Academic Program Description Form

University Name: *University of Basrah*

Faculty/Institute: *Collage of Engineering*

Scientific Department: *Computer Engineering Department*

Academic or Professional Program Name: *Computer Engineering Department*

Final Certificate Name: *Bachelor of Computer Engineering*

Academic System: *Semesters*

Description Preparation Date: 2024

File Completion Date: 13/5/ 2025

Signature:

Head of Department Name:

Dr. Musaab Adil Alaziz

Date: 1/9/2025

Signature:

Scientific Associate Name:

Dr. Muneer A. Ismael

Date: 1/9/2025

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Ali Kamil M.

Date: 1/9/2025

Signature:

University of Basrah
College of Engineering
Dean Office

Approval of the Dean

Prof. Dr. Mofeed Turky Rashid

1. Program Vision

A scientific and practical pioneering environment in both research and teaching sectors and has the capability of keeping pace with the continues growth of the technological developments in the fields of computer engineering and information technology.

2. Program Mission

The department seeks to provide the excellent environment that stimulates creativity, innovation, research and development in order to produce highly qualified computer engineers who are able to serve the labor market locally and globally.

3. Program Objectives

1. Provide highly qualified and competitive computer engineers who can deal with the professional challenges in both private and public sectors since that are well prepared and fully equipped for a successful career as computer engineers.
2. Providing advanced academic programs in the computer engineering field for both theoretical and practical sectors that match the international standards and meet the labor market needs.
3. Encourage the development of the scientific research in computer engineering field especially the information technology, computer software, computer networks, telecommunication systems, AI and robotics.
4. Communicate effectively in a variety of professional contexts with the private, public and government sectors.
5. Create enabling environment for the faculty member that helps them to improve their teaching and research skills.

4. Program Accreditation

5. Other external influences

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	7	14	6%	
College Requirements	7	34	14%	
Department Requirements	37	192	80%	
Summer Training	required			
Other				

*This can include notes whether the course is basic or optional.

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
			theoretical	**practical**
Level one / First Sem.	CoE111	Calculus I	4	
	CoE112	Electrical Circuits 1	4	2
	CoE113	Programming & Problems Solving	4	2
	CoE114	Fundamentals of Logic systems	3	
	CoE115	Industrial Chemistry	2	
	UoB101	English Language I	2	
	CoE121	Calculus II	4	
	CoE122	Digital Logic Circuits	3	2

	CoE123	Object Oriented Programming	3	2
	CoE124	Engineering Design/ Auto CAD	1	2
	CoE125	Device Physics	2	
	UoB201	English language II	2	
	UoB102	Democracy and Human Rights	2	
	CoE211	Calculus III	4	
	CoE212	Discrete Structures	4	
	CoE213	Signals & Systems	4	
	CoE214	Digital System Design	3	1
	CoE215	Electrical Circuits 2	3	1
	UoB104	Arabic Language I	2	
	UoB205	Crimes of Baath Party	2	
	CoE221	Differential Equations	4	
	CoE222	Probability and Statistics	3	
	CoE223	Microprocessor Programming	3	2
	CoE224	Algorithms	3	2
	CoE225	Digital Electronics	2	
	UoB204	Arabic Language II	2	
	CoE311	Linear Algebra	3	2
	CoE312	Computer Architecture	3	
	CoE313	Operating Systems	3	2
	CoE314	Artificial Intelligence	3	
	CoE315	Analog Electronics	3	2
	CoE316	Engineering Economics	2	
	CoE321	Numerical Analysis	3	

	CoE322	Microprocessor Interface	3	2
	CoE323	Instrumentation	2	
	CoE324	Digital Communication	3	
	CoE325	Computer Maintenance	1	2
	CoE326	Digital Signal Processing	2	2
	CoE411	Embedded Computing Systems	2	2
	CoE412	Computer Network	2	2
	CoE413	Control Systems	2	
	CoE4P	Engineering Project (continued)	2	3
	CoE414	Project management	2	
	CoE415	Image Processing	2	2
	CoE421	Information Security	2	
	CoE422	Software Design	2	2
	CoE423	Networks Technology	2	2
	CoE424	Parallel Processing Architecture	3	
	CoE4P	Engineering Project	2	3
	CoE226	Ethics, Society, Profession	2	
	CoE425	Discrete Control Systems	2	2

8. Expected learning outcomes of the program

Knowledge

1-1. Clarify the basic concepts of computer systems and their applications in social and industrial fields.
1-2. Acquiring skill in dealing with problems and dealing with them through computer systems.
1-3. Acquiring basic skills for the software industry.
1-4. Acquiring experience in industrial computer systems.
1-5. Designing programmed home systems.
1-6. Making websites and databases for various engineering systems.
1-7. Achieving the a to k criterion.

Skills

2-1. The ability to design simple and advanced programs in different programming languages.
2-2. The ability to think in addressing the issues by algorithms and methods of work.
2-3. Writing scientific reports, reading charts and analyzing digital data.

Ethics

3-1. Attention: Arousing students 'attention by implementing one of the application programs on the display screen in the hall

3-2. Response: Follow up the student's interaction with the material displayed on the screen

3-3. Interest: following up on the interest of the student who interacted more with the presented material, by increasing this interaction by requesting other programs and applications to display

3-4. Formation of direction: meaning that the student is sympathetic to the presentation and may have an opinion towards the presented topic and defend it.

3-5. The formation of value behavior: meaning that the student reaches the top of the emotional ladder, so that he has a constant level in the lesson and does not lethargic or fidget.

9. Teaching and Learning Strategies

1. Explanation and clarification using the class lectures.
2. Tutorials hours.
3. Self-learning using homework and small projects.
4. Short tests (quizzes).
5. Reports.
6. Mid-terms and final exams.

10. Evaluation methods

- Quizzes
- Assignments
- Projects / Lab.
- Report
- Midterm Exam
- Final Exam

11. Faculty

Faculty Members

Name	Academic Rank	Specialization		Number of the teaching staff	
		General	Special	Staff	Lecturer
Gaida A. Al-Suhail	Prof.	Electrical Engineering	Communications & Networks		
Ali A. Abed	Prof.	Electrical Engineering	Computer & Control		
Abbas A. Jasim	Assist. Prof.	Computer	Computer		
Mohammed A. Al-Ibadi	Assist. Prof.	Engineering	Engineering		
Wasan A. Wali	Assist. Prof.	Computer	Computer		
Fatemah K. Al-Assfor	Assist. Prof.	Engineering	Engineering		
Mohannad H. Al-Ali	Assist. Prof.	Electrical Engineering	Control		
Alaa F. Al-Ibadi	Assist. Prof.	Electrical Engineering	Computer Architecture		
Loai Ali Talib	Lecturer	Electrical Engineering	Communications & Signal Processing		
Musaab A. Alaziz	Lecturer	Electrical Engineering	Computer &Control		
Imad A. Jassim	Lecturer	Electrical Engineering	Computer &Control		
Hassanin Sh. Faham	Lecturer	Computer	Computer		
Ali N. Ibraheem	Lecturer	Engineering	Engineering		
Dunia Sattar Tahir	Lecturer	Electrical Engineering	Communications & Networks		
Hiba H. Abdulzahraa	Lecturer	Computer	Computer		
Hanadi A, Jabir	Lecturer	Engineering	Engineering		
Atheel K. Abdulzahraa	Lecturer	Computer	Artificial Intelligence		

Sarah Aziz Al-Hilfi	Lecturer	Engineering	Computer		
Intesar H. Aledani	Lecturer	Computer	Engineering		
Ali E. Hameed	Lecturer	Engineering	Computer		
Ali M. Ahmed	Lecturer	Computer	Engineering		
Dhayaa Raissan Khudher	Lecturer	Engineering	Computer		
Khalid A. Abbas	Assist. Lecture	Computer	Engineering		
Amjed A. Majeed	Assist. Lecture	Engineering	Computer & Control		
Gasak Ch. Abdulhussian	Assist. Lecture	Computer	Computer		
Mohammed K. Joudah	Assist. Lecture	Engineering	Engineering		
Umulhuda G. Abood	Assist. Lecture	Computer	Computer & Control		
Hanadi S. Ahmed	Assist. Lecture	Engineering	Digital Signal Processing		
Ali M. Fadhil	Assist. Lecture	Computer	Communications & Networks		

