

**Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department**



Academic Program and Course Description Guide

2024

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

Academic Program Description: The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

Learning Outcomes: A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

Academic Program Description Form

University Name: Diyala

Faculty/Institute: College of Engineering

Scientific Department: Department of Communication Engineering

Academic or Professional Program Name: Bachelor

Final Certificate Name: Bachelor of science in Communication engineering

Academic System: Course

Description Preparation Date: 24/4/2024

File Completion Date: 24/4/2024

Signature:

Head of Department Name:Date:

Assit-Prof. Mohammed S. Saleh

Signature:

Scientific Associate Name:Date:



The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance

Department:Date:

Signature:

Approval of the Dean

Prof. Dr. Anwar A. Khatun

25, April 2024

1. Program Vision

The department going to develop the curriculum in line with modern scientific developments in the field of communications engineering in addition to completing all the special requirements of scientific laboratories in the department. We seek to improve the staffed of teaching by dispatching members of Department of postgraduate in both inside and outside the country, and configure the appropriate conditions for scientific research in order to get Degrees required to be a Department able to compete in its own right and marked with the corresponding sections only local of which or the Arab and international Our ambitions We aspire to open graduate studies for a master's certificate in the disciplines of engineering various communication to be Department of scientific expertise to attract local and international center of which to open the horizons of cooperation through conferences, consulting, training, scientific research and development through broad and orderly opening to the community.

2. Program Mission

Expanding educational base and their applications in modern field of telematics and communications across both the international network and devices and cellular all advanced communication systems form that meets the need of institutions, both belonging to the state or the private sector through education, training and rehabilitation input from Human Resources (students) and make them able to deal with modern techniques and working in different institutions efficiently and effectively serve our dear country march.

3. Program Objectives

Teach students studying in the department on techniques required in all areas of modern communication systems and their applications in scientific and field state departments. Qualify graduates capable of working in government departments and the private sector engineering staff specialist efficiently and effectively. Contribute to provide an advanced level of related activities and the realization of the institutions experience and lead to the fulfillment of their need of human resources in order to achieve their success and the evolution and continuation.

4. Program Accreditation

None

5. Other external influences

None

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution requirements	5	6	4.24%	
College requirements	9	20	14.20%	
Department requirements	46	115	81.56%	
Summer Training				Graduation Requirements
Others				

7. Program Description

Course Name	Course Code	Level/Year	Credit Hours	
			Practical	Theory
Democracy & human Rights	U 101	Second - First	-	2
Workshop skills	COE 107	Second - First	3	-
Computer skills	U 103	First - First	3	1
English Language	U 104	First - First	-	2
Engineering Drawing	COE 106	First - First	3	-
Mathematics -I	E 101	First - First	-	4
Mathematics -II	E 102	Second - First	-	4
Electronic Physics	COE 104	Second - First	-	4
C++ Programming	COE 105	Second - First	3	1
Digital Techniques	COE103	First - First	2	4
Electrical Engineering Fundamentals I	COE 101	First - First	2	6
Electrical Engineering Fundamentals II	COE102	Second - First	2	6
Arabic Language	U 108	Second - First	-	2
Applied Mathematics –I	E201	First - Second	-	4
Applied Mathematics –II	E202	Second -Second	-	4
Electronic Circuits I	COE201	First - Second	2	2
Signals and Systems	COE202	First - Second	2	3

Communication Transmission Lines	COE203	First - Second	-	2
Probability and Random Processes	COE204	First - Second	-	4
Electric Circuits I	COE205	First - Second	2	3
Electromagnetic Fields I	COE206	First - Second	-	2
MATLAB Programming	COE207	First - Second	2	1
Electromagnetic Fields II	COE208	Second -Second	-	3
Analog Communication Systems	COE209	Second -Second	2	3
Electric Circuits II	COE210	Second -Second	2	3
Electronic Circuits II	COE211	Second -Second	2	2
Neural Network Engineering	COE212	Second -Second	2	1
Numerical Methods	COE213	Second -Second	2	2
Automatic Control Theory	COE214	Second -Second	-	2
Engineering Economy	E301	First - Third	-	2
Engineering Analysis	COE301	First - Third	-	2
Digital Communication I	COE302	First - Third	2	3
Antenna Theory and Design	COE303	First - Third	2	3
Digital Signal Processing	COE304	First - Third	2	3
Microcontroller and DSP Systems	COE305	First - Third	2	2
Communication Electronics -I	COE306	First - Third	2	3
Optical Communication Systems	COE307	First - Third	-	2
Detection and Estimation Theory	COE308	Second -Third	-	3
Digital Communication II	COE309	Second -Third	2	3
Image Processing	COE310	Second -Third	2	2
Information Theory	COE311	Second -Third	-	3
Radar Systems	COE312	Second -Third	2	2
Computer Networks	COE313	Second -Third	2	2
Waves Propagation	COE314	Second -Third	-	2
Communication Electronics -II	COE315	Second -Third	2	2
Engineering Profession Ethics	E401	First - Fourth	-	1
Graduation Project	E402	Fourth	8	-
Microwave Engineering-I	COE401	First - Fourth	2	3
Modern Communication Systems	COE402	First - Fourth	-	3
Cellular Mobile Networks	COE403	First - Fourth	-	2
Cryptography for Communication Systems	COE404	First - Fourth	-	2
Satellite Communication Systems	COE405	First - Fourth	-	2
Microwave Engineering-II	COE406	Second - Fourth	2	3
Global Positioning Systems	COE407	Second - Fourth	-	2
Multimedia Communication	COE408	Second - Fourth	-	2
Telecom Switching Systems	COE409	Second - Fourth	-	2
Television and Broadcasting Systems	COE410	Second - Fourth	-	2

8. Expected learning outcomes of the program	
Knowledge	
A. Cognitive goals A1. - Understanding and teaching the student the principles of how signal work and how to deal with communication algorithms. A2- Enabling students to obtain knowledge and understanding in working on and designing signal and system . A3- The student understands the methods of forming signal and system parts and their interconnection. A4- Enabling students to obtain knowledge and understanding of designing everything related to optical signal and system. A5- Enabling students to obtain knowledge and understanding of diagnosing faults and maintaining various signal and system devices. A6- The student understands the foundations of solving communication problems, cellular networks, and etc.	
Skills	
A. The skills goals special to the program. B1 - Explanation of communication principles topics by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning. B2 - Providing them with skills to solve practical problems related to various communication systems and algorithms for addressing and solving technical problems in various fields of Communication engineering. B3 – Obtaining experience to explore and develop communication systems and its algorithms.	
Ethics	
A. Affective and value goals C1- Enabling students to think and analyze topics related to the engineering framework, such as various logical circuits. C2- Enabling students to think and analyze topics related to Communication systems related to the engineering framework. C3- Enabling students to think and analyze topics related to solving practical problems.	

9. Teaching and Learning Strategies	
☐ Providing students with the basics, additional topics, and field experiences related to the outcomes of thinking and analysis. ☐ Forming discussion circles during or outside lectures to discuss scientific	

engineering topics that require thinking and analysis.

- ☐ Asking students a set of thinking questions during lectures, such as (what, how, when, why) for specific topics.

10. Evaluation methods

- ☐ Daily exams with practical and scientific questions.
- ☐ Participation marks for difficult competition questions among students.
- ☐ Assigning grades to homework assignments and reports assigned to them.
- ☐ Semester exams for the curriculum in addition to the final exam.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	Electronic & communications	Communications			1	
Assist. Prof.	Communications	Communications techniques			1	
Assist. Prof.	Electronic & communications	Communications			3	
Assist. Prof.	Electric Eng.	Electronic & communications			3	
Assist. Prof.	Physics	Electro-optics			1	
Assist. Prof.	Physics	Nano technology			1	
Assist. Prof.	Communications	Communications			1	
Assist. Prof.	Info. & Comm. Eng.	Image processing			1	
Assist. Prof.	Elect. & Electronic Eng.	Communications				1
Assist. Prof.	Electro-optics and laser	Optoelectronics			1	
Lecturer	Elect. & Electronic Eng.	Electronics			1	1

Lecturer	Communications	Communications			1	1
Assist. Lecturer	Communications	Communications			3	
Assist. Lecturer	Elect. & Electronic Eng.	Electronics			1	
Assist. Lecturer	Electronic & communications	Communications			2	
Assist. Lecturer	Electric Eng.	Electronic & communications			1	

Professional Development

Mentoring new faculty members

Faculty members are instructed to hold regular meetings and review questionnaires received from students with the Scientific Committee.

Professional development of faculty members

The teaching staff undergoes development through training, workshops, and seminars. Progress is evaluated by subject performance.

12. Acceptance Criterion

According to the rules and regulations of Ministry of Higher Education and Scientific Research.

13. The most important sources of information about the program

- College website.
- The department's website and contact the department by email.

14. Program Development Plan

- The courses are updated annually to keep up with developments of the world.
- The laboratories are also updated under academic curricula.
- Additionally, postgraduate programs are now being offered.

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
Third / first semester	E301	Engineering Economy	Basic	√	√	√	√	√	√	√		√	√	√	

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

Course Description Form

1. Course Name:					
Engineering Economy					
2. Course Code:					
E301					
3. Semester / Year:					
First – Third					
4. Description Preparation Date:					
24-4-2024					
5. Available Attendance Forms:					
None					
6. Number of Credit Hours (Total) / Number of Units (Total)					
30 h /					
7. Course administrator's name (mention all, if more than one name)					
Name: Assi. Prof. Marwa Mohammed Jawad					
Email: marwa_al-sultani_ENG@uodiyala.edu.iq					
8. Course Objectives					
Course Objectives		The Engineering Economics course aims to provide the basic definitions and introductory concepts of engineering economics. Use engineering economic factors and various methods to evaluate alternatives. Incorporate the effects of inflation and/or depreciation and/or taxation into economic analysis when necessary. As well as how to use basic methods of economic science in engineering economic analysis. Provide a strong physical and analytical understanding of engineering economics in order to work as a communications engineer in an engineering firm dealing with projects.			
9. Teaching and Learning Strategies					
Strategy		In this course, students are guided by: - Using different examples. - Using different styles of discussion that aim to connect the theoretical and practical sides. - Asking questions and giving exercises that require analysis and conclusions related to lectures. - Encourage students to participate in discussions and do the practical work. Encourage students to work in groups.			
10. Course Structure					
Week	Hours	Required Learning	Unit or subject name	Learning method	Evaluation

		Outcomes			method
First-second	4	Learn the theoretical and conceptual basis of engineering economics	Fundamentals and principles of Engineering Economy. Equivalence and compound interest formula.	Lecture PDF power point Video	Daily exams + monthly exams
Third – Seventh	10	The student learns to calculate decision criteria for single and multiple alternatives	Single payment model. Uniform payment model. Gradient payment model. Decision criteria for single and multiple alternatives: Present worth, annual worth, future worth, annual rate of return	Lecture PDF power point Video	Daily exams + monthly exams
Eighth - Tenth	6	The student learns economic laws and how to compare projects	benefit cost ratio. Before and after tax analysis. Economic laws. Comparison among projects.	Lecture PDF power point Video	Daily exams + monthly exams
Eleventh-Fifteenth	10	The student learns cost estimation, strategic planning and project management	Projects evaluation. Replacement. Inflation. Cost estimation, cost control monitoring and accounting, Strategic planning, Stakeholder management, procurement management and risk management	Lecture PDF power point Video	Daily exams + monthly exams

11. Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports.....etc	
12. Learning and Teaching Resources	
Required textbooks (curriculum books, if any)	• Leland T. Blank, Anthony J. Tarquin "Engineering Economy" 7th edition, McGraw-Hill International Edition, 2012. • William G. Sullivan, Elin M. Wicks and James T. Luxhoj "Engineering Economy" 14th edition, Prentice Hall, 2009 • Chan S. Park, "Fundamentals of Engineering Economy" 2nd edition, Prentice Hall, 2009 • Joseph C. Hartman, "Engineering Economy and the Decision Making Process" Prentice Hall, 2007 • N. M. Fraser and E. M. Jewkes, Engineering Economics: Financial Decision Making for Engineers, 5th edition, Pearson, Toronto, Ontario, 2013 • D. G. Newnan, J. Whittaker, T. G. Eschenbach and J. P. Lavelle, Engineering Economic Analysis, 3rd edition, Don Mills, Toronto, Ontario, 2014. • J. A. White, K. E. Case and D. B. Pratt, Principles of Engineering Economic Analysis, 5th edition, Hoboken, NJ, USA, 2010.
Main references (sources)	• Lectures given by the subject teacher • Books available in the college library
Recommended books and references (scientific journals, reports, etc.)	All serious scientific journals and periodicals related to the subject of engineering economics and its laws.
Electronic references, websites	All websites that specialize in explaining engineering economy

