built in functions. Processing dates and time and basic arithmetic with dates. Formatting of dates and times. Normalization of a database.: First, second and third normal forms. How to detect anomalies and use of the Armstrong's axioms for determining functional dependencies. Importance of normalizing a database and the types of anomalies that may be encountered in First, Second, and Third Normal Forms. How to recognize, prevent, and how to get rid of anomalies in these forms. Part-D [20 hrs] Continuation of the normalization process: BCNF form and Dependency preservation. Algorithms to ensure dependency preservation. The Join operator and its different types. Advantages and disadvantages of higher normal forms from an operational point of view. Storage and Query Processing: RAID, Storage access, indexing and hashing, query processing and query optimization. Part-E [3] [10] Transaction Management and concurrency control: Transactions (concepts, state) and concurrency control (methods). Database Recovery: Concept and Recovery Techniques
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (١٥) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to the theory: What is the benefit of using a database versus a shared file system? What is Data models and the relational database system? Data independence versus data-dependent data and how a database addresses these two issues. The Three-level Architecture and why it is necessary. What are the characteristics of each of these levels and the role of the database administrator in establishing the separation of these levels? What is database management systems, its components and how they work together?
Week 2	
Week 3	The Entity Relationship Model: ER diagrams, resolution of M:N relationships, and Table Instance Charts (TICs). Translations of TICs into relational tables.
Week 4	Introduction to SQL and relational database concepts: Relations and attributes. Candidate and primary keys. Foreign keys and why they are necessary. Introduction to relational operators and how they are applied. Creating and deleting tables.
Week 5	
Week 6	Midterm Exam
Week 7	Constraints imposed in a database: Updating and deleting rows in a table using the UPDATE TABLE, DELETE TABLE, and the DROP TABLE command with and without constraints. Implementation of the Selection and Projection operators. Ordering the results of a table according to a given attribute in ascending or descending orders.
Week 8	
Week 9	Boolean Operators in SQL: pattern matching using the LIKE clause, % and underscore characters. Arithmetic Operations and use of built-in functions in SQL. Introduction to Group functions using the Group by clause and additional built in functions. Processing dates and time and basic arithmetic with dates. Formatting of dates and times.
Week 10	
Week 11	Normalization of a database.: First, second and third normal forms. How to detect anomalies and use of the Armstrong's axioms for determining functional dependencies. Importance of normalizing a database and the types of anomalies that may be encountered in First, Second, and Third Normal Forms. How to recognize, prevent, and how to get rid of anomalies in these forms.
Week 12	Continuation of the normalization process: BCNF form and Dependency preservation. Algorithms to ensure dependency preservation. The Join operator and its different types. Advantages and disadvantages of higher normal forms from an operational point of view, join algorithm types.
Week 13	Storage and Query Processing: RAID, Storage access, indexing and hashing, query processing and query optimization.
Week 14	Transaction Management and concurrency control: Transactions (concepts, state) and concurrency control (methods).
Week 15	Database Recovery: Concept and Recovery Techniques
Week 16	Non-Relational Database systems: Document, Key-value, Column, Graph.

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	An Overview of Database and SQL Query language: Introduction to PHP and MySQL, Setup steps, HTML Review Form Handling
Week 2	Basic PHP syntax, Comments, outputs
Week 3	Arithmetic and variable operation
Week 4	PHP: control statements, Loops, and Arrays
Week 5	Creating Database, tables in SQL
Week 6	Attribute Data Types and Domains in SQL
Week 7	The Entity Relationship (ER) Model: Drawing and converting entities with a relationship to relation table
Week 8	SQL Server Constraints, Select, Inserting to Data from Database
Week 9	Updating, Deleting, ordered By Data from Database
Week 10	Group Functions: AVG, MIN, MAX, SUM
Week 11	Join in SQL Server
Week 12	View data from Database
Week 13	Nested sub-queries
Week 14 & 15	Complete web application using PHP and MySQL

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Book#1: C. J. Date, "Introduction to Database Systems", 8th Ed. Publisher: Addison-Wesley, 2003 Book#2: Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7 th Ed. Publisher: Pearson, 2016.	NO
Supporting Texts	Reference#1: A. Silberschatz, H. F.Korth, and S. Sudarshan, "Database System Concepts", 5th Ed. McGraw-Hill (2006). 1 . Reference#2: Database Systems the Complete Book by H. Garcia-Molina and et al. Prentice Hall; 2nd Edition	No