Professional Development
Mentoring new faculty members
Professional development of faculty members

12. Acceptance Criterion
Average: not less than 90% Age: Not more than 25 years old Number: Up to 125 students annually

13. The most important sources of information about the program
1. The websites of Iraqi and foreign universities. 2. Workshops held by the Ministry of Higher Education in addition to the Ministry's standards. 3. Twinning with the University of Oklahoma, USA. 4. ABET American Academic Accreditation Program. 5. IEEE Computer Engineering Body of Knowledge

14. Program Development Plan

Program Skills Outline																
				Required program Learning outcomes												
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	
3rd Year\ 1st semester	CoE 334	Analog Electronics	Basic	x	x	x	x	x	x	x	x	x	x	x	x	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Analog Electronics	
2. Course Code:	
CoE 334	
3. Semester / Year:	
3rd Year\ 1st semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
60 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Ali A. Abed Email: ali.abed@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	The theoretical foundations of computer engineering have expanded substantially in recent years. The objective of this course is to introduce students to this fundamental area of computer science which enables students to focus on the study of design and analysis of analog electronic circuits using the theoretical methods and simulation programs. This course is the fundamental of many other courses such as: control, embedded systems.
9. Teaching and Learning Strategies	
Strategy	1. Explanation and clarification using the class lectures. 2. Tutorials hours. 3. Self-learning using homework and small projects. 4. Laboratories. 5. Short tests (quizzes).

	6. Reports. 7. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Knowledge of op amps parameters and characteristics	Introduction to op-amp, input mode & parameters, negative feedback	Theoretical and Tutorial	Questions, discussion and Quizzes
2	4	Knowledge of other op amps parameters and characteristics	Bias current & voltage, open- & closed-loop frequency response	Theoretical and Tutorial	Questions, discussion and Quizzes
3	4	Design of special op amp circuits	Comparators, amplifiers	Theoretical and Tutorial	Questions, discussion and Quizzes
4	4	Design of other special op amp circuits	Integrators/differentiators	Theoretical and Tutorial	Questions, discussion and Quizzes
5	4	Build another special industrial analog circuits	Instrumentation amplifier/ isolation amp,	Theoretical and Tutorial	Questions, discussion and Quizzes
6	4	Build complex analog circuits	OTA, analog multiplier	Theoretical and Tutorial	Questions, discussion and Quizzes
7	4	Build oscillator circuits	Oscillator/ feedback osc., osc. With RC circuits	Theoretical and Tutorial	Questions, discussion and Quizzes
8	4	Build oscillator circuits	Osc. With LC circuits, relaxation, 555 timer	Theoretical and Tutorial	Questions, discussion and Quizzes
9	4	Study the voltage regulation	Voltage regulation, linear series reg.,	Theoretical and Tutorial	Questions, discussion and Quizzes
10	4	Design of series and shunt regulators	Shunt regulators	Theoretical and Tutorial	Questions, discussion and Quizzes
11	4	Building of different power amplifiers	Class A power amplifier, Class B	Theoretical and Tutorial	Questions, discussion and Quizzes
12	4	Build another type of power amplifiers	Class AB, Class C power amplifiers	Theoretical and Tutorial	Questions, discussion and Quizzes
13	4	Knowing responses and characteristics of active filters	Active filter responses, characteristics	Theoretical and Tutorial	Questions, discussion and Quizzes

14	4	Building LPF/HPF	Active LPF, HPF	Theoretical and Tutorial	Questions, discussion and Quizzes
15	4	Building other types of active filters	Active BPF, BSF	Theoretical and Tutorial	Questions, discussion and Quizzes

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Floyd, Thomas L. Electronic devices:
Main references (sources)	electron flow version / Thomas L. Floyd. 9th edition.
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline																
				Required program Learning outcomes												
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	
3rd Year\ 1st semester	CoE 331	Computer Architecture	Basic	x	x	x	x	x	x	x	x	x	x	x	x	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Computer Architecture	
2. Course Code:	
CoE 331	
3. Semester / Year:	
3rd Year\ 1st semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Fatemah K. Al-Assfor Email: Fatmah.hassan@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	• To learn the basic structure and operations of a computer. • To learn the arithmetic and logic unit and implementation of fixed-point and floating-point arithmetic. • To understand the memory hierarchies, cache memories and virtual memories. • To learn the techniques used in designing the control unit • To learn the different ways of communication with I/O devices
9. Teaching and Learning Strategies	
Strategy	8. Explanation and clarification using the class lectures. 9. Tutorials hours. 10. Self-learning using homework and small projects. 11. Laboratories.

	12. Short tests (quizzes). 13. Reports. 14. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Introduction and Overview	General definition, purpose of Digital Arithmetic and Introduction to computer architecture,CPU organization and its parts, sketch CPU organization, definition of the performance factors, reasons for binary arithmetic with computers. Review of basic fixed- point number representation systems (non-negative and signed integers), sign detection.	Theoretical	Questions and discussion
2	3	Algorithms and design of the common Fixed-Point arithmetic operations	design of two operand addition/ subtraction: (CRA, CLA), , recoding (coding).	Theoretical	Theoretical
3	3	Algorithms and design of the common Fixed-Point arithmetic operations	data compression, multi-operand addition (carry save adder CSA), sequential multiplier	Theoretical	Theoretical
4	3	Algorithms and design of the common Fixed-Point arithmetic operations	Booth recoding multiplier, division algorithms: (restoring and non-restoring) division	Theoretical	Theoretical
5	3	Design of High speed CPU components	design of combinational shifters (barrel shifters).	Theoretical	Theoretical
6	3	Design of High speed CPU components	general- purpose registers (GPR), Timers	Theoretical	Theoretical
7	3	Design of High speed CPU components	Tri- state buffers, arithmetic and logic unit (ALU).	Theoretical	Theoretical

8	3	Real number representations	IEEE754 FP representation and format (sign, exponent, and magnitude) of floating-point numbers, exceptions, special values, single- precision and double- precision format, dynamic range, integer to real numbers conversion.	Theoretical	Theoretical
9	3	Floating- point Algorithms and Implementation	FP addition/ subtraction, multiplication, multiply-add fused (MAF) unit, division.	Theoretical	Theoretical
10	3	Memory system hierarchy	role of memory system**,** High-Speed Memories: locality of reference, Cache Memory: Organization and Mapping Techniques. Replacement Algorithms.	Theoretical	Theoretical
11	3	Memory system hierarchy	Write policies. Main memory systems: Types of main memories: (SRAM, DRAM), main memory characteristics and performance: (latency, cycle time, and bandwidth).	Theoretical	Theoretical
12	3	Virtual Memory System	(Paging, Segmentation, and hybrid), fault trap, Address Translation Virtual to physical, translation look-aside buffer TLB.	Theoretical	Theoretical
13	3	Control Unit Design	Single Bus Organization, Control Unit Operations: Instruction sequencing, Micro operations and Register Transfer. Hardwired Control: Design methods – State table and classical method.	Theoretical	Theoretical
14	3	Control Unit Design	Design Examples - Multiplier CU. Micro-programmed Control: Basic concepts, Microinstructions and	Theoretical	Theoretical

			micro- program sequencing.		
15	3	Processor Design	Datapath and control; single cycle design and implementation; simplifying control design; multicycle implementation of datapath and control.	Theoretical	Theoretical

11. Course Evaluation
Midterm Exam: 30% Teacher assessment: 10% Final Exam: 60 %

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	M. RAFIQUZZAMAN, “Fundamentals of Digital Logic and Microcomputer Design”, Fifth Edition
Main references (sources)	
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
3rd Year\ 1st semester	CoE 326	Digital Signal Processing	Basic	x	x	x	x	x	x	x	x	x	x	x	x

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Digital Signal Processing	
2. Course Code:	
CoE 326	
3. Semester / Year:	
3rd Year\ 1st semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
60 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Hassanin S. Al-Fahaam Email: hassanin.husein@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	• Preparing and qualifying specialized engineers to meet the requirements of the labor market in the private and public sectors in computer engineering through diversifying the methods of learning and teaching and training students to apply the acquired knowledge and skills to solve real problems. • Providing distinguished academic programs in the field of computer engineering, both theoretical and practical, that comply with international standards of academic quality and meet the needs of the labor market. • Encouraging and developing scientific research in the fields of computer engineering in general and the fields

	of artificial intelligence, robotics, computer software, computer networks, communications and control in particular. • Prepare a stimulating environment for faculty members to develop their educational and research knowledge and skills. • Building and developing partnership with governmental and private sectors and society in all its various institutions.