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4. Program Accreditation

None

5. Other external influences

None

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution requirements	5	6	4.24%	
College requirements	9	20	14.20%	
Department requirements	46	115	81.56%	
Summer Training				Graduation Requirements
Others				

7. Program Description

Course Name	Course Code	Level/Year	Credit Hours	
			Practical	Theory
Democracy & human Rights	U 101	Second - First	-	2
Workshop skills	COE 107	Second - First	3	-
Computer skills	U 103	First - First	3	1
English Language	U 104	First - First	-	2
Engineering Drawing	COE 106	First - First	3	-
Mathematics -I	E 101	First - First	-	4
Mathematics -II	E 102	Second - First	-	4
Electronic Physics	COE 104	Second - First	-	4
C++ Programming	COE 105	Second - First	3	1
Digital Techniques	COE103	First - First	2	4
Electrical Engineering Fundamentals I	COE 101	First - First	2	6
Electrical Engineering Fundamentals II	COE102	Second - First	2	6
Arabic Language	U 108	Second - First	-	2
Applied Mathematics –I	E201	First - Second	-	4
Applied Mathematics –II	E202	Second -Second	-	4
Electronic Circuits I	COE201	First - Second	2	2
Signals and Systems	COE202	First - Second	2	3

Communication Transmission Lines	COE203	First - Second	-	2
Probability and Random Processes	COE204	First - Second	-	4
Electric Circuits I	COE205	First - Second	2	3
Electromagnetic Fields I	COE206	First - Second	-	2
MATLAB Programming	COE207	First - Second	2	1
Electromagnetic Fields II	COE208	Second -Second	-	3
Analog Communication Systems	COE209	Second -Second	2	3
Electric Circuits II	COE210	Second -Second	2	3
Electronic Circuits II	COE211	Second -Second	2	2
Neural Network Engineering	COE212	Second -Second	2	1
Numerical Methods	COE213	Second -Second	2	2
Automatic Control Theory	COE214	Second -Second	-	2
Engineering Economy	E301	First - Third	-	2
Engineering Analysis	COE301	First - Third	-	2
Digital Communication I	COE302	First - Third	2	3
Antenna Theory and Design	COE303	First - Third	2	3
Digital Signal Processing	COE304	First - Third	2	3
Microcontroller and DSP Systems	COE305	First - Third	2	2
Communication Electronics -I	COE306	First - Third	2	3
Optical Communication Systems	COE307	First - Third	-	2
Detection and Estimation Theory	COE308	Second -Third	-	3
Digital Communication II	COE309	Second -Third	2	3
Image Processing	COE310	Second -Third	2	2
Information Theory	COE311	Second -Third	-	3
Radar Systems	COE312	Second -Third	2	2
Computer Networks	COE313	Second -Third	2	2
Waves Propagation	COE314	Second -Third	-	2
Communication Electronics -II	COE315	Second -Third	2	2
Engineering Profession Ethics	E401	First - Fourth	-	1
Graduation Project	E402	Fourth	8	-
Microwave Engineering-I	COE401	First - Fourth	2	3
Modern Communication Systems	COE402	First - Fourth	-	3
Cellular Mobile Networks	COE403	First - Fourth	-	2
Cryptography for Communication Systems	COE404	First - Fourth	-	2
Satellite Communication Systems	COE405	First - Fourth	-	2
Microwave Engineering-II	COE406	Second - Fourth	2	3
Global Positioning Systems	COE407	Second - Fourth	-	2
Multimedia Communication	COE408	Second - Fourth	-	2
Telecom Switching Systems	COE409	Second - Fourth	-	2
Television and Broadcasting Systems	COE410	Second - Fourth	-	2

8. Expected learning outcomes of the program	
Knowledge	
A. Cognitive goals A1. - Understanding and teaching the student the principles of how signal work and how to deal with communication algorithms. A2- Enabling students to obtain knowledge and understanding in working on and designing signal and system . A3- The student understands the methods of forming signal and system parts and their interconnection. A4- Enabling students to obtain knowledge and understanding of designing everything related to optical signal and system. A5- Enabling students to obtain knowledge and understanding of diagnosing faults and maintaining various signal and system devices. A6- The student understands the foundations of solving communication problems, cellular networks, and etc.	
Skills	
A. The skills goals special to the program. B1 - Explanation of communication principles topics by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning. B2 - Providing them with skills to solve practical problems related to various communication systems and algorithms for addressing and solving technical problems in various fields of Communication engineering. B3 – Obtaining experience to explore and develop communication systems and its algorithms.	
Ethics	
A. Affective and value goals C1- Enabling students to think and analyze topics related to the engineering framework, such as various logical circuits. C2- Enabling students to think and analyze topics related to Communication systems related to the engineering framework. C3- Enabling students to think and analyze topics related to solving practical problems.	

9. Teaching and Learning Strategies	
☐ Providing students with the basics, additional topics, and field experiences related to the outcomes of thinking and analysis. ☐ Forming discussion circles during or outside lectures to discuss scientific	

engineering topics that require thinking and analysis.

- ☐ Asking students a set of thinking questions during lectures, such as (what, how, when, why) for specific topics.

10. Evaluation methods

- ☐ Daily exams with practical and scientific questions.
- ☐ Participation marks for difficult competition questions among students.
- ☐ Assigning grades to homework assignments and reports assigned to them.
- ☐ Semester exams for the curriculum in addition to the final exam.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	Electronic & communications	Communications			1	
Assist. Prof.	Communications	Communications techniques			1	
Assist. Prof.	Electronic & communications	Communications			3	
Assist. Prof.	Electric Eng.	Electronic & communications			3	
Assist. Prof.	Physics	Electro=optics			1	
Assist. Prof.	Physics	Nano technology			1	
Assist. Prof.	Communications	Communications			1	
Assist. Prof.	Info. & Comm. Eng.	Image processing			1	
Assist. Prof.	Elect. & Electronic Eng.	Communications				1
Assist. Prof.	Electro-optics and laser	Optoelectronics			1	
Lecturer	Elect. & Electronic Eng.	Electronics			1	1

Lecturer	Communications	Communications			1	1
Assist. Lecturer	Communications	Communications			3	
Assist. Lecturer	Elect. & Electronic Eng.	Electronics			1	
Assist. Lecturer	Electronic & communications	Communications			2	
Assist. Lecturer	Electric Eng.	Electronic & communications			1	

Professional Development

Mentoring new faculty members

Faculty members are instructed to hold regular meetings and review questionnaires received from students with the Scientific Committee.

Professional development of faculty members

The teaching staff undergoes development through training, workshops, and seminars. Progress is evaluated by subject performance.

12. Acceptance Criterion

According to the rules and regulations of Ministry of Higher Education and Scientific Research.

13. The most important sources of information about the program

- College website.
- The department's website and contact the department by email.

14. Program Development Plan

- The courses are updated annually to keep up with developments of the world.
- The laboratories are also updated under academic curricula.
- Additionally, postgraduate programs are now being offered.

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
Third/ First semester	COE301	Engineering analysis	Basic	√	√	√	√	√	√	√		√	√	√	

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

Course Description Form

1. Course Name:	
Engineering analysis	
2. Course Code:	
COE301	
3. Semester / Year:	
First – Third	
4. Description Preparation Date:	
24-4-2024	
5. Available Attendance Forms:	
None	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 h	
7. Course administrator's name (mention all, if more than one name)	
Name: Assi. Prof. Israa Hazem Ali Email: Israa_Hassan_ENG@uodiyala.edu.iq	
8. Course Objectives	
Course Objectives	1. Matrix Analysis: Singular and non-singular matrices, Rank of a matrix, Elementary operations and equivalent matrices, Consistency of a set of equations, Uniqueness of solutions of sets of equations, 2. Inverse method, Row transformation method, Gaussian elimination method, triangular decomposition method, Comparison of methods. 3. Eigenvalues and eigenvectors, Cayley-Hamilton theorem, 4. Systems of first-order ordinary differential equations, Diagonalisation of a matrix, Systems of second-order differential equations, Matrix transformation, Rotation of axes, application of matrices to electric cct. 5. Interpolation: Polynomials, Curve Fitting, and Interpolation, Extrapolation. 6. Solution of Differential Equation by Power Series: Legendre's equation, Legendre's polynomials, Bessel function of the first and second order kinds, Bessel function properties.
9. Teaching and Learning Strategies	
Strategy	In this course, students are guided by: - Using different examples. - Using different styles of discussion that aim to connect the theoretical and practical sides. - Asking questions and giving exercises that require analysis and conclusions related to lectures.

	• Encourage students to participate in discussions and do the practical work. • Encourage students to work in groups.
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10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1 st -2 nd	4	Singular and non-singular matrices, Rank of a matrix, Elementary operations and equivalent matrices, Consistency of a set of equations, Uniqueness of solutions of sets of equations	Matrix Analysis:	Lecture PDF power point Video	Daily exams + monthly exams
3 rd -4 th	4	Inverse method, Row transformation method, Gaussian elimination method, triangular decomposition method, Comparison of methods.	Matrix Analysis:	Lecture PDF power point Video	Daily exams + monthly exams
5 th -6 th	4	Eigenvalues and eigenvectors, Cayley-Hamilton theorem	Matrix Analysis:	Lecture PDF power point Video	Daily exams + monthly exams
7 th -9 th	6	Systems of first-order ordinary differential equations, Diagonalisation of a matrix, Systems of second-order differential equations, Matrix transformation, Rotation of axes, application of matrices to electric cct.	Matrix Analysis:	Lecture PDF power point Video	Daily exams + monthly exams

10 th -12 th	6	Interpolation: Polynomials, Curve Fitting, and Interpolation, Extrapolation.	Interpolation:	Lecture PDF power point Video	Daily exams + monthly exams
13 th -15 th	6	Legendre's equation, Legendre's polynomials, Bessel function of the first and second order kinds, Bessel function properties	Solution of Differential Equation by Power Series	Lecture PDF power point Video	Daily exams + monthly exams

11. Course Evaluation

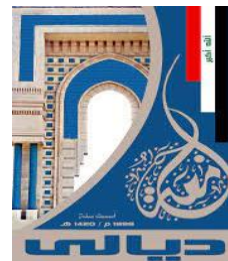
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports etc

12. Learning and Teaching Resources

Required textbooks (curriculum books, if any)	• <i>Advanced Engineering Mathematics, 3rd edition, by C. R. Wylie</i> • <i>Advanced engineering mathematics 10 th edition</i>
Main references (sources)	• <i>Lectures given by the subject teacher</i> • <i>Books available in the college library</i>
Recommended books and references (scientific journals, reports, etc.)	• <i>Mathematics for Engineers and Applied Scientists, 2nd edition, by Stanley.</i> • <i>Introductory Digital Signal Processing, 2nd edition by P. A. Lynn.</i> •
Electronic references, websites	All websites that specialize in explaining microwave



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الملحق 4: وصف المادة الدراسية

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Digital Communication I		Module Delivery
Module Type	Basic		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	COE 302		
ECTS Credits	3		
SWL (hr/sem)	100		
Module Level	3	Semester of Delivery	
Administering Department	Communication Engineering	College	College of Engineering
Module Leader	Mokhalad Abdulameer Kadhim ALSAEEDI	e-mail	mukhalad.abd@uodiyala.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	MSC
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Assoc. Prof. Montadar Abas Taher	e-mail	montadar.abas@uodiyala.edu.iq
Scientific Committee Approval Date		Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى



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Prerequisite module	COE209 Analog Communication Systems	Semester	2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. To show the main components of Digital communication systems. 2. To introduce the theory behind carrying a signal over another signal Digitally. 3. To learn how to attach a message signal to the carrier signal Digitally. 4. To show the various types of digital modulation techniques. 5. To show the effect of noise on the signals.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the main components of the digital communication system. 2. Show how to recognize the differences between digital modulation types. 3. Show how to distinguish between the different components of digital modulations. 4. Understanding digital modulation family. 5. Understanding the theory behind the generation of each digital modulation type.
Indicative Contents المحتويات الإرشادية	• Introduction to digital communication systems (3 hrs). • Pulse Modulation Techniques (12 hrs). • Multiplexing Techniques (8 hrs). • Digital Modulation Techniques (12 hrs). • Optimum Receivers for the AWGN Channel (6 hrs). • Noise in pulse modulations (4 hrs).
Description	Introduction to digital communication systems: Basic Elements of Digital Communication Systems, Communication Channels. Pulse Modulation Techniques: PAM, PWM, PPM. PCM, DPCM, DM. Adaptive Delta Modulation (ADM). Multiplexing Techniques: TDM, FDM, applications. Digital Modulation Techniques: ASK, PSK, FSK, QPSK, DPSK, DEPSK, MSK, M-ary-FSK, M-ary-PSK, QAM, M-ary-QAM. Optimum Receivers for the AWGN Channel: Receiver for Signals Corrupted by AWGN, Performance of Memoryless Modulation, Trade off of power, bandwidth, data rate, and error probability. Noise in pulse modulations.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The primary approach for administering this module is expected to motivate students to participate in the exercises while simultaneously improving and developing their capacity for critical thought. This will be accomplished via lessons, collaborative tutorials, and the consideration of straightforward trials
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including selecting tasks that are appealing to students.