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Engineering Analysis		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	CET3204		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	6
Administering Department	CET	College	EETC
Module Leader	Bassem Sabah	e-mail	
Module Leader's Acad. Title	Assist.	Module Leader's Qualification	
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Mathematics II (CET1204)	Semester	2
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	This course aims to provide students with a fundamental understanding of basic and advanced engineering analysis techniques, including engineering components and systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Introduce the students to the theory and application of Laplace transform. 2. Give students an understanding of the time and frequency domain with different functions. 3. Get better in powered circuit analysis with applications and practical examples of matrix in Matlab. 4. Introduce the z-transform, which is the generalisation of the Laplace transform to discrete-time systems. 5. Provide students with a fundamental understanding of basic and advanced statistical techniques. 6. Provide students with a fundamental understanding of statistical measurements and graphs. 7. Provide an introduction to the method, tools and ideas of numerical computation, including the bisection method, false position method, and Newton-Raphson method. 8. Use numerical methods for solving algebraic and transcendental equations and solutions of linear and non-linear simultaneous equations. 9. Understand the basic theory of the numerical solution of ordinary differential equations. 10. Be familiar with the theorem that is related to matrices and its applications to analysis of the electronic circuits. 11. Learning the method of solving complicated equations. 12. Applying all of the above outcomes practically using Matlab.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. - Laplace Transform [15 hrs] - Z-transform [15 hrs] - Numerical computations [15hrs] - solution of linear simultaneous [10hrs] - Solution of nonlinear equation [5 hrs] - Numerical solution of ordinary differential equation [5 hrs] - High-level assessment Matrix [5 hrs]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

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

الحمل الدراسي للطالب موزع على (١٥) اسبوع

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٦٤	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fundamental of Laplace transform (L.T)
Week 2	properties, theorem of L.T
Week 3	Applications of L.T in electronic circuits
Week 4	Fundamental of Z-transform (Z.T), properties of Z.T
Week 5	Midterm Exam
Week 6	theorem of Z.T
Week 7	Applications of Z.T
Week 8	Numerical computations
Week 9	(bisection method, false position method,
Week 10	Newton Raphson's method, solution of algebraic and transcendental equations
Week 11	solution of linear simultaneous equations : 1)Direct methods: a)Gauss elimination B)Gauss Jordan
Week 12	2)Iterative method a)Jacobi's B)Gauss seidel iteration)
Week 13	Solution of nonlinear equation (Newton Raphson method)
Week 14	Numerical solution of ordinary differential equation (Picard's, Euler's method)
Week 15	Matrices solution of the linear system of equations, linear transformations, Cayley-Hamilton theorem

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Using Matlab in engineering analysis
Week 2	Lab 2: application of Laplace transform in electronic circuits.
Week 3	Lab 3: application of Z-transform
Week 4	Lab 4: bisection method
Week 5	Lab 5: newton-Raphson method
Week 6	Lab 6: Numerical solution of ordinary D.E
Week 7	Lab 7: Gaussian elimination and Gaussian Jordan methods

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Higher Engineering Mathematics by Dr. B.S. Grewal	Yes
Recommended Texts	An introduction to Numerical analysis by David F. Mayers	yes
Websites	www.ocw.mit.edu , www.math.uiowa.edu	

Grading Scheme

مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Data Communications		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	CET3205		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	6
Administering Department	CET	College	EETC
Module Leader	Saad Karim	e-mail	
Module Leader's Acad. Title	Assist.	Module Leader's Qualification	M.Sc.
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module		Semester	5
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	The aims to students in third stage to defined and understand the Digital Modulation Synchronization Line Codes Spread Spectrum Systems Satellite Communication
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Describe digital communications modulation and Explain the modulation and demodulation of quadrature amplitude modulation 2 -Explain the advantage and disadvantage of each type of digital communications systems 4- Discuss the comparison between the types of digital systems and its advantages 5- Explain Synchronization 6- Describe Spread Spectrum Systems 7- Explain types Satellite Communication 8-Describe the Advantages and Applications of Microwaves
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. - Digital Modulation (10 hr) - Synchronization (10 hr) - Line Codes (10 hr) - Spread Spectrum Systems (15 hr) - Satellite Communication (15hr) - Microwaves(10hr)