9. Teaching and Learning Strategies

Strategy	15. Explanation and clarification using the class lectures. 16. Tutorials hours. 17. Self-learning using homework and small projects. 18. Laboratories. 19. Short tests (quizzes). 20. Reports. 21. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	introduction, basic definitions, important Discrete Time (DT) signals	Fundamentals of discrete time systems	Theoretical and Tutorial	Questions, discussion and Quizzes
2	4	introduction, basic definitions, important Discrete Time systems	Fundamentals of discrete time systems	Theoretical and Tutorial	Questions, discussion and Quizzes
3	4	Fourier transform of sequences	Fundamentals of discrete time systems	Theoretical and Tutorial	Questions, discussion and Quizzes
4	4	definition of Z-transform, inverse Z-transforms	The Z transform	Theoretical and Tutorial	Questions, discussion and Quizzes
5	4	relationships between system representations, computation of	The Z transform	Theoretical and Tutorial	Questions, discussion and Quizzes

		frequency response			
6	4	direct form realizations of IIR filters, cascade realizations of IIR filters	Realizations of digital filters	Theoretical and Tutorial	Questions, discussion and Quizzes
7	4	parallel realizations of IIR filters, and realizations of FIR filters	Realizations of digital filters	Theoretical and Tutorial	Questions, discussion and Quizzes
8	4	Sampling of continuous time signals	Sampling	Theoretical and Tutorial	Questions, discussion and Quizzes
9	4	changing the sampling rate	Sampling	Theoretical and Tutorial	Questions, discussion and Quizzes
10	4	multidate signal processing, interpolation, and decimation	Sampling	Theoretical and Tutorial	Questions, discussion and Quizzes
11	4	design of IIR	Digital filter design	Theoretical and Tutorial	Questions, discussion and Quizzes
12	4	design of FIR	Digital filter design	Theoretical and Tutorial	Questions, discussion and Quizzes
13	4	properties	Discrete Fourier transform	Theoretical and Tutorial	Questions, discussion and Quizzes
14	4	circular convolution	Discrete Fourier transform	Theoretical and Tutorial	Questions, discussion and Quizzes
15	4	Fast Fourier Transform “FFT”	Discrete Fourier transform	Theoretical and Tutorial	Questions, discussion and Quizzes

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Applied Digital Signal Processing South Asian Edition G. Manolakis
Main references (sources)	electron flow version / Thomas L. Floyd. 9th edition.

Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline																
				Required program Learning outcomes												
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	
3rd Year\ 1st semester	CoE 311	Linear Algebra	Basic	x	x	x	x	x	x	x	x	x	x	x	x	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Linear Algebra	
2. Course Code:	
CoE 311	
3. Semester / Year:	
3rd Year\ 1st semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Mohammed A. Al-Ibadi Email: Mohammed.joudah@uobasra.edu.iq	
8. Email: Course Objectives	
Course Objectives	• Preparing and qualifying specialized engineers to meet the requirements of the labor market in the private and public sectors in computer engineering through diversifying the methods of learning and teaching and training students to apply the acquired knowledge and skills to solve real problems. • Providing distinguished academic programs in the field of computer engineering, both theoretical and practical, that comply with international standards of academic quality and meet the needs of the labor market. • Encouraging and developing scientific research in the fields of computer engineering in general and the fields

	of artificial intelligence, robotics, computer software, computer networks, communications and control in particular. • Prepare a stimulating environment for faculty members to develop their educational and research knowledge and skills. • Building and developing partnership with governmental and private sectors and society in all its various institutions.

9. Teaching and Learning Strategies

Strategy	22. Explanation and clarification using the class lectures. 23. Tutorials hours. 24. Self-learning using homework and small projects. 25. Laboratories. 26. Short tests (quizzes). 27. Reports. 28. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Introduction to systems of linear equations	Introduction	Theoretical and Tutorial	1
2	3	How to solve systems of linear equations. Row reduction method	Introduction	Theoretical and Tutorial	2
3	3	Echelon forms	Introduction	Theoretical and Tutorial	3
4	3	Pivot variables	Solution of linear systems via row reduction	Theoretical and Tutorial	4
5	3	General and parametric solutions	Solution of linear systems via row reduction	Theoretical and Tutorial	5
6	3	Augmented matrix	Matrices	Theoretical and Tutorial	6
7	3	Pivot and free variables	Matrices	Theoretical and Tutorial	7
8	3	Transformation matrices	Elementary matrix operations	Theoretical and Tutorial	8

9	3	Scaling and interchanging matrices	Elementary matrix operations	Theoretical and Tutorial	9
10	3	LU Decomposition	Methods of solving matrices	Theoretical and Tutorial	10
11	3	Solving using LU Decomposition	Methods of solving matrices	Theoretical and Tutorial	11
12	3	Inverse of a Matrix	Methods of solving matrices	Theoretical and Tutorial	12
13	3	Gause – Jordan elimination method	Methods of solving matrices	Theoretical and Tutorial	13
14	3	Adding and Scaling Vectors	Geometry of linear equations	Theoretical and Tutorial	14
15	3	Linear combination	Geometry of linear equations	Theoretical and Tutorial	15

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Linear Algebra and its Applications by David C. Lay
Main references (sources)	
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
3rd Year\ 1st semester	CoE 313	Operating System	Basic	x	x	x	x	x	x	x	x	x	x	x	x

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Operating System	
2. Course Code:	
CoE 313	
3. Semester / Year:	
3rd Year\ 1st semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Musaab A. Alaziz Email: mosab.adil@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	This course aims to convey a thorough understanding of the basics of an operating system by studying techniques and algorithms for providing services in a computer system, and to understand implementation aspects of popular systems by means of case studies.
9. Teaching and Learning Strategies	
Strategy	29. Explanation and clarification using the class lectures. 30. Tutorials hours. 31. Self-learning using homework and small projects. 32. Laboratories. 33. Short tests (quizzes). 34. Reports. 35. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	3	Introduction, Hardware: CPU, memories, Memory hierarchy, I/O devices, I/O interrupts, DMA, Firmware: BOIS, Software, Operating systems review and its roles, Types of operating systems, Time sharing, Concurrency, System programs,	History and overview	Theoretical and Tutorial	Questions, discussion and Quizzes
2	3	Operating system structures, Operating system components, Microkernel, System calls and APIs, Interrupts, General definitions: Buffering, resources, device management, device driver, caching, crash…etc.	History and overview	Theoretical and Tutorial	Questions, discussion and Quizzes
3	3	Processes, Process state diagram, Process control block (PCB), Context switch, Process scheduling,	Process Management	Theoretical and Tutorial	Questions, discussion and Quizzes
4	3	Queuing diagram, Schedulers, Types and operation of processes.,	Process Management	Theoretical and Tutorial	Questions, discussion and Quizzes