Student Workload (SWL)

الحمل الدراسي للطلاب محسوب ل ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	36	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	2.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

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



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Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Basic Elements of Digital Communication Systems, and Communication Channels.
Week 2	Pulse Amplitude Modulation (PAM).
Week 3	Pulse Width Modulation (PWM), Pulse Position Modulation (PPM).
Week 4	Pulse Code Modulation (PCM), Delta Modulation (DM).
Week 5	Time Division Multiplexing (TDM) and its applications.
Week 6	Frequency Division Multiplexing (FDM) and its applications.
Week 7	Amplitude Shift Keying (ASK), Phase Shift Keying (PSK), Frequency Shift Keying (FSK).
Week 8	Quadrature-PSK, Differential-PSK, Minimum Shift Keying (MSK).
Week 9	M-Ary-FSK, M-ary-PSK.
Week 10	Quadrature Amplitude Modulation (QAM), M-ary-QAM.
Week 11	Noise in pulse modulations
Week 12	Optimum Receivers for the AWGN Channel: Receiver for Signals Corrupted by AWGN.
Week 13	Performance of Memoryless Modulation.
Week 14	Trade off of power, bandwidth, data rate, and error probability: Part: 1
Week 15	Trade off of power, bandwidth, data rate, and error probability: Part: 2



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Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Pulse Amplitude Modulation using Signal Generators and one Transistor.
Week 2	Pulse Amplitude Modulation by Student Design.
Week 3	Pulse Width Modulation using Transistor.
Week 4	Pulse Width Modulation by Student Design.
Week 5	Pulse Position Modulation: Using signal generator and 555-timer.
Week 6	Pulse Position Modulation: Using Op-Amps and 555-timer.
Week 7	Amplitude Shift Keying. Using One Transistor.
Week 8	Amplitude Shift Keying. Using One Transistor and 555-timer.
Week 9	Amplitude Shift Keying: by student design.
Week 10	Phase Shift keying.
Week 11	Phase Shift keying: by student design.
Week 12	Frequency Shift Keying Part 1.
Week 13	Frequency Shift Keying Part 2: by student design.
Week 14	Frequency Division Multiplexing Part – 1. (using signal generators)
Week 15	Frequency Division Multiplexing Part – 2. (using 555-timers)

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	- John G. Proakis, Masoud Salehi, Fundamentals of communication systems, second edition, Pearson Education, 2014, SBN: 9780133354850. - Simon Haykin, Michael Moher, Introduction to Analog and Digital Communications, Second Edition, John Wiley & Sons, 2007, ISBN: 9780471432227.	Yes
Recommended Texts	- Simon Haykin, Digital Communication Systems, first edition, Wiley, 2014, ISBN: 9780471647355. - John Proakis & Masoud Salehi, Digital Communications, fifth edition, McGraw-Hill Education, 2007, ISBN: 9780072957167.	Yes
Websites	N/A	



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Grading Scheme

مخطط الدرجات

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

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

1. Program Vision

The department going to develop the curriculum in line with modern scientific developments in the field of communications engineering in addition to completing all the special requirements of scientific laboratories in the department. We seek to improve the staffed of teaching by dispatching members of Department of postgraduate in both inside and outside the country, and configure the appropriate conditions for scientific research in order to get Degrees required to be a Department able to compete in its own right and marked with the corresponding sections only local of which or the Arab and international Our ambitions We aspire to open graduate studies for a master's certificate in the disciplines of engineering various communication to be Department of scientific expertise to attract local and international center of which to open the horizons of cooperation through conferences, consulting, training, scientific research and development through broad and orderly opening to the community.

2. Program Mission

Expanding educational base and their applications in modern field of telematics and communications across both the international network and devices and cellular all advanced communication systems form that meets the need of institutions, both belonging to the state or the private sector through education, training and rehabilitation input from Human Resources (students) and make them able to deal with modern techniques and working in different institutions efficiently and effectively serve our dear country march.

3. Program Objectives

Teach students studying in the department on techniques required in all areas of modern communication systems and their applications in scientific and field state departments. Qualify graduates capable of working in government departments and the private sector engineering staff specialist efficiently and effectively. Contribute to provide an advanced level of related activities and the realization of the institutions experience and lead to the fulfillment of their need of human resources in order to achieve their success and the evolution and continuation.

4. Program Accreditation

None

5. Other external influences

None

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution requirements	5	6	4.24%	
College requirements	9	20	14.20%	
Department requirements	46	115	81.56%	
Summer Training				Graduation Requirements
Others				

7. Program Description

Course Name	Course Code	Level/Year	Credit Hours	
			Practical	Theory
Democracy & human Rights	U 101	Second - First	-	2
Workshop skills	COE 107	Second - First	3	-
Computer skills	U 103	First - First	3	1
English Language	U 104	First - First	-	2
Engineering Drawing	COE 106	First - First	3	-
Mathematics -I	E 101	First - First	-	4
Mathematics -II	E 102	Second - First	-	4
Electronic Physics	COE 104	Second - First	-	4
C++ Programming	COE 105	Second - First	3	1
Digital Techniques	COE103	First - First	2	4
Electrical Engineering Fundamentals I	COE 101	First - First	2	6
Electrical Engineering Fundamentals II	COE102	Second - First	2	6
Arabic Language	U 108	Second - First	-	2
Applied Mathematics –I	E201	First - Second	-	4
Applied Mathematics –II	E202	Second -Second	-	4
Electronic Circuits I	COE201	First - Second	2	2
Signals and Systems	COE202	First - Second	2	3

Communication Transmission Lines	COE203	First - Second	-	2
Probability and Random Processes	COE204	First - Second	-	4
Electric Circuits I	COE205	First - Second	2	3
Electromagnetic Fields I	COE206	First - Second	-	2
MATLAB Programming	COE207	First - Second	2	1
Electromagnetic Fields II	COE208	Second -Second	-	3
Analog Communication Systems	COE209	Second -Second	2	3
Electric Circuits II	COE210	Second -Second	2	3
Electronic Circuits II	COE211	Second -Second	2	2
Neural Network Engineering	COE212	Second -Second	2	1
Numerical Methods	COE213	Second -Second	2	2
Automatic Control Theory	COE214	Second -Second	-	2
Engineering Economy	E301	First - Third	-	2
Engineering Analysis	COE301	First - Third	-	2
Digital Communication I	COE302	First - Third	2	3
Antenna Theory and Design	COE303	First - Third	2	3
Digital Signal Processing	COE304	First - Third	2	3
Microcontroller and DSP Systems	COE305	First - Third	2	2
Communication Electronics -I	COE306	First - Third	2	3
Optical Communication Systems	COE307	First - Third	-	2
Detection and Estimation Theory	COE308	Second -Third	-	3
Digital Communication II	COE309	Second -Third	2	3
Image Processing	COE310	Second -Third	2	2
Information Theory	COE311	Second -Third	-	3
Radar Systems	COE312	Second -Third	2	2
Computer Networks	COE313	Second -Third	2	2
Waves Propagation	COE314	Second -Third	-	2
Communication Electronics -II	COE315	Second -Third	2	2
Engineering Profession Ethics	E401	First - Fourth	-	1
Graduation Project	E402	Fourth	8	-
Microwave Engineering-I	COE401	First - Fourth	2	3
Modern Communication Systems	COE402	First - Fourth	-	3
Cellular Mobile Networks	COE403	First - Fourth	-	2
Cryptography for Communication Systems	COE404	First - Fourth	-	2
Satellite Communication Systems	COE405	First - Fourth	-	2
Microwave Engineering-II	COE406	Second - Fourth	2	3
Global Positioning Systems	COE407	Second - Fourth	-	2
Multimedia Communication	COE408	Second - Fourth	-	2
Telecom Switching Systems	COE409	Second - Fourth	-	2
Television and Broadcasting Systems	COE410	Second - Fourth	-	2

8. Expected learning outcomes of the program	
Knowledge	
A. Cognitive goals A1. - Understanding and teaching the student the principles of how signal work and how to deal with communication algorithms. A2- Enabling students to obtain knowledge and understanding in working on and designing signal and system . A3- The student understands the methods of forming signal and system parts and their interconnection. A4- Enabling students to obtain knowledge and understanding of designing everything related to optical signal and system. A5- Enabling students to obtain knowledge and understanding of diagnosing faults and maintaining various signal and system devices. A6- The student understands the foundations of solving communication problems, cellular networks, and etc.	
Skills	
A. The skills goals special to the program. B1 - Explanation of communication principles topics by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning. B2 - Providing them with skills to solve practical problems related to various communication systems and algorithms for addressing and solving technical problems in various fields of Communication engineering. B3 – Obtaining experience to explore and develop communication systems and its algorithms.	
Ethics	
A. Affective and value goals C1- Enabling students to think and analyze topics related to the engineering framework, such as various logical circuits. C2- Enabling students to think and analyze topics related to Communication systems related to the engineering framework. C3- Enabling students to think and analyze topics related to solving practical problems.	

9. Teaching and Learning Strategies	
☐ Providing students with the basics, additional topics, and field experiences related to the outcomes of thinking and analysis. ☐ Forming discussion circles during or outside lectures to discuss scientific	

engineering topics that require thinking and analysis.

- ☐ Asking students a set of thinking questions during lectures, such as (what, how, when, why) for specific topics.

10. Evaluation methods

- ☐ Daily exams with practical and scientific questions.
- ☐ Participation marks for difficult competition questions among students.
- ☐ Assigning grades to homework assignments and reports assigned to them.
- ☐ Semester exams for the curriculum in addition to the final exam.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	Electronic & communications	Communications			1	
Assist. Prof.	Communications	Communications techniques			1	
Assist. Prof.	Electronic & communications	Communications			3	
Assist. Prof.	Electric Eng.	Electronic & communications			3	
Assist. Prof.	Physics	Electro-optics			1	
Assist. Prof.	Physics	Nano technology			1	
Assist. Prof.	Communications	Communications			1	
Assist. Prof.	Info. & Comm. Eng.	Image processing			1	
Assist. Prof.	Elect. & Electronic Eng.	Communications				1
Assist. Prof.	Electro-optics and laser	Optoelectronics			1	
Lecturer	Elect. & Electronic Eng.	Electronics			1	1

Lecturer	Communications	Communications			1	1
Assist. Lecturer	Communications	Communications			3	
Assist. Lecturer	Elect. & Electronic Eng.	Electronics			1	
Assist. Lecturer	Electronic & communications	Communications			2	
Assist. Lecturer	Electric Eng.	Electronic & communications			1	

Professional Development

Mentoring new faculty members

Faculty members are instructed to hold regular meetings and review questionnaires received from students with the Scientific Committee.

Professional development of faculty members

The teaching staff undergoes development through training, workshops, and seminars. Progress is evaluated by subject performance.

12. Acceptance Criterion

According to the rules and regulations of Ministry of Higher Education and Scientific Research.

13. The most important sources of information about the program

- College website.
- The department's website and contact the department by email.

14. Program Development Plan

- The courses are updated annually to keep up with developments of the world.
- The laboratories are also updated under academic curricula.
- Additionally, postgraduate programs are now being offered.