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

Student Workload (SWL) الحمل الدراسي للطالب موزع على (١٥) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Digital Modulation: Quadrature Phase Shift Keying (QPSK), Offset QPSK
Week 2	Minimum Shift Keying, Gaussian Minimum Shift Keying (GMSK).
Week 3	Quadrature Amplitude Modulation (QAM), Multilevel Modulation Techniques M-ary PSK, M-ary QAM
Week 4	Synchronization: Phase Locked Loop (PLL) Recovery; Carrier Recovery: square law device,.
Week 5	Costas loop, DF PLL; Clock Recovery: spectrum line method, minimum mean square error, early-late gate method
Week 6	Line Codes: Binary Line Codes; Multilevel Signaling
Week 7	Mid exam
Week 8	Spread Spectrum Systems: Introduction; Advantages and Disadvantages; Pseudo Noise Sequence (PN Sequence) Generation and Properties
Week 9,10	Spread Spectrum Systems: Direct Sequence Spread Spectrum; Frequency Hopping Spread Spectrum (SFH, FFH).
Week 11	Satellite Communication: introduction; Types Of Satellites; Frequency Bands;
Week 12	Satellite Construction; Satellite Link Design;
Week 13	Modulation and Multiplexing Techniques: FDM/FM, TDM; Multiple Access: FDMA, TDMA, CDMA.
Week 14	Typical Frequencies; Band Designation;
Week 15	Introduction to antennas & Microwaves , Advantages of Microwaves; Applications of Microwaves.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Quadrature Phase Shift Keying (QPSK)
Week 2	Minimum Shift Keying
Week 3	Quadrature Amplitude Modulation (QAM), Multilevel Modulation Techniques M-ary PSK, M-ary QAM
Week 4	Phase Locked Loop (PLL) Recovery
Week 5,6	Direct Sequence Spread Spectrum; Frequency Hopping Spread Spectrum (SFH, FFH).

Week 7	Satellite Link Design; Modulation and Multiplexing Techniques: FDM/FM, TDM
Week 8,9	Design Multiple Access: FDMA, TDMA, CDMA

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	- Sarkar N., Elements of Digital Communications, first edition, 2003	NO
Recommended Texts	- Data Communications and Networking, Fourth Edition by Behrouz A. Forouzan	No
Websites		

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Digital Image Processing		Module Delivery
Module Type	Elective		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	CET3206		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	6
Administering Department	CET	College	ETC
Module Leader	Akram Kadhim meshait	e-mail	
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	29/10/2023	Version Number	1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To become familiar with digital image fundamentals 2. To get exposed to simple image enhancement techniques in Spatial and Frequency domain. 3. To learn concepts of degradation function and restoration techniques. 4. To study the image segmentation and representation techniques. 5. To become familiar with image compression and recognition methods
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms. 2. describe features of images. 3. Have a good understanding of the mathematical foundations for digital manipulation of images. 4. Operate on images using the techniques of smoothing, sharpening and enhancement. 5. image acquisition; preprocessing; segmentation; Fourier domain processing, compression and 6. analysis. 7. Be able to write programs using Matlab language for digital manipulation of images; image 8. Understand the restoration concepts and filtering techniques. 9. Be able to understand the documentation for, and make use of, the MATLAB library and MATLAB. 10. Acquisition; preprocessing; segmentation; Fourier domain processing; and compression. 11. Learn and understand the Image Enhancement in the Spatial Domain. 12. Learn and understand the Image Enhancement in the Frequency Domain. 13. Learn the basics of segmentation, features extraction, compression and recognition methods for color models.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Fundamentals</u> Need for DIP- Fundamental steps in DIP – Elements of visual perception -Image sensing and Acquisition – Image Sampling and Quantization – Imaging geometry, discrete image mathematical characterization. [15 hrs] <u>Image Transforms</u> Two dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse

	FFT, Discrete cosine transform and KL transform.-Discrete Short time Fourier Transform- and its application in Compression. [10 hrs] <u>Image Enhancement</u> Spatial Domain: Basic relationship between pixels- Basic Gray level Transformations – Histogram Processing – Smoothing spatial filters- Sharpening spatial filters. Frequency Domain: Smoothing frequency domain filters- sharpening frequency domain filters Homomorphic filtering. [15 hrs] <u>Image Restoration:</u> Overview of Degradation models –Unconstrained and constrained restorations- Inverse Filtering , Wiener-Filter. [10 hrs] <u>Feature Extraction:</u> Detection of discontinuities – Edge linking and Boundary detection- Thresholding- - Edge based segmentation-Region based Segmentation- matching-Advanced optimal border and surface detection- Use of motion in segmentation. Image Morphology – Boundary descriptors- Regional descriptors. [10 hrs] <u>Image Reconstruction from Projections:</u> Need- Radon Transform – Back projection operator- Projection Theorem- Inverse Radon Transform. [10 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The assessment strategy for this module is designed to provide students with the opportunity to demonstrate the skills and knowledge as described in the learning outcomes. The written examination will assess the knowledge of terminology, concepts and theory of Digital Image Processing, as well as the ability to analyze problems and apply mathematical models of signal processing to solve and predict effects. The laboratory experiments will evaluate the acquired technical skills and expertise required to apply these methods to practical Digital Image Processing tasks.

Student Workload (SWL)

الحمل الدراسي للطالب موزع على (١٥) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	• Introduction and Digital Image Fundamentals: • The origins of Digital Image Processing • Examples of Fields that Use Digital Image Processing • Fundamentals Steps in Image Processing
Week 2	Introduction and Digital Image Fundamentals (cont.): • Image Sampling and Quantization, • Some basic relationships like Neighbors, Connectivity, Distance • Measures between pixels • Translation, Scaling, Rotation and Perspective Projection of image
Week 3	Introduction and Digital Image Fundamentals (cont.): • Linear and Non Linear Operations
Week 4	Image Enhancement in the Spatial Domain: • Some basic Gray Level Transformations • Histogram Processing
Week 5	Image Enhancement in the Spatial Domain (cont.): • Enhancement Using Arithmetic and Logic operations
Week 6	Image Enhancement in the Spatial Domain (cont.): • Combining Spatial Enhancement Methods • Basics of Spatial Filters
Week 7	Mid-term Exam
Week 8	Image Enhancement in the Spatial Domain (cont.): • Smoothing and Sharpening Spatial Filters
Week 9	Image Enhancement in the Spatial Domain (cont.): • Histogram Processing
Week 10	Image Enhancement in the Frequency Domain: • Introduction to Fourier Transform and the frequency Domain • Computing and Visualizing
Week 11	Image Enhancement in the Frequency Domain (cont.): • Smoothing Frequency Domain Filters
Week 12	Image Restoration: • A model of The Image Degradation / Restoration Process
Week 13	Image Restoration (cont.): • Inverse filtering • Wiener filtering

Week 14	Image Segmentation: • Detection of Discontinuities • Edge linking and boundary detection • Thresholding
Week 15	Object Recognition: • Patterns and Pattern Classes • Decision-Theoretic Methods

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Digital image Representation • Reading, Displaying, Writing Images using MATLAB • Data Classes, Image Types using MATLAB
Week 2	Lab 2: Digital image Representation (cont.) • Introduction to M Function Programming using MATLAB
Week 3	Lab 3: Image Enhancement in the Spatial Domain: • Intensity Transformation Function (MATLAB)
Week 4	Lab 4: Image Enhancement in the Spatial Domain (cont.): • Histogram Processing and Function Plotting (MATLAB)
Week 5	Lab 5: Image Restoration
Week 6	Lab 6: Image Segmentation.
Week 7	Lab 7: Object Recognition:

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Digital Image Processing, Anil.K.Jain – ,Pearson Education-2003.	No
Recommended Texts	Rafael C. Gonzalez, Richard E. Woods, _Digital Image Processing', Pearson, Third Edition, 2010.	No
Websites	https://www.youtube.com/watch?v=6dFnpz_AEyA&list=PL9567DFCA3A66F299	

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
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