		Bounded-buffer problem			
5	3	Definition, Benefits, Types of threads, Multithreading models, Java threads, Java thread management, Java thread states, Producer-consumer problem.	Threads	Theoretical and Tutorial	Questions, discussion and Quizzes
6	3	CPU-I/O burst cycle, Preemptive and non-preemptive scheduling,	Scheduling and dispatch	Theoretical and Tutorial	Questions, discussion and Quizzes
7	3	Dispatcher, Scheduling criteria, Multi-processor and multiple core scheduling.	Scheduling and dispatch	Theoretical and Tutorial	Questions, discussion and Quizzes
8	3	Define the problem, Race condition, Critical section problem, Mutual exclusion,	Process Synchronization	Theoretical and Tutorial	Questions, discussion and Quizzes
9	3	Semaphore, Starvation, Producer-consumer problem, Monitors	Process Synchronization	Theoretical and Tutorial	Questions, discussion and Quizzes
10	3	Definition, Deadlock characterization, Necessary conditions, Resource allocation graph	Deadlock	Theoretical and Tutorial	Questions, discussion and Quizzes
11	3	Deadlock prevention, avoidance, and recovery. Process termination.	Deadlock	Theoretical and Tutorial	Questions, discussion and Quizzes
12	3	Address binding, Logical vs. physical address	Memory Management	Theoretical and Tutorial	Questions, discussion and Quizzes

		space, Static and dynamic loading and linking			
13	3	Overlaying and swapping, paging, segmentation, fragmentation, Memory hierarchy.	Memory Management	Theoretical and Tutorial	Questions, discussion and Quizzes
14	3	Definition, attribute, types, access methods, Directory, Allocation methods, Consistency checking, Backup and restore, Disk management.	File systems	Theoretical and Tutorial	Questions, discussion and Quizzes
15	3	Goals of protection, Domain of protection, Access matrix, Access control and rights, Cryptography, User authentication, Firewall.	Protection and Security	Theoretical and Tutorial	Questions, discussion and Quizzes

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Silberschatz, Galvin, and Gagne. Operating System Concepts. John Wiley & Sons.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline																
				Required program Learning outcomes												
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	
3rd Year\ 2nd semester	CoE 314	Artificial Intelligence	Basic	x	x	x	x	x	x	x	x	x	x	x	x	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Artificial Intelligence	
2. Course Code:	
CoE 314	
3. Semester / Year:	
3rd Year\ 2nd semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Wasan A. Wali Email: Wasan.wali@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	Teach students the main techniques used in computer knowledge and artificial intelligence. Expert systems, artificial neural networks, fuzzy systems, evolutionary genetic algorithms, and hybrid intelligent systems powered by hundreds of smart tools to solve specific problems and rely on intelligent machines that can capture experiences similar to humans. This intelligent behavior of the computer can achieve human-level performance in a cognitive task or more accurately
9. Teaching and Learning Strategies	
Strategy	1. Explanation and clarification using the class lectures. 2. Tutorials hours. 3. Self-learning using homework and small projects. 4. Laboratories. 5. Short tests (quizzes).

	6. Reports. 7. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	programming features required for intelligent systems	Introduction on knowledge	Theoretical	Questions and discussion
2	3	methods of knowledge representation	Introduction to knowledge	Theoretical	Questions and discussion
3	3	artificial intelligence programming languages	Introduction to artificial intelligence	Theoretical + tutorial	Questions and discussion
4	3	Expert systems	Introduction to artificial intelligence	Theoretical	Questions, discussion, and quiz
5	3	Introduction to fuzzy set	Fuzzy set theory	Theoretical	Questions and discussion
6	3	design of fuzzy systems	Fuzzy set theory	Theoretical + tutorial	Questions and discussion
7	3	stability methods for fuzzy controllers.	Introduction to Intelligent control systems	Theoretical	Questions and discussion
8	3	Introduction to artificial neural network	Principles of neural networks	Theoretical	Questions, discussion, and quiz
9	3	learning methods for ANN	Principles of neural networks	Theoretical	Questions and discussion
10	3	learning methods, Back-propagation	Principles of neural networks	Theoretical	Questions, discussion, and quiz
11	3	Introduction Genetic algorithms	Genetic algorithms	Theoretical + tutorial	Questions and discussion
12	3	Genetic algorithms application	Genetic algorithms	Theoretical + tutorial	Questions, discussion, and quiz
13	3	Neuro-fuzzy systems design	hybrid Intelligent systems	Theoretical	Questions and discussion
14	3	Geno-fuzzy systems	hybrid Intelligent systems	Theoretical+ tutorial	Questions and discussion
15	3	Different topics	Discussion and revision	Theoretical	discussion

11. Course Evaluation	
Midterm Exam: 30% Teacher assessment: 10% Final Exam: 60 %	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1-Negnevitsky", Artificial Intelligence A Guide to Intelligent Systems,2002 2-Russel, "Artificial Intelligence", 2003. 3-Razwick, "Fuzzy Controllers", 2000. 4-Zilouchian, "Intelligent Control Systems using Soft Computing Methodologies", 2007
Main references (sources)	
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline																
				Required program Learning outcomes												
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	
3rd Year\ 2nd semester	CoE 324	Digital Communications	Basic	x	x	x	x	x	x	x	x	x	x	x	x	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Digital Communications	
2. Course Code:	
CoE 324	
3. Semester / Year:	
3rd Year\ 2nd semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Ghaida A. Al-Suhail Email: ghaida.suhail@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	• Preparing and qualifying specialized engineers to meet the requirements of the labor market in the private and public sectors in computer engineering through diversifying the methods of learning and teaching and training students to apply the acquired knowledge and skills to solve real problems. • Providing distinguished academic programs in the field of computer engineering, both theoretical and practical, that comply with international standards of academic quality and meet the needs of the labor market. • Encouraging and developing scientific research in the fields of computer engineering in general and the fields of artificial intelligence, robotics, computer software, computer networks,

	communications and control in particular. • Prepare a stimulating environment for faculty members to develop their educational and research knowledge and skills. • Building and developing partnership with governmental and private sectors and society in all its various institutions.

9. Teaching and Learning Strategies

Strategy	8. Explanation and clarification using the class lectures. 9. Tutorials hours. 10. Self-learning using homework and small projects. 11. Laboratories. 12. Short tests (quizzes). 13. Reports. 14. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Concepts and Definitions in Digital and Data Communications	Introduction to Digital Communications	E-learning/ Presentation	Questions &Tutorial
2	3	Type of Nodes and Networks, Packet/Message Store-and Forward Transmission, Bit-Character oriented Transmissions	Introduction to Data Communications	E-learning/ Presentation	Questions &Tutorial
3	3	Transmission Modes. Synchronization & Framing	Introduction to Data Communications	E-learning/ Presentation	Questions &Tutorial (Quiz or Assignment)
4	3	Network Models: OSI Model and TCP/IP Model	Network Models	E-learning/ Presentation	Questions &Tutorial
5	3	Digital/Analogue Bandwidth, Noiseless Channel (Nyquist Bit Rate), Noisy Channel (Shannon Capacity)	Physical Layer	E-learning/ Presentation	Questions &Tutorial

6	3	Transmission Impairments: Attenuation, Delay Distortion, Noise	Physical Layer	E-learning/ Presentation	Questions &Tutorial (Quiz or Assignment)
7	3	Line Coding, Analog Modulations, Pulse Modulations (PTM, PCM, DM)	Digital Transmission	E-learning/ Presentation	Questions &Tutorial
8	3	Digital-To-Analogue Modulation Techniques (ASK, PSK, FSK, QAM)	Digital Transmission	E-learning/ Presentation	Questions &Tutorial
9	3	FDM, WDM, TDM, CDM/CDMA	Multiplexing Techniques	E-learning/ Presentation	Questions &Tutorial (Assignment)
10	3	Error Detection and Correction Methods (Checksum, Hamming, CRC)	Error Control Techniques	E-learning/ Presentation	Questions &Tutorial
11	3	Transmission Loss in Guided (Optical Transmission system)	Transmission Media	E-learning/ Presentation	Questions &Tutorial
12	3	Transmission Loss in Unguided Media (Wireless Transmission), Satellite Networks	Transmission Media	E-learning/ Presentation	Questions &Tutorial (Quiz or Assignment)
13	3	Principle of Spread Spectrum, Direct Sequence Spread Spectrum, Frequency Hopping	Spread Spectrum Techniques	E-learning/ Presentation	Questions &Tutorial
14	3	Cellular System Principles, Frequency Re-Use ,Increasing Capacity	Cellular Networks	E-learning/ Presentation	Questions &Tutorial
15	3	Different topics	Discussion and revision	E-learning/ Presentation	Questions &Tutorial