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
Third/ first semester	COE304	DSP	Basic	√	√	√	√	√	√	√		√	√	√	

- 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:				
COE304				
3. Semester / Year:				
First - Third				
4. Description Preparation Date:				
24-4-2024				
5. Available Attendance Forms:				
None				
6. Number of Credit Hours (Total) / Number of Units (Total)				
30h				
7. Course administrator's name (mention all, if more than one name)				
Name: Asisst. Prof. Haraa Raheem Hatem Email: Haraa_altaie_eng@uodiyala.edu.iq				
8. Course Objectives				
Course Objectives	In this course, –students will learn: - Sampling and A/D conversion - The Fourier Transform method - Inverse Discrete Fourier Transform (IDFT) - Inverse Z-transforms - Properties of Z-transforms			
9. Teaching and Learning Strategies				
Strategy	In this course, students are guided by: - Using different examples. - Using different styles of discussion that aim to connect the theoretical and practical sides. - Asking questions and giving exercises that require analysis and conclusions related to lectures. - Encourage students to participate in discussions and do the practical work. - Encourage students to work in groups.			
10. Course Structure				
	Hou Required Learning			Evaluation

Week		Outcomes	Unit or subject name	Learning method	method
1 st	2	introduces Analog to Digital (A/D)	Analog to Digital (A/D) and Digital to Analog (D/A) Conversion	Lecture PDF power point Video	Daily exams + monthly exams
2 nd	2	Digital to Analog (D/A) Conversion	Analog to Digital (A/D) and Digital to Analog (D/A) Conversion	Lecture PDF power point Video	Daily exams + monthly exams
3 rd	2	Sampling	Sampling theorem	Lecture PDF power point Video	Daily exams + monthly exams
4 th	2	Introduction to the Z-transform.	Z-transform	Lecture PDF power point Video	Daily exams + monthly exams
5 th	2	Inverse Z-transforms	Z-transform	Lecture PDF power point Video	Daily exams + monthly exams
6 th	2	Properties of Z-transforms	Z-transform	Lecture PDF power point Video	Daily exams + monthly exams
7 th	2	Properties of DFT	Discrete Fourier Transform (DFT)	Lecture PDF power point Video	Daily exams + monthly exams

8 th	2	Inverse Discrete Fourier Transform (IDFT)	Discrete Fourier Transform (DFT)	Lecture PDF power point Video	Daily exams + monthly exams
9 th	2	Definition of Fast Fourier Transform (FFT)	Fast Fourier Transform (FFT)	Lecture PDF power point Video	Daily exams + monthly exams
10 th	2	Decimation in time FFT (DIF-FFT)	Fast Fourier Transform (FFT)	Lecture PDF power point Video	Daily exams + monthly exams
11 th	2	Decimation in Frequency FFT (DIF-FFT)	Fast Fourier Transform (FFT)	Lecture PDF power point Video	Daily exams + monthly exams
12 th	2	Applications of Fast Fourier Transform (FFT)	Fast Fourier Transform (FFT)	Lecture PDF power point Video	Daily exams + monthly exams
13 th	2	Transfer Functions	Transfer Functions	Lecture PDF power point Video	Daily exams + monthly exams
14 th	2	Discrete Time Filters	Digital Filter Design	Lecture PDF power point Video	Daily exams + monthly exams

15 th	2	Design of FIR using windows methods	Digital Filter Design	Lecture PDF power point Video	Daily exams + monthly exams
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11. Course Evaluation

Distributing the score out of 100 according to Exams (hour monthly exam 15%, three hours final exam 50%). Reports and seminars 15%, DSP Lab.10% , H.W and class activities 10%.

12. Learning and Teaching Resources

Required textbooks (curriculum books, if any)	• John G. Proakis, digital signal processing
Main references (sources)	• Lectures given by the subject teacher • Books available in the college library
Recommended books and references (scientific journals, reports, etc.)	• B.P. Poth, " signal processing and linear system" ,2009,6th edition, oxford. • T.T. Ha, Theory and Design of Digital Communication Systems", Cambridge University Press, 2011
Electronic references, websites	All websites that specialize in explaining digital signal processing

1. Program Vision

The department going to develop the curriculum in line with modern scientific developments in the field of communications engineering in addition to completing all the special requirements of scientific laboratories in the department. We seek to improve the staffed of teaching by dispatching members of Department of postgraduate in both inside and outside the country, and configure the appropriate conditions for scientific research in order to get Degrees required to be a Department able to compete in its own right and marked with the corresponding sections only local of which or the Arab and international Our ambitions We aspire to open graduate studies for a master's certificate in the disciplines of engineering various communication to be Department of scientific expertise to attract local and international center of which to open the horizons of cooperation through conferences, consulting, training, scientific research and development through broad and orderly opening to the community.

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4. Program Accreditation

None

5. Other external influences

None

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution requirements	5	6	4.24%	
College requirements	9	20	14.20%	
Department requirements	46	115	81.56%	
Summer Training				Graduation Requirements
Others				

7. Program Description

Course Name	Course Code	Level/Year	Credit Hours	
			Practical	Theory
Democracy & human Rights	U 101	Second - First	-	2
Workshop skills	COE 107	Second - First	3	-
Computer skills	U 103	First - First	3	1
English Language	U 104	First - First	-	2
Engineering Drawing	COE 106	First - First	3	-
Mathematics -I	E 101	First - First	-	4
Mathematics -II	E 102	Second - First	-	4
Electronic Physics	COE 104	Second - First	-	4
C++ Programming	COE 105	Second - First	3	1
Digital Techniques	COE103	First - First	2	4
Electrical Engineering Fundamentals I	COE 101	First - First	2	6
Electrical Engineering Fundamentals II	COE102	Second - First	2	6
Arabic Language	U 108	Second - First	-	2
Applied Mathematics –I	E201	First - Second	-	4
Applied Mathematics –II	E202	Second -Second	-	4
Electronic Circuits I	COE201	First - Second	2	2
Signals and Systems	COE202	First - Second	2	3
Communication Transmission Lines	COE203	First - Second	-	2
Probability and Random Processes	COE204	First - Second	-	4
Electric Circuits I	COE205	First - Second	2	3
Electromagnetic Fields I	COE206 ²	First - Second	-	2
MATLAB Programming	COE207	First - Second	2	1
Electromagnetic Fields II	COE208	Second -Second	-	3

Analog Communication Systems	COE209	Second -Second	2	3
Electric Circuits II	COE210	Second -Second	2	3
Electronic Circuits II	COE211	Second -Second	2	2
Neural Network Engineering	COE212	Second -Second	2	1
Numerical Methods	COE213	Second -Second	2	2
Automatic Control Theory	COE214	Second -Second	-	2
Engineering Economy	E301	First - Third	-	2
Engineering Analysis	COE301	First - Third	-	2
Digital Communication I	COE302	First - Third	2	3
Antenna Theory and Design	COE303	First - Third	2	3
Digital Signal Processing	COE304	First - Third	2	3
Microcontroller and DSP Systems	COE305	First - Third	2	2
Communication Electronics -I	COE306	First - Third	2	3
Optical Communication Systems	COE307	First - Third	-	2
Detection and Estimation Theory	COE308	Second -Third	-	3
Digital Communication II	COE309	Second -Third	2	3
Image Processing	COE310	Second -Third	2	2
Information Theory	COE311	Second -Third	-	3
Radar Systems	COE312	Second -Third	2	2
Computer Networks	COE313	Second -Third	2	2
Waves Propagation	COE314	Second -Third	-	2
Communication Electronics -II	COE315	Second -Third	2	2
Engineering Profession Ethics	E401	First - Fourth	-	1
Graduation Project	E402	Fourth	8	-
Microwave Engineering-I	COE401	First - Fourth	2	3
Modern Communication Systems	COE402	First - Fourth	-	3
Cellular Mobile Networks	COE403	First - Fourth	-	2
Cryptography for Communication Systems	COE404	First - Fourth	-	2
Satellite Communication Systems	COE405	First - Fourth	-	2
Microwave Engineering-II	COE406	Second - Fourth	2	3
Global Positioning Systems	COE407	Second - Fourth	-	2
Multimedia Communication	COE408	Second - Fourth	-	2
Telecom Switching Systems	COE409	Second - Fourth	-	2
Television and Broadcasting Systems	COE410	Second - Fourth	-	2

8. Expected learning outcomes of the program

Knowledge

A. Cognitive goals

A1. - Understanding and teaching the student the principles of how signal work and how to deal with communication algorithms.

A2- Enabling students to obtain knowledge and understanding in working on

and designing signal and system.

A3- The student understands the methods of forming signal and system parts and their interconnection.

A4- Enabling students to obtain knowledge and understanding of designing everything related to optical signal and system.

A5- Enabling students to obtain knowledge and understanding of diagnosing faults and maintaining various signal and system devices.

A6- The student understands the foundations of solving communication problems, cellular networks, and etc.

Skills

A. The skills goals special to the program.

B1 - Explanation of communication principles topics by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning.

B2 - Providing them with skills to solve practical problems related to various communication systems and algorithms for addressing and solving technical problems in various fields of Communication engineering.

B3 – Obtaining experience to explore and develop communication systems and its algorithms.

Ethics

A. Affective and value goals

C1- Enabling students to think and analyze topics related to the engineering framework, such as various logical circuits.

C2- Enabling students to think and analyze topics related to Communication systems related to the engineering framework.

C3- Enabling students to think and analyze topics related to solving practical problems.

9. Teaching and Learning Strategies

☐ Providing students with the basics, additional topics, and field experiences related to the outcomes of thinking and analysis.

☐ Forming discussion circles during or outside lectures to discuss scientific engineering topics that require thinking and analysis.

☐ Asking students a set of thinking questions during lectures, such as (what, how, when, why) for specific topics.

10. Evaluation methods

☐ Daily exams with practical and scientific questions.

☐ Participation marks for difficult competition questions among students.

☐ Assigning grades to homework assignments and reports assigned to them.

☐ Semester exams for the curriculum in addition to the final exam.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	Electronic & communications	Communications			1	
Assist. Prof.	Communications	Communications techniques			1	
Assist. Prof.	Electronic & communications	Communications			3	
Assist. Prof.	Electric Eng.	Electronic & communications			3	
Assist. Prof.	Physics	Electro=optics			1	
Assist. Prof.	Physics	Nano technology			1	
Assist. Prof.	Communications	Communications			1	
Assist. Prof.	Info. & Comm. Eng.	Image processing			1	
Assist. Prof.	Elect. & Electronic Eng.	Communications				1
Assist. Prof.	Electro-optics and laser	Optoelectronics			1	
Lecturer	Elect. & Electronic Eng.	Electronics			1	1
Lecturer	Communications	Communications			1	1
Assist. Lecturer	Communications	Communications			3	
Assist. Lecturer	Elect. & Electronic Eng.	Electronics			1	
Assist. Lecturer	Electronic & communications	Communications			2	
Assist. Lecturer	Electric Eng.	Electronic & communications			1	

Professional Development

Mentoring new faculty members

Faculty members are instructed to hold regular meetings and review questionnaires received from students with the Scientific Committee.

Professional development of faculty members

The teaching staff undergoes development through training, workshops, and seminars. Progress is evaluated by subject performance.

12. Acceptance Criterion

According to the rules and regulations of Ministry of Higher Education and Scientific Research.

13. The most important sources of information about the program

- College website.
- The department's website and contact the department by email.

14. Program Development Plan

- The courses are updated annually to keep up with developments of the world.
- The laboratories are also updated under academic curricula.
- Additionally, postgraduate programs are now being offered.