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1- Chan S. Park. Fundamentals of Engineering Economics. Pearson Education (2012), (2004). 2- (Synthesis Lectures on Engineering) David L. Whitman, Ronald E. Terry-Fundamentals of Engineering Economics and Decision Analysis, Morgan & Claypool Publishers (2012) 3- Donald C. Newnan et al., Engineering Economic Analysis, 9th Ed., 2004, Oxford University
Main references (sources)	
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	https://easyengineering.net/engineering-economics-by-panneerselvam-book/

Program Skills Outline																
				Required program Learning outcomes												
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	
3rd Year\ 2nd semester	CoE 322	Microprocessor Interface	Basic	x	x	x	x	x	x	x	x	x	x	x	x	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Microprocessor Interface	
2. Course Code:	
CoE 322	
3. Semester / Year:	
3rd Year\ 2nd semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Ghaida A. Al-Suhail Email: ghaida.suhail@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	• Minimum-mode and maximum-mode operation of 8088/8086 microprocessors • System clock, bus cycles, and time states. • Memory organization and address space. • Demultiplexing the address/data buses. • Memory devices and subsystem design. • Input/ output interface. • Memory mapped input/output. • Design of input/output ports with specific addresses. • Programmable input/output. • Programmable timers. • Interrupt address pointer, masking of interrupt, software interrupt, non-maskable interrupt, and reset. • Programmable interrupt controller. • Direct memory access and DMA programmable controller.

	• Serial communication and its programmable controller.

9. Teaching and Learning Strategies	
Strategy	15. Explanation and clarification using the class lectures. 16. Tutorials hours. 17. Self-learning using homework and small projects. 18. Laboratories. 19. Short tests (quizzes). 20. Reports. 21. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Handshaking, buffering	I/O fundamentals	Theoretical and Tutorial	Questions, discussion and Quizzes
2	3	I/O read and write bus cycles	I/O fundamentals	Theoretical and Tutorial	Questions, discussion and Quizzes
3	3	Design of isolated and memory-mapped I/O	Design of I/O ports	Theoretical and Tutorial	Questions, discussion and Quizzes
4	3	Specific Decoded port address.	Design of I/O ports	Theoretical and Tutorial	Questions, discussion and Quizzes
5	3	(8255 PPI) internal architecture,	Programmable I/O	Theoretical and Tutorial	Questions, discussion and Quizzes
6	3	port description, programming and modes of operation	Programmable I/O	Theoretical and Tutorial	Questions, discussion and Quizzes
7	3	interfacing with microprocessor.	Programmable I/O	Theoretical and Tutorial	Questions, discussion and Quizzes
8	3	Programmable interval timer (8254 PIT) internal architecture	Programmable Timers	Theoretical and Tutorial	Questions, discussion and Quizzes

9	3	counters, programming and modes of operation	Programmable Timers	Theoretical and Tutorial	Questions, discussion and Quizzes
10	3	Vectored and prioritized interrupts, interrupt handling, interrupts service routines structure	Interrupt structures	Theoretical and Tutorial	Questions, discussion and Quizzes
11	3	software interrupt, internal interrupt, non-maskable interrupt, reset, external hardware interrupt.	Interrupt structures	Theoretical and Tutorial	Questions, discussion and Quizzes
12	3	Programmable interrupt controller (8259 PIC) internal architecture and programming	Interrupt structures	Theoretical and Tutorial	Questions, discussion and Quizzes
13	3	programmable direct memory access controller (8237 DMA controller), programming and interfacing	Direct memory access DMA	Theoretical and Tutorial	Questions, discussion and Quizzes
14	3	Bus protocols, local and global buses, bus arbitration	Buses	Theoretical and Tutorial	Questions, discussion and Quizzes
15	3	Floppy, Optical disk, Hard disk, RAID	Mass storage Devices	Theoretical and Tutorial	Questions, discussion and Quizzes

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	THE 8088 AND 8086 MICROPROCESSORS Programming, Interfacing, Software, Hardware, and Applications, Fourth Edition, Walter A. Triebel and Avtar Singh. THE INTEL MICROPROCESSORS, Eighth Edition, BARRY B. BREY

Main references (sources)	
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
4th Year\ 1st semester	CoE 421	Ethics	Basic	x	x	x	x	x	x	x	x	x	x	x	x

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Ethics	
2. Course Code:	
CoE 421	
3. Semester / Year:	
4th Year\ 1st semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
22 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Ali Essam Hameed Email: ali.haddad@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	the study of the ethical issues and decisions facing individuals and organizations working in the field of engineering. The purpose of studying the ethics of the engineering profession is to increase the engineer's ability to face the ethical issues that arise during his engineering work and responsibly. Any profession must have rules of ethics regulating the general behavior of the members of this profession with each other and with others. ABET has called for the integration of ethics into education to teach future engineers ethical practices and ethical thinking.
9. Teaching and Learning Strategies	
Strategy	1. Explanation and clarification using the class lectures. 2. Tutorials hours. 3. Self-learning using homework and small projects. 4. Laboratories.

	5. Short tests (quizzes). 6. Reports. 7. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Overview about Ethics	Introduction to Ethics	Theoretical lecture	discussion
2	2	What is an engineering ethics concept	General components of professional ethics	Theoretical lecture	Exercise and discussion
3	2	What is the purpose of studding Ethics	Ethics related to professional ethics	Theoretical lecture	Quizzes
4	2	Rules Codes of ABET	Engineering disasters	Seminar	Exercise and discussion
5	2	Knowing the impact of Ethics codes on society	Ethics Codes	Theoretical lecture	discussion
6	2	Knowledge the self-Obligations of an engineer	Obligations of the engineer under the ethics of practicing the engineering profession and self-obligations1	Theoretical lecture	discussion
7	2	Knowledge the self-Obligations of an engineer	Obligations of the engineer under the ethics of practicing the engineering profession and self-obligations2	Theoretical lecture	discussion
8	2	Biography Ibn Sina	Biography Ibn Sina	Seminar	discussion
9	2	Ethics rules towards co-workers	Ethical obligations towards co-workers	Theoretical lecture	Exercise and discussion
10	2	Ethics rules towards employers	Obligations to employers	Theoretical lecture	Quizzes
11	2	Ethics rules towards society, the environment and the profession	The engineer's commitments to society, the environment and the profession	Theoretical lecture	discussion

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	قواعد واخلاقيات ممارسة مهنة الهندسة د. نبيل عبد الرزاق
Main references (sources)	
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline																
				Required program Learning outcomes												
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	
4th Year\ 1st semester	CoE 431	Software Design	Basic	x	x	x	x	x	x	x	x	x	x	x	x	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Software Design	
2. Course Code:	
CoE 431	
3. Semester / Year:	
4th Year\ 1st semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Ali ALiedani Email: Ali.nabeel@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	introduce students to the importance of accuracy in building a software project and the problems that the developer may face in building the project. For this, the student will learn about the stages of building the engineering project and how to organize the project construction so that it is easy to track and develop the project. The student will learn to use and make diagrams to describe computer programs in terms of their component elements or the process line of the program.
9. Teaching and Learning Strategies	
Strategy	8. Explanation and clarification using the class lectures. 9. Tutorials hours. 10. Self-learning using homework and small projects. 11. Laboratories. 12. Short tests (quizzes).

	13. Reports. 14. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	life cycle, life cycle model, quality, phases, Process improvement, Process assessment models, metrics, standards and guidelines	Software life cycle and process models	Theoretical and Tutorial	Questions, discussion and Quizzes
2	3	Requirements analysis modeling techniques, Prototyping, formal specification techniques, functional and non-functional requirements	Software requirements and specifications	Theoretical and Tutorial	Questions, discussion and Quizzes
3	3	design concepts, architecture, structured design, Object-oriented analysis and design	Software design 1	Theoretical and Tutorial	Questions, discussion and Quizzes
4	3	Component-level design, Design for reuse, Quality in relation to specification (completeness, consistency, simplicity, verifiability).	Software design 2	Theoretical and Tutorial	Questions, discussion and Quizzes
5	3	The guiding strategies to build structure program	Software implementation1	Theoretical and Tutorial	Questions, discussion and Quizzes
6	3	The characteristic of object orient program	Software implementation2	Theoretical and Tutorial	Questions, discussion and Quizzes
7	3	Testing fundamentals, tools, test plan creation, test case generation	Software testing1	Theoretical and Tutorial	Questions, discussion and Quizzes

		Validation planning, Black-box and white-box testing techniques			
8	3	Unit integration, validation, system testing, Object-oriented testing, , Measures of Reliability and Availability, and inspections	Software testing 2	Theoretical and Tutorial	Questions, discussion and Quizzes
9	3	Software maintenance, forms of maintenance, defect removal, upgrade, enhancement	Software evolution 1	Theoretical and Tutorial	Questions, discussion and Quizzes
10	3	Patterns of behavior, bottlenecks measurement, regression testing version control, Software re-use, and Reengineering	Software evolution 2	Theoretical and Tutorial	Questions, discussion and Quizzes
11	3	Programming environments, Requirements analysis and design modeling tools, teams composition, project management difficult		Theoretical and Tutorial	Questions, discussion and Quizzes
12	3	Resource allocation, Gantt charts, Project planning, costing, and timely compliance and delivery	Project management 2	Theoretical and Tutorial	Questions, discussion and Quizzes
13	3	performance constraints, real-time features remands, Hardware and software co-design.	Concurrent Design	Theoretical and Tutorial	Questions, discussion and Quizzes

14	3	define HCI, context, reasons, web interface, Human performance	Computer Interfaces 1	Theoretical and Tutorial	Questions, discussion and Quizzes
15	3	usability testing, graphical user interfaces GUI, web interfaces	Computer Interfaces	Theoretical and Tutorial	Questions, discussion and Quizzes

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Fundamentals Approach to Discrete Mathematics, D.P Acharjya Discrete Mathematics and Its Applications, Rosen
Main references (sources)	Fundamentals Approach to Discrete Mathematics, D.P Acharjya Discrete Mathematics and Its Applications, Rosen
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
4th Year\ 1st semester	CoE 432	Computer Network	Basic	x	x	x	x	x	x	x	x	x	x	x	x

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Computer Network	
2. Course Code:	
CoE 432	
3. Semester / Year:	
4th Year\ 1st semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Abbas A. Jasim Email: jasim@buog.edu.iq	
8. Email: Course Objectives	
Course Objectives	Introduction to the design and performance analysis of computer networks Architectures, protocols, standards and technologies of computer networks. Including different computer networks types, media, models, switching, retransmission, flow and error control.
9. Teaching and Learning Strategies	
Strategy	15. Explanation and clarification using the class lectures. 16. Tutorials hours. 17. Self-learning using homework and small projects. 18. Laboratories. 19. Short tests (quizzes). 20. Reports. 21. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	3	Fundamental concepts of network	Theoretical and Tutorial	Questions, discussion and Quizzes	1
2	3	types of computers networks	Theoretical and Tutorial	Questions, discussion and Quizzes	2
3	3	LANs, MANs, WANs	Theoretical and Tutorial	Questions, discussion and Quizzes	3
4	3	Network architecture	Theoretical and Tutorial	Questions, discussion and Quizzes	4
5	3	Protocol suits and layering concepts	Theoretical and Tutorial	Questions, discussion and Quizzes	5
6	3	OSI and TCP/IP reference models	Theoretical and Tutorial	Questions, discussion and Quizzes	6
7	3	Retransmission techniques: ARQ system utilization of networks	Theoretical and Tutorial	Questions, discussion and Quizzes	7
8	3	Stop and wait protocol, Goback N and selective repeat protocols.	Theoretical and Tutorial	Questions, discussion and Quizzes	8
9	3	Switching techniques and communication services	Theoretical and Tutorial	Questions, discussion and Quizzes	9
10	3	Circuit and packet switching, broad cast method,	Theoretical and Tutorial	Questions, discussion and Quizzes	10
11	3	types of communication services connection, connectionless and expedited service	Theoretical and Tutorial	Questions, discussion and Quizzes	11
12	3	Local Area Networks Technology: ALOHA (pure and slotted),	Theoretical and Tutorial	Questions, discussion and Quizzes	12

13	3	Ethernet (CSMA/CD), Token ring, Token bus, FDDI network, DQDB network.	Theoretical and Tutorial	Questions, discussion and Quizzes	13
14	3	Network Devices	Theoretical and Tutorial	Questions, discussion and Quizzes	14
15	3	Network Evaluation and performance	Theoretical and Tutorial	Questions, discussion and Quizzes	15

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Data Communication and Networks (2007) by B. Forouzan Local Area Networks (2003) by B. Forouzan
Main references (sources)	G. E. Keiser, "Local Area Networks". J. Walrand, "Communication Networks".
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline																
				Required program Learning outcomes												
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	
4th Year\ 1st semester	CoE 433	Control system	Basic	x												

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Control system	
2. Course Code:	
CoE 433	
3. Semester / Year:	
4th Year\ 1st semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
60 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Loai Ali Talib Email: loai.talib@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	introduce the students to the fundamental principles of control systems. The topics of open loop, closed loop and feedback and modelling of system are studied. The performance of systems and stability analysis will also be introduced. state space model will be considered.
9. Teaching and Learning Strategies	
Strategy	22. Explanation and clarification using the class lectures. 23. Tutorials hours. 24. Self-learning using homework and small projects. 25. Laboratories. 26. Short tests (quizzes). 27. Reports. 28. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	4	Introduction, Definition ,concept of open, feedback and closed loop, Laplace and inverse Laplace transform	Introduction to control system, Laplace transform	theoretical	Questions and discussion
2	4	Basic principles, definition of transfer function, Impulse response, modeling of some examples of electrical and mechanical systems	Modeling and Mathematical Models	theoretical	Questions and discussion
3	4	DC servo motor, operating principle, Types of control, Field control, Armature control	Modeling of systems	theoretical	Questions and discussion
4	4	Introduction, closed loop system, Block diagram simplification rules , Examples	Block diagram representation	theoretical	Questions and discussion
5	4	Test signals, Response of first order system,	Analysis of control system	theoretical	Questions and discussion
6	4	response of second order system, examples, Transient response specifications.	Analysis of control system	theoretical	Questions and discussion
7	4	Types of systems, Error coefficients, steady state error, examples	Analysis of control system	theoretical	Questions and discussion
8	4	Basic concept, Routh - Hurwitz criterion, special cases, examples	Stability analysis	theoretical	Questions and discussion
9	4	Introduction, Rules of construction root locus	Root locus method	theoretical	Questions and discussion

10	4	Examples on root locus, applications	Root locus method	theoretical	Questions and discussion
11	4	Response to sinusoidal input, sinusoidal transfer function, example	Frequency response	theoretical	Questions and discussion
12	4	Bode plot, polar plot, Examples	Frequency response	theoretical	Questions and discussion
13	4	Nyquist stability criterion Relative stability, Gain margin, Phase margin, Examples	Frequency response	theoretical	Questions and discussion
14	4	Introduction, definitions, state space representation of systems, solving state equation, state transition matrix	State space analysis of control system	theoretical	Questions and discussion
15	4	Transfer function and transfer function matrix, Controllability and observability, State feedback	State space analysis of control system	theoretical	Questions and discussion

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	K. Ogata, Modern control engineering
Main references (sources)	Dazzo, Linear control systems
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline																
				Required program Learning outcomes												
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	
4th Year\ 2nd semester	CoE 422	Project Management	Basic	x	x	x	x	x	x	x	x	x	x	x	x	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Project Management	
2. Course Code:	
CoE 422	
3. Semester / Year:	
4th Year\ 2nd semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Ali Essam Hameed Email: ali.haddad@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	provide the knowledge and techniques required to properly manage projects of all types and sizes. Course material covers the approaches and practices in project management over the life cycle of the project. This course is highly interactive, with hands-on, in-class practice projects and analysis of real-world project examples. While providing the knowledge needed for project planning, monitoring, and control, it focuses on the development of leadership, teamwork, and problem solving skills
9. Teaching and Learning Strategies	
Strategy	1. Explanation and clarification using the class lectures. 2. Tutorials hours. 3. Self-learning using homework and small projects. 4. Laboratories.