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
Third Year/ First Semester	COE305	Microcontroller and DSP Systems	Basic	√	√	√	√	√	√	√		√	√	√	

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

Course Description Form

1. Course Name: Microcontroller and DSP Systems	
2. Course Code: COE305	
3. Semester / Year: Third Year/ first Semester	
4. Description Preparation Date:	
24-4-2024	
5. Available Attendance Forms:	
None	
6. Number of Credit Hours (Total) / Number of Units (Total): 30	
7. Course administrator's name (mention all, if more than one name)	
Lecturer Name: Yousif Allbadi Email: yousifallbadi@uodiyala.edu.iq	
8. Course Objectives	
Course Objectives	1. The student learns about the basics of the Microprocessor and the Microcontroller and can be able to comparison between them. 2. The student learns about the basics of Embedded Systems (Hardware & Software). 3. The student learns about the basics of Digital Signal Processing Systems (Hardware & Software). 4. The student learns about the Arduino Types and Hardware Description. 5. The student learns about the Arduino software (IDE) and program structure. 6. Identify and be able to explain the data types and functions of the Arduino. 7. Identify and be able to explain the variables & Constants and how to treat them. 8. Being able to test the IDE program to run the pulse width modulation. 9. The student will be able to write Arduino codes to run some basic tasks. 10. The student will also be able to Programming Techniques: Program Design and Development, Relational Operators and Logical

	Variables, Logical Operators and Functions, Conditional Statements, Loops, The Switch Structure, and Debugging Arduino Lab Programs. 11. The student will be able to use the Arduino board and connect other devices to implement some laboratory experiments
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9. Teaching and Learning Strategies

Strategy	In this course, students are guided by: 1. Using different examples. 2. Using different styles of discussion that aim to connect the theoretical and practical sides. 3. Asking questions and giving exercises that require analysis and conclusions related to lectures. 4. Encourage students to participate in discussions and do practical work. 5. Encourage students to work in groups.
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10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1	2	The student will be able to understand and analyze all the requirements of this subject in Introduction to Microprocessor & Microcontroller.	Introduction to Microcontroller (Hardware & Software).	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 2	2	The student will be able to understand and analyze all the requirements of this subject in The applications of the Microcontrollers.	Embedded Systems (Hardware & Software).	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 3	2	The student will be able to understand and analyze all the requirements of this subject in The working principle of the embedded systems and their applications.	DSP Systems (Hardware & Software).	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 4	2	The student will be able to understand and analyze all the requirements of this subject in The working principle of the DSP systems and their applications.	Arduino Types and hardware description	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams

Week 5	2	The student will be able to understand and analyze all the requirements of this subject in Introduction to Arduino.	Arduino software and program structure	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 6	2	The student will be able to understand and analyze all the requirements of this subject in Arduino Types and Applications	Arduino Data Types and Functions	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 7	2	The student will be able to understand and analyze all the requirements of this subject in Arduino Hardware Description.	Arduino Variables & Constants and operators	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 8	2	The student will be able to understand and analyze all the requirements of this subject in Arduino software and program structure.	Arduino Control Statements and Loop	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 9	2	The student will be able to understand and analyze all the requirements of this subject in Arduino Data Types and Functions.	Arduino Functions, Time, and Libraries	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 10	2	The student will be able to understand and analyze all the requirements of this subject in Arduino Variables & Constants.	Arduino Functions, Time, and Libraries	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 11	2	The student will be able to understand and analyze all the requirements of this subject in Arduino operators.	operators.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 12	2	The student will be able to understand and analyze all the requirements of this subject in Control Statements and Loop.	Control Statements and Loop.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams

Week 13	2	The student will be able to understand and analyze all the requirements of this subject in Functions, Time, and Libraries.	Libraries.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 14	2	The student will be able to understand and analyze all the requirements of this subject in Pulse Width Modulation.	Arduino Pulse Width Modulation	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 15	2	The student will be able to understand and analyze all the requirements of this subject in Arduino Projects.		Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 16	2	Preparatory week before the final exam		Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams

11. Course Evaluation					
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports..... etc					
12. Learning and Teaching Resources					
Required textbooks (curricular books, if any)			Arduino Tutorials Point.		
Main references (sources)					
Recommended books and references (scientific journals, reports...)			Arduino Cookbook: Recipes to Begin, Expand, and Enhance Your Projects, Michael Margolis		
Electronic References, Websites			https://www.arduino.cc/en/Tutorial/HomePage		

1. Program Vision

The department going to develop the curriculum in line with modern scientific developments in the field of communications engineering in addition to completing all the special requirements of scientific laboratories in the department. We seek to improve the staffed of teaching by dispatching members of Department of postgraduate in both inside and outside the country, and configure the appropriate conditions for scientific research in order to get Degrees required to be a Department able to compete in its own right and marked with the corresponding sections only local of which or the Arab and international Our ambitions We aspire to open graduate studies for a master's certificate in the disciplines of engineering various communication to be Department of scientific expertise to attract local and international center of which to open the horizons of cooperation through conferences, consulting, training, scientific research and development through broad and orderly opening to the community.

2. Program Mission

Expanding educational base and their applications in modern field of telematics and communications across both the international network and devices and cellular all advanced communication systems form that meets the need of institutions, both belonging to the state or the private sector through education, training and rehabilitation input from Human Resources (students) and make them able to deal with modern techniques and working in different institutions efficiently and effectively serve our dear country march.

3. Program Objectives

Teach students studying in the department on techniques required in all areas of modern communication systems and their applications in scientific and field state departments. Qualify graduates capable of working in government departments and the private sector engineering staff specialist efficiently and effectively. Contribute to provide an advanced level of related activities and the realization of the institutions experience and lead to the fulfillment of their need of human resources in order to achieve their success and the evolution and continuation.

4. Program Accreditation

None

5. Other external influences

None

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution requirements	5	6	4.24%	
College requirements	9	20	14.20%	
Department requirements	46	115	81.56%	
Summer Training				Graduation Requirements
Others				

7. Program Description

Course Name	Course Code	Level/Year	Credit Hours	
			Practical	Theory
Democracy & human Rights	U 101	Second - First	-	2
Workshop skills	COE 107	Second - First	3	-
Computer skills	U 103	First - First	3	1
English Language	U 104	First - First	-	2
Engineering Drawing	COE 106	First - First	3	-
Mathematics -I	E 101	First - First	-	4
Mathematics -II	E 102	Second - First	-	4
Electronic Physics	COE 104	Second - First	-	4
C++ Programming	COE 105	Second - First	3	1
Digital Techniques	COE103	First - First	2	4
Electrical Engineering Fundamentals I	COE 101	First - First	2	6
Electrical Engineering Fundamentals II	COE102	Second - First	2	6
Arabic Language	U 108	Second - First	-	2
Applied Mathematics –I	E201	First - Second	-	4
Applied Mathematics –II	E202	Second -Second	-	4
Electronic Circuits I	COE201	First - Second	2	2
Signals and Systems	COE202	First - Second	2	3

Communication Transmission Lines	COE203	First - Second	-	2
Probability and Random Processes	COE204	First - Second	-	4
Electric Circuits I	COE205	First - Second	2	3
Electromagnetic Fields I	COE206	First - Second	-	2
MATLAB Programming	COE207	First - Second	2	1
Electromagnetic Fields II	COE208	Second -Second	-	3
Analog Communication Systems	COE209	Second -Second	2	3
Electric Circuits II	COE210	Second -Second	2	3
Electronic Circuits II	COE211	Second -Second	2	2
Neural Network Engineering	COE212	Second -Second	2	1
Numerical Methods	COE213	Second -Second	2	2
Automatic Control Theory	COE214	Second -Second	-	2
Engineering Economy	E301	First - Third	-	2
Engineering Analysis	COE301	First - Third	-	2
Digital Communication I	COE302	First - Third	2	3
Antenna Theory and Design	COE303	First - Third	2	3
Digital Signal Processing	COE304	First - Third	2	3
Microcontroller and DSP Systems	COE305	First - Third	2	2
Communication Electronics -I	COE306	First - Third	2	3
Optical Communication Systems	COE307	First - Third	-	2
Detection and Estimation Theory	COE308	Second -Third	-	3
Digital Communication II	COE309	Second -Third	2	3
Image Processing	COE310	Second -Third	2	2
Information Theory	COE311	Second -Third	-	3
Radar Systems	COE312	Second -Third	2	2
Computer Networks	COE313	Second -Third	2	2
Waves Propagation	COE314	Second -Third	-	2
Communication Electronics -II	COE315	Second -Third	2	2
Engineering Profession Ethics	E401	First - Fourth	-	1
Graduation Project	E402	Fourth	8	-
Microwave Engineering-I	COE401	First - Fourth	2	3
Modern Communication Systems	COE402	First - Fourth	-	3
Cellular Mobile Networks	COE403	First - Fourth	-	2
Cryptography for Communication Systems	COE404	First - Fourth	-	2
Satellite Communication Systems	COE405	First - Fourth	-	2
Microwave Engineering-II	COE406	Second - Fourth	2	3
Global Positioning Systems	COE407	Second - Fourth	-	2
Multimedia Communication	COE408	Second - Fourth	-	2
Telecom Switching Systems	COE409	Second - Fourth	-	2
Television and Broadcasting Systems	COE410	Second - Fourth	-	2

8. Expected learning outcomes of the program	
Knowledge	
A. Cognitive goals A1. - Understanding and teaching the student the principles of how signal work and how to deal with communication algorithms. A2- Enabling students to obtain knowledge and understanding in working on and designing signal and system . A3- The student understands the methods of forming signal and system parts and their interconnection. A4- Enabling students to obtain knowledge and understanding of designing everything related to optical signal and system. A5- Enabling students to obtain knowledge and understanding of diagnosing faults and maintaining various signal and system devices. A6- The student understands the foundations of solving communication problems, cellular networks, and etc.	
Skills	
A. The skills goals special to the program. B1 - Explanation of communication principles topics by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning. B2 - Providing them with skills to solve practical problems related to various communication systems and algorithms for addressing and solving technical problems in various fields of Communication engineering. B3 – Obtaining experience to explore and develop communication systems and its algorithms.	
Ethics	
A. Affective and value goals C1- Enabling students to think and analyze topics related to the engineering framework, such as various logical circuits. C2- Enabling students to think and analyze topics related to Communication systems related to the engineering framework. C3- Enabling students to think and analyze topics related to solving practical problems.	

9. Teaching and Learning Strategies	
☐ Providing students with the basics, additional topics, and field experiences related to the outcomes of thinking and analysis. ☐ Forming discussion circles during or outside lectures to discuss scientific	

engineering topics that require thinking and analysis.

- ☐ Asking students a set of thinking questions during lectures, such as (what, how, when, why) for specific topics.

10. Evaluation methods

- ☐ Daily exams with practical and scientific questions.
- ☐ Participation marks for difficult competition questions among students.
- ☐ Assigning grades to homework assignments and reports assigned to them.
- ☐ Semester exams for the curriculum in addition to the final exam.

11. Faculty

Faculty Members						
Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	Electronic & communications	Communications			1	
Assist. Prof.	Communications	Communications techniques			1	
Assist. Prof.	Electronic & communications	Communications			3	
Assist. Prof.	Electric Eng.	Electronic & communications			3	
Assist. Prof.	Physics	Electro-optics			1	
Assist. Prof.	Physics	Nano technology			1	
Assist. Prof.	Communications	Communications			1	
Assist. Prof.	Info. & Comm. Eng.	Image processing			1	
Assist. Prof.	Elect. & Electronic Eng.	Communications				1
Assist. Prof.	Electro-optics and laser	Optoelectronics			1	
Lecturer	Elect. & Electronic Eng.	Electronics			1	1

Lecturer	Communications	Communications			1	1
Assist. Lecturer	Communications	Communications			3	
Assist. Lecturer	Elect. & Electronic Eng.	Electronics			1	
Assist. Lecturer	Electronic & communications	Communications			2	
Assist. Lecturer	Electric Eng.	Electronic & communications			1	

Professional Development

Mentoring new faculty members

Faculty members are instructed to hold regular meetings and review questionnaires received from students with the Scientific Committee.

Professional development of faculty members

The teaching staff undergoes development through training, workshops, and seminars. Progress is evaluated by subject performance.

12. Acceptance Criterion

According to the rules and regulations of Ministry of Higher Education and Scientific Research.

13. The most important sources of information about the program

- College website.
- The department's website and contact the department by email.

14. Program Development Plan

- The courses are updated annually to keep up with developments of the world.
- The laboratories are also updated under academic curricula.
- Additionally, postgraduate programs are now being offered.

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
Third /2 nd	COE308	Detection and Estimation Theory	Basic	√	√	√	√	√	√	√		√	√	√	

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

Course Description Form

1. Course Name: Detection and Estimation Theory					
2. Course Code: COE308					
3. Semester / Year: 3 rd / 2 nd					
4. Description Preparation Date:					
24-4-2024					
5. Available Attendance Forms: mandatory					
None					
6. Number of Credit Hours (Total) / Number of Units (Total) : 30					
7. Course administrator's name (mention all, if more than one name)					
Lecture :Name: wisam hayed mahdi Email: wisam_haider@uodiyala.edu.iq					
8. Course Objectives					
Course Objectives		The curriculum of the Detection and Guessing Theory course aims to study the detection of signals without having any prior information using statistical signal processing through several algorithms to detect several types of signals. In addition to calculating the error rate during detection. Then applying the algorithms to signals of different generations of mobile communications.			
9. Teaching and Learning Strategies					
Strategy	☐ The Lecture gives detailed theoretical lectures. ☐ The Lecture requests periodic reports on the basic topics of the subject.				
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

First	2	The student learns an introduction to statistical signal processing and the definition of noise	Introduction to classical signal detection theory and statistical signal processing, Law of large numbers and central limit theorem.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Second	2	The student learns an introduction to statistical signal processing and the definition of noise	Introduction to classical signal detection theory and statistical signal processing, Law of large numbers and central limit theorem.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Third	2	The student learns different detection theories	Jointly Gaussian random vectors and their properties. Hypothesis testing and detection: Maximum likelihood (ML), maximum a posterior probability (MAP), and Bayes criteria;	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Fourth	2	The student learns different detection theories	Jointly Gaussian random vectors and their properties. Hypothesis testing and detection: Maximum likelihood (ML), maximum a posterior probability (MAP), and Bayes criteria;	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Fifth	2	The student learns different detection theories	Jointly Gaussian random vectors and their properties. Hypothesis testing and detection: Maximum likelihood (ML), maximum a posterior probability (MAP), and Bayes criteria;	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Sixth	2	The student learns different estimation theories	Likelihood ratios, Neyman-Pearson test. Estimation: Minimum mean-square (MMSE) and linear least square estimation, orthogonality principle;	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams

Seventh	2	The student learns different estimation theories	Likelihood ratios, Neyman-Pearson test. Estimation: Minimum mean-square (MMSE) and linear least square estimation, orthogonality principle;	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Eighth	2	The student learns different estimation theories	Likelihood ratios, Neyman-Pearson test. Estimation: Minimum mean-square (MMSE) and linear least square estimation, orthogonality principle;	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Ninth	2	The student learns different estimation theories	Likelihood ratios, Neyman-Pearson test. Estimation: Minimum mean-square (MMSE) and linear least square estimation, orthogonality principle;	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Tenth	2	The student learns error reduction methods for the previous theories	Recursive estimation, Kalman filtering; Parameter estimation, Cramer-Rao bound; Sparsity and compressed sensing.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Eleventh	2	The student learns error reduction methods for the previous theories	Recursive estimation, Kalman filtering; Parameter estimation, Cramer-Rao bound; Sparsity and compressed sensing.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Twelfth	2	The student learns error reduction methods for the previous theories	Recursive estimation, Kalman filtering; Parameter estimation, Cramer-Rao bound; Sparsity and compressed sensing.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Thirteenth	2	The student learns error reduction methods for the previous theories	Recursive estimation, Kalman filtering; Parameter estimation, Cramer-Rao bound; Sparsity and compressed sensing.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams

Fourteenth	2	The student learns error reduction methods for the previous theories	Recursive estimation, Kalman filtering; Parameter estimation, Cramer-Rao bound; Sparsity and compressed sensing.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
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11. Course Evaluation					
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports.....etc					
12. Learning and Teaching Resources					
Required textbooks (curricular books, if any)					
Main references (sources)					
Recommended books and references (scientific journals, reports...)					
Electronic References, Websites					

1. Program Vision

The department going to develop the curriculum in line with modern scientific developments in the field of communications engineering in addition to completing all the special requirements of scientific laboratories in the department. We seek to improve the staffed of teaching by dispatching members of Department of postgraduate in both inside and outside the country, and configure the appropriate conditions for scientific research in order to get Degrees required to be a Department able to compete in its own right and marked with the corresponding sections only local of which or the Arab and international Our ambitions We aspire to open graduate studies for a master's certificate in the disciplines of engineering various communication to be Department of scientific expertise to attract local and international center of which to open the horizons of cooperation through conferences, consulting, training, scientific research and development through broad and orderly opening to the community.

2. Program Mission

Expanding educational base and their applications in modern field of telematics and communications across both the international network and devices and cellular all advanced communication systems form that meets the need of institutions, both belonging to the state or the private sector through education, training and rehabilitation input from Human Resources (students) and make them able to deal with modern techniques and working in different institutions efficiently and effectively serve our dear country march.

3. Program Objectives

Teach students studying in the department on techniques required in all areas of modern communication systems and their applications in scientific and field state departments. Qualify graduates capable of working in government departments and the private sector engineering staff specialist efficiently and effectively. Contribute to provide an advanced level of related activities and the realization of the institutions experience and lead to the fulfillment of their need of human resources in order to achieve their success and the evolution and continuation.

4. Program Accreditation

None

5. Other external influences

None

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution requirements	5	6	4.24%	
College requirements	9	20	14.20%	
Department requirements	46	115	81.56%	
Summer Training				Graduation Requirements
Others				

7. Program Description

Course Name	Course Code	Level/Year	Credit Hours	
			Practical	Theory
Democracy & human Rights	U 101	Second - First	-	2
Workshop skills	COE 107	Second - First	3	-
Computer skills	U 103	First - First	3	1
English Language	U 104	First - First	-	2
Engineering Drawing	COE 106	First - First	3	-
Mathematics -I	E 101	First - First	-	4
Mathematics -II	E 102	Second - First	-	4
Electronic Physics	COE 104	Second - First	-	4
C++ Programming	COE 105	Second - First	3	1
Digital Techniques	COE103	First - First	2	4
Electrical Engineering Fundamentals I	COE 101	First - First	2	6
Electrical Engineering Fundamentals II	COE102	Second - First	2	6
Arabic Language	U 108	Second - First	-	2
Applied Mathematics –I	E201	First - Second	-	4
Applied Mathematics –II	E202	Second -Second	-	4
Electronic Circuits I	COE201	First - Second	2	2
Signals and Systems	COE202	First - Second	2	3
Communication Transmission Lines	COE203	First - Second	-	2
Probability and Random Processes	COE204	First - Second	-	4
Electric Circuits I	COE205	First - Second	2	3
Electromagnetic Fields I	COE206 ²	First - Second	-	2
MATLAB Programming	COE207	First - Second	2	1
Electromagnetic Fields II	COE208	Second -Second	-	3

Analog Communication Systems	COE209	Second -Second	2	3
Electric Circuits II	COE210	Second -Second	2	3
Electronic Circuits II	COE211	Second -Second	2	2
Neural Network Engineering	COE212	Second -Second	2	1
Numerical Methods	COE213	Second -Second	2	2
Automatic Control Theory	COE214	Second -Second	-	2
Engineering Economy	E301	First - Third	-	2
Engineering Analysis	COE301	First - Third	-	2
Digital Communication I	COE302	First - Third	2	3
Antenna Theory and Design	COE303	First - Third	2	3
Digital Signal Processing	COE304	First - Third	2	3
Microcontroller and DSP Systems	COE305	First - Third	2	2
Communication Electronics -I	COE306	First - Third	2	3
Optical Communication Systems	COE307	First - Third	-	2
Detection and Estimation Theory	COE308	Second -Third	-	3
Digital Communication II	COE309	Second -Third	2	3
Image Processing	COE310	Second -Third	2	2
Information Theory	COE311	Second -Third	-	3
Radar Systems	COE312	Second -Third	2	2
Computer Networks	COE313	Second -Third	2	2
Waves Propagation	COE314	Second -Third	-	2
Communication Electronics -II	COE315	Second -Third	2	2
Engineering Profession Ethics	E401	First - Fourth	-	1
Graduation Project	E402	Fourth	8	-
Microwave Engineering-I	COE401	First - Fourth	2	3
Modern Communication Systems	COE402	First - Fourth	-	3
Cellular Mobile Networks	COE403	First - Fourth	-	2
Cryptography for Communication Systems	COE404	First - Fourth	-	2
Satellite Communication Systems	COE405	First - Fourth	-	2
Microwave Engineering-II	COE406	Second - Fourth	2	3
Global Positioning Systems	COE407	Second - Fourth	-	2
Multimedia Communication	COE408	Second - Fourth	-	2
Telecom Switching Systems	COE409	Second - Fourth	-	2
Television and Broadcasting Systems	COE410	Second - Fourth	-	2

8. Expected learning outcomes of the program

Knowledge

A. Cognitive goals

A1. - Understanding and teaching the student the principles of how signal work and how to deal with communication algorithms.

A2- Enabling students to obtain knowledge and understanding in working on

and designing signal and system.

A3- The student understands the methods of forming signal and system parts and their interconnection.

A4- Enabling students to obtain knowledge and understanding of designing everything related to optical signal and system.

A5- Enabling students to obtain knowledge and understanding of diagnosing faults and maintaining various signal and system devices.

A6- The student understands the foundations of solving communication problems, cellular networks, and etc.

Skills

A. The skills goals special to the program.

B1 - Explanation of communication principles topics by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning.

B2 - Providing them with skills to solve practical problems related to various communication systems and algorithms for addressing and solving technical problems in various fields of Communication engineering.

B3 – Obtaining experience to explore and develop communication systems and its algorithms.

Ethics

A. Affective and value goals

C1- Enabling students to think and analyze topics related to the engineering framework, such as various logical circuits.

C2- Enabling students to think and analyze topics related to Communication systems related to the engineering framework.

C3- Enabling students to think and analyze topics related to solving practical problems.

9. Teaching and Learning Strategies

☐ Providing students with the basics, additional topics, and field experiences related to the outcomes of thinking and analysis.

☐ Forming discussion circles during or outside lectures to discuss scientific engineering topics that require thinking and analysis.

☐ Asking students a set of thinking questions during lectures, such as (what, how, when, why) for specific topics.

10. Evaluation methods

☐ Daily exams with practical and scientific questions.

☐ Participation marks for difficult competition questions among students.

☐ Assigning grades to homework assignments and reports assigned to them.

☐ Semester exams for the curriculum in addition to the final exam.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	Electronic & communications	Communications			1	
Assist. Prof.	Communications	Communications techniques			1	
Assist. Prof.	Electronic & communications	Communications			3	
Assist. Prof.	Electric Eng.	Electronic & communications			3	
Assist. Prof.	Physics	Electro=optics			1	
Assist. Prof.	Physics	Nano technology			1	
Assist. Prof.	Communications	Communications			1	
Assist. Prof.	Info. & Comm. Eng.	Image processing			1	
Assist. Prof.	Elect. & Electronic Eng.	Communications				1
Assist. Prof.	Electro-optics and laser	Optoelectronics			1	
Lecturer	Elect. & Electronic Eng.	Electronics			1	1
Lecturer	Communications	Communications			1	1
Assist. Lecturer	Communications	Communications			3	
Assist. Lecturer	Elect. & Electronic Eng.	Electronics			1	
Assist. Lecturer	Electronic & communications	Communications			2	
Assist. Lecturer	Electric Eng.	Electronic & communications			1	

Professional Development

Mentoring new faculty members

Faculty members are instructed to hold regular meetings and review questionnaires received from students with the Scientific Committee.

Professional development of faculty members

The teaching staff undergoes development through training, workshops, and seminars. Progress is evaluated by subject performance.

12. Acceptance Criterion

According to the rules and regulations of Ministry of Higher Education and Scientific Research.

13. The most important sources of information about the program

- College website.
- The department's website and contact the department by email.

14. Program Development Plan

- The courses are updated annually to keep up with developments of the world.
- The laboratories are also updated under academic curricula.
- Additionally, postgraduate programs are now being offered.