	5. Short tests (quizzes). 6. Reports. 7. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Introduction to Project Management	Project, Project Management, Program Management, Portfolio Management	Lecture	Questions, discussion and Quizzes
2	3	Systems View of Project Management	Systems View, Organizations	Lecture	Questions, discussion and Quizzes
3	3	Project and Product Life Cycles	Project and Life Cycle, Operations, Product Life Cycle	Lecture	Questions, discussion and Quizzes
4	3	The Project Management Process Groups	The Project Management Process Groups,	Lecture	Questions, discussion and Quizzes
5	3	Microsoft Project Professional	Microsoft Project Professional	Lecture	Questions, discussion and Quizzes
6	3	Project Integration Management	Project Integration Management	Lecture	Questions, discussion and Quizzes
7	3	Project Scope Management	Project Scope Management	Lecture	Questions, discussion and Quizzes
8	3	Project Schedule Management	Project Schedule Management	Lecture	Questions, discussion and Quizzes
9	3	Project Cost Management	Project Cost Management	Lecture	Questions, discussion and Quizzes
10	3	Project Quality Management	Project Quality Management	Lecture	Questions, discussion and Quizzes
11	3	Project Resource Management	Project Resource Management	Lecture	Questions, discussion and Quizzes
12	3	Project Communications Management	Project Communications Management	Lecture	Questions, discussion and Quizzes

13	3	Project Risk Management	Project Risk Management	Lecture	Questions, discussion and Quizzes
14	3	Project Procurement Management	Project Procurement Management	Lecture	Questions, discussion and Quizzes
15	3	Project Stakeholder Management	Project Stakeholder Management	Lecture	Questions, discussion and Quizzes

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1.K. Schwalbe, Information Technology Project Management, 9th ed., Boston, MA: Cengage Learning, 2019. 2.A Guide to the Project Management Body of Knowledge (PMBOK Guide), 6th ed., Newtown Square, PA: Project Management Institute, 2017.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
4th Year\ 2nd semester	CoE 435	Embedded Computing Systems	Basic	x	x	x	x	x	x	x	x	x	x	x	x

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Embedded Computing Systems	
2. Course Code:	
CoE 435	
3. Semester / Year:	
4th Year\ 2nd semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: hassanin husein Email: hassanin.husein@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	introduce the students to real time system and its requirements. In addition, it introduces the embedded systems represented with ARM and Arduino system from hardware and software respective. This Course also demonstrate the interfacing and communication in synchronous and asynchronous manner. also, the course introduces the Robotic system with regard to control system.
9. Teaching and Learning Strategies	
Strategy	8. Explanation and clarification using the class lectures. 9. Tutorials hours. 10. Self-learning using homework and small projects. 11. Laboratories. 12. Short tests (quizzes).

	13. Reports. 14. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Indicate some reasons for studying embedded systems, Product life cycle, Quality design, Debugging, Computers, processors, memory, and microcontrollers, Digital logic and open collector, Types of real-time systems.	Introduction to embedded systems	Theoretical and Tutorial	Questions, discussion and Quizzes
2	3	ARM processor architecture, Software model, Addressing modes, programming instructions,	Embedded ARM microcontrollers	Theoretical and Tutorial	Questions, discussion and Quizzes
3	3	Fundamental concepts of assembly language and linking: labels, address management.	Embedded ARM microcontrollers2	Theoretical and Tutorial	Questions, discussion and Quizzes
4	3	Microcontroller I/O pins, I/O programming and the direction register, Phased-lock loop, SysTick timer, Measurement of dynamic efficiency, Power management, Fault tolerant system	Microcontroller Hardware	Theoretical and Tutorial	Questions, discussion and Quizzes
5	3	Fundamentals, Foreground/Background, Delay tasks, Round Robin scheduler, Semaphores, Thread synchronization or rendezvous	Real-time operating systems	Theoretical and Tutorial	Questions, discussion and Quizzes
6	3	Resource sharing, non-reentrant code or mutual exclusion, Thread communication using: mailbox and FIFO queue, Switch debouncing, Deadlocks, Monitors, Free RTOS	Real-time operating systems2	Theoretical and Tutorial	Questions, discussion and Quizzes

7	3	Introduction to interfacing, , Synchronous serial interface SSI, LCD interface, Scanned keyboard, Actuators, Pulse width modulation, Motors drivers, I2C interface	Interfacing and Communication:	Theoretical and Tutorial	Questions, discussion and Quizzes
8	3	USB interface, High speed interfacing: Hardware FIFO, Dual-port memory, DMA controllers sensors interface.	Interfacing and Communication	Theoretical and Tutorial	Questions, discussion and Quizzes
9	3	I/O synchronization, Interrupt concepts, Polled I/O vs. interrupt-driven I/O, NVIC on ARM processor, SysTick periodic interrupts, Timer periodic interrupt, Ballast code timing, Multithreading.	Interrupt programming and real-time systems	Theoretical and Tutorial	Questions, discussion and Quizzes
10	3	Analog to digital conversion, Real-time data acquisition, Digital to analog conversion, 4~20mA signal standards.	Analog I/O Interfacing	Theoretical and Tutorial	Questions, discussion and Quizzes
11	3	Quality programming, Modular software design, and Threads, Call graph, Data-flow graph, Top-down vs. bottom-up design, Memory management and the Heap	Software design	Theoretical and Tutorial	Questions, discussion and Quizzes
12	3	: Networked embedded systems, Reentrant programming, Critical section, Network topologies: ring, bus, multi-hop.,	Networked embedded systems 1	Theoretical and Tutorial	Questions, discussion and Quizzes
13	3	Producer- consumer using FIFO queue, Distributed systems, Wireless communication, Internet-enabled embedded systems	Networked embedded systems	Theoretical and Tutorial	Questions, discussion and Quizzes

14	3	Fundamentals, CAN, Ethernet, Internet of Things.	High speed network:	Theoretical and Tutorial	Questions, discussion and Quizzes
15	3	Introduction to Digital Control, Closed-loop control, PID controllers, Fuzzy logic control	Robotic systems	Theoretical and Tutorial	Questions, discussion and Quizzes

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Embedded System Design Book by P. Marwedel and Peter Marwede
Main references (sources)	
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
4th Year\ 2nd semester	CoE 436	Network Technology	Basic	x	x	x	x	x	x	x	x	x	x	x	x

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Network Technology	
2. Course Code:	
CoE 436	
3. Semester / Year:	
4th Year\ 2nd semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Abbas A. Jasim Email: jasim@buog.edu.iq	
8. Email: Course Objectives	
Course Objectives	The concepts of internetworking, internetwork architecture, protocols, network services and applications. Server based operation. Networking problem notification and control. Authentication and security issues.
9. Teaching and Learning Strategies	
Strategy	15. Explanation and clarification using the class lectures. 16. Tutorials hours. 17. Self-learning using homework and small projects. 18. Laboratories. 19. Short tests (quizzes). 20. Reports. 21. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	3	Internet protocols and Transport protocols	Theoretical and Tutorial	Questions, discussion and Quizzes	1
2	3	TCP/IP Internet, ISDN and B-ISDN(Addressing and address mapping)	Theoretical and Tutorial	Questions, discussion and Quizzes	2
3	3	Computer network routing: Routing Algorithms	Theoretical and Tutorial	Questions, discussion and Quizzes	3
4	3	Routing tables (for datagram and virtual circuit network)	Theoretical and Tutorial	Questions, discussion and Quizzes	4
5	3	Routing protocols RIP, OSPF	Theoretical and Tutorial	Questions, discussion and Quizzes	5
6	3	routing strategies (flooding, spanning tree, static routing, and Hierarchical routing)	Theoretical and Tutorial	Questions, discussion and Quizzes	6
7	3	TCP/IP Transport and Application Protocols	Theoretical and Tutorial	Questions, discussion and Quizzes	7
8	3	TCP/IP Transport and Application Protocols	Theoretical and Tutorial	Questions, discussion and Quizzes	8
9	3	Congestion control strategies	Theoretical and Tutorial	Questions, discussion and Quizzes	9
10	3	Close loop and open loop congestion control	Theoretical and Tutorial	Questions, discussion and Quizzes	10
11	3	Close loop and open loop congestion control	Theoretical and Tutorial	Questions, discussion and Quizzes	11
12	3	Network security	Theoretical and Tutorial	Questions, discussion and Quizzes	12
13	3	Encryption and Decryption	Theoretical and Tutorial	Questions, discussion and Quizzes	13
14	3	Network Evaluation and performance	Theoretical and Tutorial	Questions, discussion and Quizzes	14
15	3	Internet protocols and Transport protocols	Theoretical and Tutorial	Questions, discussion and Quizzes	15