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
Third Year/ Second Semester	COE309	Digital Communication II	Basic	√	√	√	√	√	√	√		√	√	√	

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

Course Description Form

1. Course Name: Digital Communication II	
2. Course Code: COE309	
3. Semester / Year: Third Year/ Second Semester	
4. Description Preparation Date:	
24-4-2024	
5. Available Attendance Forms:	
None	
6. Number of Credit Hours (Total) / Number of Units (Total): 45	
7. Course administrator's name (mention all, if more than one name)	
Lecturer Name: Yousif Allbadi Email: yousifallbadi@uodiyala.edu.iq	
8. Course Objectives	
Course Objectives	During the semester, the student learns to understand digital communication systems and main components and understands the general well and its components as well as getting to know the wireless communication system. And how wireless communication systems and standards started across different generations of wireless restrictions from (2G to 5G). Also studying fading (Rayleigh Fading) and its types and its impact on digital communications and multipath and deriving and studying the mathematical expression Rayleigh Fading, and its mathematical representation and studying its properties using MATLAB and the phenomenon of deep fading (Deep Fading) Identifying the extent of the impact of fading on multipath in digital communications and how the process of demolition and construction (construction and destructive) is when calculating all times at the receiver (addition). In addition to studying the bit error rate (BER) and heat energy to noise energy (SNR) and comparing both types of communications (wired and wireless), in addition to diversity in digital communications (diversity). Also study the models of multiple antenna types (SISO, MISO, SIMO, and MIMO) and represent them mathematically and identify what is called maximum ratio combination (MRC) (maximum ratio combination). In addition to that, the new important development for the

	student in the field of digital communications, which is wireless access technologies (multiple access technologies for wireless communications) and identify their types (FDMA, TDMA, and CDMA) and how they work and the type of each type and calculate the number of users in each type and compare all types in terms of use, advantages and disadvantages. Also study how to calculate capacity in wired communications (wireless communication capacity)
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9. Teaching and Learning Strategies

Strategy	In this course, students are guided by: 1. Using different examples. 2. Using different styles of discussion that aim to connect the theoretical and practical sides. 3. Asking questions and giving exercises that require analysis and conclusions related to lectures. 4. Encourage students to participate in discussions and do practical work. 5. Encourage students to work in groups.
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10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1	3	The student will be able to understand and analyze all the requirements of this subject in the main components of a Digital Communication	Introduction and Review of Digital Communications System	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 2	3	The student will be able to understand and analyze all the requirements of this subject in Evolution of Wireless Technologies	Evolution of Wireless Technologies	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 3	3	The student will be able to understand and analyze all the requirements of this subject in Evolution of Wireless Technologies	Evolution of Wireless Technologies	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 4	3	The student will be able to understand and analyze all the requirements of this subject in Fading Channels	Fading Channels	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams

Week 5	3	The student will be able to understand and analyze all the requirements of this subject in Fading Channels	Fading Channels	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 6	3	The student will be able to understand and analyze all the requirements of this subject in the Multipath Propagation	Develop a Model for the Multipath Propagation	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 7	3	The student will be able to understand and analyze all the requirements of this subject in the Multipath Propagation	Develop a Model for the Multipath Propagation	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 8	3	The student will be able to understand and analyze all the requirements of this subject in Rayleigh Fading	Rayleigh Fading	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 9	3	The student will be able to understand and analyze all the requirements of this subject in Performance of Wireless and Wireline Communication Systems	Performance of Communication Systems	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 10	3	The student will be able to understand and analyze all the requirements of this subject in study (BER) and (SNR) and compare (wired and wireless)	Performance of Wireless and Wireline Communication Systems	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 11	3	The student will be able to understand and analyze all the requirements of this subject in the diversity of digital communications	The Diversity	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 12	3	The student will be able to understand and analyze all the requirements of this subject in learns the models of multi-antenna systems and how to represent them mathematically.	Model of Multiple Antenna Systems	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams

Week 13	3	The student will be able to understand and analyze all the requirements of this subject in learns the models of multi-antenna systems and how to represent them mathematically.	Model of Multiple Antenna Systems	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 14	3	The student will be able to understand and analyze all the requirements of this subject in Multiple Access Techniques for Wireless Communication	Multiple Access Techniques for Wireless Communication	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 15	3	The student will be able to understand and analyze all the requirements of this subject in learns about multiple access technologies for wireless communications.	Capacity of Wireless Channels.	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams
Week 16	3	Preparatory week before the final exam	Revision	Lectures, PDF, power point and Video	Daily exams + practical experiments + monthly exams

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

Required textbooks (curricular books, if any)

Main references (sources)

Recommended books and references

(scientific journals, reports...)

Electronic References, Websites

- John Proakis & Masoud Salehi, 2008. Digital Communications, Fifth Edition. McGraw-Hill Education.
- Simon Haykin, 2014. Digital Communication Systems. First Edition, Wiley.
- Wireless Communications Principles and Practice ,Theodore S. Rappaport

1. Program Vision

The department going to develop the curriculum in line with modern scientific developments in the field of communications engineering in addition to completing all the special requirements of scientific laboratories in the department. We seek to improve the staffed of teaching by dispatching members of Department of postgraduate in both inside and outside the country, and configure the appropriate conditions for scientific research in order to get Degrees required to be a Department able to compete in its own right and marked with the corresponding sections only local of which or the Arab and international Our ambitions We aspire to open graduate studies for a master's certificate in the disciplines of engineering various communication to be Department of scientific expertise to attract local and international center of which to open the horizons of cooperation through conferences, consulting, training, scientific research and development through broad and orderly opening to the community.

2. Program Mission

Expanding educational base and their applications in modern field of telematics and communications across both the international network and devices and cellular all advanced communication systems form that meets the need of institutions, both belonging to the state or the private sector through education, training and rehabilitation input from Human Resources (students) and make them able to deal with modern techniques and working in different institutions efficiently and effectively serve our dear country march.

3. Program Objectives

Teach students studying in the department on techniques required in all areas of modern communication systems and their applications in scientific and field state departments. Qualify graduates capable of working in government departments and the private sector engineering staff specialist efficiently and effectively. Contribute to provide an advanced level of related activities and the realization of the institutions experience and lead to the fulfillment of their need of human resources in order to achieve their success and the evolution and continuation.

4. Program Accreditation

None

5. Other external influences

None

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution requirements	5	6	4.24%	
College requirements	9	20	14.20%	
Department requirements	46	115	81.56%	
Summer Training				Graduation Requirements
Others				

7. Program Description

Course Name	Course Code	Level/Year	Credit Hours	
			Practical	Theory
Democracy & human Rights	U 101	Second - First	-	2
Workshop skills	COE 107	Second - First	3	-
Computer skills	U 103	First - First	3	1
English Language	U 104	First - First	-	2
Engineering Drawing	COE 106	First - First	3	-
Mathematics -I	E 101	First - First	-	4
Mathematics -II	E 102	Second - First	-	4
Electronic Physics	COE 104	Second - First	-	4
C++ Programming	COE 105	Second - First	3	1
Digital Techniques	COE103	First - First	2	4
Electrical Engineering Fundamentals I	COE 101	First - First	2	6
Electrical Engineering Fundamentals II	COE102	Second - First	2	6
Arabic Language	U 108	Second - First	-	2
Applied Mathematics –I	E201	First - Second	-	4
Applied Mathematics –II	E202	Second -Second	-	4
Electronic Circuits I	COE201	First - Second	2	2
Signals and Systems	COE202	First - Second	2	3

Communication Transmission Lines	COE203	First - Second	-	2
Probability and Random Processes	COE204	First - Second	-	4
Electric Circuits I	COE205	First - Second	2	3
Electromagnetic Fields I	COE206	First - Second	-	2
MATLAB Programming	COE207	First - Second	2	1
Electromagnetic Fields II	COE208	Second -Second	-	3
Analog Communication Systems	COE209	Second -Second	2	3
Electric Circuits II	COE210	Second -Second	2	3
Electronic Circuits II	COE211	Second -Second	2	2
Neural Network Engineering	COE212	Second -Second	2	1
Numerical Methods	COE213	Second -Second	2	2
Automatic Control Theory	COE214	Second -Second	-	2
Engineering Economy	E301	First - Third	-	2
Engineering Analysis	COE301	First - Third	-	2
Digital Communication I	COE302	First - Third	2	3
Antenna Theory and Design	COE303	First - Third	2	3
Digital Signal Processing	COE304	First - Third	2	3
Microcontroller and DSP Systems	COE305	First - Third	2	2
Communication Electronics -I	COE306	First - Third	2	3
Optical Communication Systems	COE307	First - Third	-	2
Detection and Estimation Theory	COE308	Second -Third	-	3
Digital Communication II	COE309	Second -Third	2	3
Image Processing	COE310	Second -Third	2	2
Information Theory	COE311	Second -Third	-	3
Radar Systems	COE312	Second -Third	2	2
Computer Networks	COE313	Second -Third	2	2
Waves Propagation	COE314	Second -Third	-	2
Communication Electronics -II	COE315	Second -Third	2	2
Engineering Profession Ethics	E401	First - Fourth	-	1
Graduation Project	E402	Fourth	8	-
Microwave Engineering-I	COE401	First - Fourth	2	3
Modern Communication Systems	COE402	First - Fourth	-	3
Cellular Mobile Networks	COE403	First - Fourth	-	2
Cryptography for Communication Systems	COE404	First - Fourth	-	2
Satellite Communication Systems	COE405	First - Fourth	-	2
Microwave Engineering-II	COE406	Second - Fourth	2	3
Global Positioning Systems	COE407	Second - Fourth	-	2
Multimedia Communication	COE408	Second - Fourth	-	2
Telecom Switching Systems	COE409	Second - Fourth	-	2
Television and Broadcasting Systems	COE410	Second - Fourth	-	2

8. Expected learning outcomes of the program	
Knowledge	
A. Cognitive goals A1. - Understanding and teaching the student the principles of how signal work and how to deal with communication algorithms. A2- Enabling students to obtain knowledge and understanding in working on and designing signal and system . A3- The student understands the methods of forming signal and system parts and their interconnection. A4- Enabling students to obtain knowledge and understanding of designing everything related to optical signal and system. A5- Enabling students to obtain knowledge and understanding of diagnosing faults and maintaining various signal and system devices. A6- The student understands the foundations of solving communication problems, cellular networks, and etc.	
Skills	
A. The skills goals special to the program. B1 - Explanation of communication principles topics by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning. B2 - Providing them with skills to solve practical problems related to various communication systems and algorithms for addressing and solving technical problems in various fields of Communication engineering. B3 – Obtaining experience to explore and develop communication systems and its algorithms.	
Ethics	
A. Affective and value goals C1- Enabling students to think and analyze topics related to the engineering framework, such as various logical circuits. C2- Enabling students to think and analyze topics related to Communication systems related to the engineering framework. C3- Enabling students to think and analyze topics related to solving practical problems.	

9. Teaching and Learning Strategies	
☐ Providing students with the basics, additional topics, and field experiences related to the outcomes of thinking and analysis. ☐ Forming discussion circles during or outside lectures to discuss scientific	

engineering topics that require thinking and analysis.

- ☐ Asking students a set of thinking questions during lectures, such as (what, how, when, why) for specific topics.

10. Evaluation methods

- ☐ Daily exams with practical and scientific questions.
- ☐ Participation marks for difficult competition questions among students.
- ☐ Assigning grades to homework assignments and reports assigned to them.
- ☐ Semester exams for the curriculum in addition to the final exam.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	Electronic & communications	Communications			1	
Assist. Prof.	Communications	Communications techniques			1	
Assist. Prof.	Electronic & communications	Communications			3	
Assist. Prof.	Electric Eng.	Electronic & communications			3	
Assist. Prof.	Physics	Electro-optics			1	
Assist. Prof.	Physics	Nano technology			1	
Assist. Prof.	Communications	Communications			1	
Assist. Prof.	Info. & Comm. Eng.	Image processing			1	
Assist. Prof.	Elect. & Electronic Eng.	Communications				1
Assist. Prof.	Electro-optics and laser	Optoelectronics			1	
Lecturer	Elect. & Electronic Eng.	Electronics			1	1

Lecturer	Communications	Communications			1	1
Assist. Lecturer	Communications	Communications			3	
Assist. Lecturer	Elect. & Electronic Eng.	Electronics			1	
Assist. Lecturer	Electronic & communications	Communications			2	
Assist. Lecturer	Electric Eng.	Electronic & communications			1	

Professional Development

Mentoring new faculty members

Faculty members are instructed to hold regular meetings and review questionnaires received from students with the Scientific Committee.

Professional development of faculty members

The teaching staff undergoes development through training, workshops, and seminars. Progress is evaluated by subject performance.

12. Acceptance Criterion

According to the rules and regulations of Ministry of Higher Education and Scientific Research.

13. The most important sources of information about the program

- College website.
- The department's website and contact the department by email.

14. Program Development Plan

- The courses are updated annually to keep up with developments of the world.
- The laboratories are also updated under academic curricula.
- Additionally, postgraduate programs are now being offered.