11. Course Evaluation	
Midterm Exam: 30% Teacher assessment: 10% Final Exam: 60 %	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Data Communication and Networks (2007) by B. Forouzan Local Area Networks (2003) by B. Forouzan
Main references (sources)	G. E. Keiser, "Local Area Networks". J. Walrand, "Communication Networks
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline																
				Required program Learning outcomes												
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	
4th Year\ 2nd semester	CoE E3x	Discrete control	Basic	x	x	x	x	x	x	x	x	x	x	x	x	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Discrete control	
2. Course Code:	
CoE E3x	
3. Semester / Year:	
4th Year\ 2nd semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Loai Ali Talib Email: loai.talib@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	is to introduce the students to the fundamental principles of discrete time system control system. Introduction to discrete time control system, z transform and inverse z transform, impulse sampling and data hold, pulse transfer function, time response and frequency response are studied. The performance of systems and stability analysis will also be introduced
9. Teaching and Learning Strategies	
Strategy	22. Explanation and clarification using the class lectures. 23. Tutorials hours. 24. Self-learning using homework and small projects. 25. Laboratories. 26. Short tests (quizzes). 27. Reports.

	28. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Introduction, Definition ,concept of discrete time control , structure	Introduction to discrete time control system,	Theoretical	Questions and discussion
2	3	Z- transform and inverse z – transform , solving difference equation, examples	Fundamental of discrete time control system,	Theoretical	Questions and discussion
3	3	Time response of discrete time system , convolution summation, frequency response	Time response and frequency response	Theoretical	Questions and discussion
4	3	Introduction, basic structure, ADC and DAC , concept of sampling and sample. Hold device, transfer function of ZOH and z- transfer function	Modeling of discrete time control system	Theoretical	Questions and discussion
5	3	Effect of sampler on the z- transfer function, z - transfer function of cascaded elements, examples	Analysis of discrete time control system	Theoretical	Questions and discussion
6	3	Pulse transfer function of closed loop discrete time system Different configuration, examples	Analysis of discrete control system	Theoretical	Questions and discussion
7	3	Block diagram realization of digital controller, direct programming, standard programming ..	Realization of digital controller	Theoretical	Questions and discussion
8	3	Basic concept, mapping between the s-plane and the z- plane, stability analysis of closed loop discrete time system, examples	Stability analysis of discrete time control system	Theoretical	Questions and discussion
9	3	Methods of testing stability, The Jury stability test , bilinear	Stability analysis of discrete time control system	Theoretical	Questions and discussion

		transformation and Routh criterion, examples			
10	3	Transient response of discrete time system, transient response specifications	Stability analysis of discrete time control system	Theoretical	Questions and discussion
11	3	Steady state error in closed loop discrete time system, types of system, examples	Steady state error analysis of discrete time control system	Theoretical	Questions and discussion
12	3	Root locus in z- plane, general rules for constructing root loci	Root locus diagram of discrete time system	Theoretical	Questions and discussion
13	3	Different examples on root locus plot	Root locus diagram of discrete time system	Theoretical	Questions and discussion
14	3	Introduction, definitions, state space representation of discrete time systems, solving state equation, state transition matrix	State space analysis of discrete time system	Theoretical	Questions and discussion
15	3	Solving state equation, z - transfer function matrix, Controllability and observability test ,introduction to State feedback	State space analysis of discrete time system	Theoretical	Questions and discussion

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	K. Ogata, Discrete time control system
Main references (sources)	M. Sami Fadali, digital control engineering
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
4th Year\ 2nd semester	CoE 437	Parallel Processing	Basic	x	x	x	x	x	x	x	x	x	x	x	x

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:	
Parallel Processing	
2. Course Code:	
CoE 437	
3. Semester / Year:	
4th Year\ 2nd semester	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
Presence and on-line	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 Hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Fatemah K. Al-Assfor Email: Fatmah.hassan@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	- Demonstrate an understanding of uniprocessor computer architecture. - Explain the operation of parallel hardware including cache-coherence and mutexes on shared-memory machines, and interconnect performance (bisection bandwidth, bandwidth and latency) characteristics on distributed-memory machines. - Demonstrate an understanding of parallel hardware and general parallel program design techniques, understanding of shared-memory machines by designing, and distributed-memory machines by designing.
9. Teaching and Learning Strategies	
Strategy	29. Explanation and clarification using the class lectures. 30. Tutorials hours.

	31. Self-learning using homework and small projects. 32. Laboratories. 33. Short tests (quizzes). 34. Reports. 35. Mid-terms and final exams for both theoretical and Lab subjects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Introduction	Necessity of high performance, constraints of conventional architecture, Von Neuman architecture, limitations, evolution of parallel processors	Theoretical	Questions and discussion
2	3	Parallelism	parallelism of Uniprocessor architecture, parallel processing mechanisms, multiple function units.	Theoretical	Theoretical
3	3	Parallelism	parallelism and pipelining within CPU, overlapped CPU, use of memory hierarchy system.	Theoretical	Theoretical
4	3	Architectural Classifications of parallel computers	Flynn's classifications (SISD, SIMD, MISD, and MIMD) computer organizations, classification based on computing between processing elements, SIMD.	Theoretical	Theoretical
5	3	Memory architecture of Parallel Processing	shared, distributed, and hybrid distributed- shared memory, UMA and NUMA, COMA	Theoretical	Theoretical

6	3	Multiprocessor Architecture	multiprocessor systems, loosely coupled, tightly coupled, multiprocessor characteristics	Theoretical	Theoretical
7	3	Multiprocessor Architecture	inter processor communication networks (time shared buses, crossbar switches	Theoretical	Theoretical
8	3	Vector and array Processors	basic vector architecture, vector processor, vector instruction types, array processors (array, wave front array.	Theoretical	Theoretical
9	3	Vector and array Processors	systolic array, bus architecture), matrix multiplication systolic array, processors, switching methodology, network topology. Multithread architecture	Theoretical	Theoretical
10	3	Pipeline Mechanism	instruction pipelining, multiple function units, internal data forwarding, linear pipeline processors, speedup, efficiency, throughput, classification of pipeline processors (arithmetic, instruction).	Theoretical	Theoretical
11	3	Pipeline Mechanism	Hazard types (data, structural, and control), hazards handling and reducing, role of cache memory on pipeline system.	Theoretical	Theoretical

12	3	Branch Handling	Techniques of branch handling (pipelining, looping, out of order execution, software scheduling), predicted execution, speculative loading,	Theoretical	Theoretical
13	3	Branch Handling	superscalar processors, very large instruction word processor VLIW, case study (Pentium Processor).	Theoretical	Theoretical
14	3	Interconnection Networks	static versus dynamic SIMD networks, network performance static networks (linear, tree, torus, cube, hypercube, mesh, ring).	Theoretical	Theoretical
15	3	Interconnection Networks	Dynamic interconnection networks; switches versus links, single stage network (shuffle exchange), multistage interconnection networks MIN (perfect shuffle, inverse shuffle, bit reversal, and butterfly) Omega MIN	Theoretical	Theoretical

11. Course Evaluation

Midterm Exam: 30%
Teacher assessment: 10%
Final Exam: 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	M. RAFIQUZZAMAN, “Fundamentals of Digital Logic and

	Microcomputer Design", Fifth Edition
Main references (sources)	
Recommended books and references (scientific journals, reports...)	websites. Libraries sites in international universities.
Electronic References, Websites	