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
			Basic	√	√	√	√	√	√	√		√	√	√	

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

Course Description Form

1. Course Name:					
Image processing					
2. Course Code:					
COE310					
3. Semester / Year:					
Second -Third					
4. Description Preparation Date:					
24-4-2024					
5. Available Attendance Forms:					
None					
6. Number of Credit Hours (Total) / Number of Units (Total)					
3/2					
7. Course administrator's name (mention all, if more than one name)					
Name:					
Email:					
8. Course Objectives					
Course Objectives		The objective of the Image Processing course is to convert an image into a digital format and perform some operations on it, in order to obtain an improved image or to extract some useful information from it. It is a kind of signal distribution, the image processing system usually involves treating images as two-dimensional signals while applying already defined signal processing techniques to them. Image processing technology is among the rapidly growing technologies nowadays, with its applications in various aspects of business. Image processing constitutes a fundamental research area in engineering and computer science disciplines as well.			
9. Teaching and Learning Strategies					
Strategy	- Using different examples. - Using different styles of discussion that aim to connect the theoretical and practical sides. - Asking questions and giving exercises that require analysis and conclusions related to lectures. - Encourage students to participate in discussions and do the practical work.				
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1-15	30	Student study the source of image and type of image and operation on image processing	Introduction to digital image processing, Basic definitions, fundamental steps of digital image processing, components of digital image system, light and electromagnetic spectrum, Types of imaging system. Types of Digital Images, A simple image formation model, Image Sampling and Quantization, Digital Image Representation, Spatial and Gray-level Resolution, relationship between pixels, intensity transformation furcation. Histogram processing fundamentals of spatial filtering, sharpening spatial filters, combining spatial enhancements methods, image compression by direct cosin transform, noise model. Restoration in the presence of noise only, minimum mean square error filtering, constrained least square filtering, geometric mean filter, color model, noise in color image	Lecture PDF and power point Video	Daily exams and semester exams
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11. Course Evaluation					
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exam, reports.....etc					
12. Learning and Teaching Resources					
Required textbooks (curricular books, if any)					
Main references (sources)		•Rafael C. Gonzalez, "Digital Image Processing",			
Recommended books and references (scientific journals, reports...)					
Electronic References, Websites					

1. Program Vision

The department going to develop the curriculum in line with modern scientific developments in the field of communications engineering in addition to completing all the special requirements of scientific laboratories in the department. We seek to improve the staffed of teaching by dispatching members of Department of postgraduate in both inside and outside the country, and configure the appropriate conditions for scientific research in order to get Degrees required to be a Department able to compete in its own right and marked with the corresponding sections only local of which or the Arab and international Our ambitions We aspire to open graduate studies for a master's certificate in the disciplines of engineering various communication to be Department of scientific expertise to attract local and international center of which to open the horizons of cooperation through conferences, consulting, training, scientific research and development through broad and orderly opening to the community.

2. Program Mission

Expanding educational base and their applications in modern field of telematics and communications across both the international network and devices and cellular all advanced communication systems form that meets the need of institutions, both belonging to the state or the private sector through education, training and rehabilitation input from Human Resources (students) and make them able to deal with modern techniques and working in different institutions efficiently and effectively serve our dear country march.

3. Program Objectives

Teach students studying in the department on techniques required in all areas of modern communication systems and their applications in scientific and field state departments. Qualify graduates capable of working in government departments and the private sector engineering staff specialist efficiently and effectively. Contribute to provide an advanced level of related activities and the realization of the institutions experience and lead to the fulfillment of their need of human resources in order to achieve their success and the evolution and continuation.

4. Program Accreditation

None

5. Other external influences

None

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution requirements	5	6	4.24%	
College requirements	9	20	14.20%	
Department requirements	46	115	81.56%	
Summer Training				Graduation Requirements
Others				

7. Program Description

Course Name	Course Code	Level/Year	Credit Hours	
			Practical	Theory
Democracy & human Rights	U 101	Second - First	-	2
Workshop skills	COE 107	Second - First	3	-
Computer skills	U 103	First - First	3	1
English Language	U 104	First - First	-	2
Engineering Drawing	COE 106	First - First	3	-
Mathematics -I	E 101	First - First	-	4
Mathematics -II	E 102	Second - First	-	4
Electronic Physics	COE 104	Second - First	-	4
C++ Programming	COE 105	Second - First	3	1
Digital Techniques	COE103	First - First	2	4
Electrical Engineering Fundamentals I	COE 101	First - First	2	6
Electrical Engineering Fundamentals II	COE102	Second - First	2	6
Arabic Language	U 108	Second - First	-	2
Applied Mathematics –I	E201	First - Second	-	4
Applied Mathematics –II	E202	Second -Second	-	4
Electronic Circuits I	COE201	First - Second	2	2
Signals and Systems	COE202	First - Second	2	3

Communication Transmission Lines	COE203	First - Second	-	2
Probability and Random Processes	COE204	First - Second	-	4
Electric Circuits I	COE205	First - Second	2	3
Electromagnetic Fields I	COE206	First - Second	-	2
MATLAB Programming	COE207	First - Second	2	1
Electromagnetic Fields II	COE208	Second -Second	-	3
Analog Communication Systems	COE209	Second -Second	2	3
Electric Circuits II	COE210	Second -Second	2	3
Electronic Circuits II	COE211	Second -Second	2	2
Neural Network Engineering	COE212	Second -Second	2	1
Numerical Methods	COE213	Second -Second	2	2
Automatic Control Theory	COE214	Second -Second	-	2
Engineering Economy	E301	First - Third	-	2
Engineering Analysis	COE301	First - Third	-	2
Digital Communication I	COE302	First - Third	2	3
Antenna Theory and Design	COE303	First - Third	2	3
Digital Signal Processing	COE304	First - Third	2	3
Microcontroller and DSP Systems	COE305	First - Third	2	2
Communication Electronics -I	COE306	First - Third	2	3
Optical Communication Systems	COE307	First - Third	-	2
Detection and Estimation Theory	COE308	Second -Third	-	3
Digital Communication II	COE309	Second -Third	2	3
Image Processing	COE310	Second -Third	2	2
Information Theory	COE311	Second -Third	-	3
Radar Systems	COE312	Second -Third	2	2
Computer Networks	COE313	Second -Third	2	2
Waves Propagation	COE314	Second -Third	-	2
Communication Electronics -II	COE315	Second -Third	2	2
Engineering Profession Ethics	E401	First - Fourth	-	1
Graduation Project	E402	Fourth	8	-
Microwave Engineering-I	COE401	First - Fourth	2	3
Modern Communication Systems	COE402	First - Fourth	-	3
Cellular Mobile Networks	COE403	First - Fourth	-	2
Cryptography for Communication Systems	COE404	First - Fourth	-	2
Satellite Communication Systems	COE405	First - Fourth	-	2
Microwave Engineering-II	COE406	Second - Fourth	2	3
Global Positioning Systems	COE407	Second - Fourth	-	2
Multimedia Communication	COE408	Second - Fourth	-	2
Telecom Switching Systems	COE409	Second - Fourth	-	2
Television and Broadcasting Systems	COE410	Second - Fourth	-	2

8. Expected learning outcomes of the program	
Knowledge	
A. Cognitive goals A1. - Understanding and teaching the student the principles of how signal work and how to deal with communication algorithms. A2- Enabling students to obtain knowledge and understanding in working on and designing signal and system . A3- The student understands the methods of forming signal and system parts and their interconnection. A4- Enabling students to obtain knowledge and understanding of designing everything related to optical signal and system. A5- Enabling students to obtain knowledge and understanding of diagnosing faults and maintaining various signal and system devices. A6- The student understands the foundations of solving communication problems, cellular networks, and etc.	
Skills	
A. The skills goals special to the program. B1 - Explanation of communication principles topics by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning. B2 - Providing them with skills to solve practical problems related to various communication systems and algorithms for addressing and solving technical problems in various fields of Communication engineering. B3 – Obtaining experience to explore and develop communication systems and its algorithms.	
Ethics	
A. Affective and value goals C1- Enabling students to think and analyze topics related to the engineering framework, such as various logical circuits. C2- Enabling students to think and analyze topics related to Communication systems related to the engineering framework. C3- Enabling students to think and analyze topics related to solving practical problems.	

9. Teaching and Learning Strategies	
☐ Providing students with the basics, additional topics, and field experiences related to the outcomes of thinking and analysis. ☐ Forming discussion circles during or outside lectures to discuss scientific	

engineering topics that require thinking and analysis.

- ☐ Asking students a set of thinking questions during lectures, such as (what, how, when, why) for specific topics.

10. Evaluation methods

- ☐ Daily exams with practical and scientific questions.
- ☐ Participation marks for difficult competition questions among students.
- ☐ Assigning grades to homework assignments and reports assigned to them.
- ☐ Semester exams for the curriculum in addition to the final exam.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	Electronic & communications	Communications			1	
Assist. Prof.	Communications	Communications techniques			1	
Assist. Prof.	Electronic & communications	Communications			3	
Assist. Prof.	Electric Eng.	Electronic & communications			3	
Assist. Prof.	Physics	Electro-optics			1	
Assist. Prof.	Physics	Nano technology			1	
Assist. Prof.	Communications	Communications			1	
Assist. Prof.	Info. & Comm. Eng.	Image processing			1	
Assist. Prof.	Elect. & Electronic Eng.	Communications				1
Assist. Prof.	Electro-optics and laser	Optoelectronics			1	
Lecturer	Elect. & Electronic Eng.	Electronics			1	1

Lecturer	Communications	Communications			1	1
Assist. Lecturer	Communications	Communications			3	
Assist. Lecturer	Elect. & Electronic Eng.	Electronics			1	
Assist. Lecturer	Electronic & communications	Communications			2	
Assist. Lecturer	Electric Eng.	Electronic & communications			1	

Professional Development

Mentoring new faculty members

Faculty members are instructed to hold regular meetings and review questionnaires received from students with the Scientific Committee.

Professional development of faculty members

The teaching staff undergoes development through training, workshops, and seminars. Progress is evaluated by subject performance.

12. Acceptance Criterion

According to the rules and regulations of Ministry of Higher Education and Scientific Research.

13. The most important sources of information about the program

- College website.
- The department's website and contact the department by email.

14. Program Development Plan

- The courses are updated annually to keep up with developments of the world.
- The laboratories are also updated under academic curricula.
- Additionally, postgraduate programs are now being offered.

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
Third/ Second semester	COE311	Information Theory	Basic	√	√	√	√	√	√	√		√	√	√	

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

Course Description Form

1. Course Name:					
Information theory					
2. Course Code:					
COE311					
3. Semester / Year:					
Second - Third					
4. Description Preparation Date:					
24-4-2024					
5. Available Attendance Forms:					
None					
6. Number of Credit Hours (Total) / Number of Units (Total)					
45h					
7. Course administrator's name (mention all, if more than one name)					
Name: Assi. Prof. Marwa Mohammed Jawad					
Email: marwa_al-sultani_ENG@uodiyala.edu.iq					
8. Course Objectives					
Course Objectives		The Information Theory course aims to introduce the student to the basics and principles of information theory, and to understand the basic elements of the communication system. In addition, it introduces important concepts in information theory such as information measurement, information rate, information source, and types of entropy. Explaining the techniques of source encryption and data compression, as well as understanding the techniques of error control during encryption and knowing the techniques for detecting and correcting errors using correction theory.			
9. Teaching and Learning Strategies					
Strategy		In this course, students are guided by: - Using different examples. - Using different styles of discussion that aim to connect the theoretical and practical sides. - Asking questions and giving exercises that require analysis and conclusions related to lectures. - Encourage students to participate in discussions and do the practical work. Encourage students to work in groups.			
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

First	3	Learns the basics and principles of information theory. Review of probability and random variables.	Fundamentals and principles of information theory Review of probability and random variables.	Lecture PDF power point Video	Daily exams + monthly exams
Second – sixth	15	Learn how to measure information, types of entropy, and channel capacity.	Introduction to information measurement, the types of entropies and channel capacity: Source of information; uncertainty; information & entropy; joint and conditional entropies; mutual information; discrete memory-less channels; channel model BSC; channel capacity.	Lecture PDF power point Video	Daily exams + monthly exams
Seventh-ninth	9	Learn the techniques for encoding and sending it through the channel	The techniques of source coding and data compression: Mathematical Model of Information Source; Huffman Coding; Shannon-Fano Codes	Lecture PDF power point Video	Daily exams + monthly exams
Tenth-Fifteenth	15	Learn techniques for detecting and correcting errors in receipt.	Types of Errors. Error control coding (channel coding): Source of Errors; Information Rate; Galois Field Modem Algebra; Taxonomy of Codes; Linear Block Codes; Minimum Distance & Correction; Hamming Code BCH Codes; Cyclic Code; Reed-Solomon Code; Convolution Encoder; (Connection of Convolution, Representation, Code Tree, Trellis Diagram, State Diagram); Maximum Likelihood Decoding; Viterbi Algorithm	Lecture PDF power point Video	Daily exams + monthly exams

11. Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports.....etc	
12. Learning and Teaching Resources	
Required textbooks (curriculum books, if any)	• <i>Digital Communication" by: J.G. Proakis</i> • <i>"Modern Digital and Analog Communication Systems" by Lathi</i> • <i>"FUNDAMENTALS of INFORMATION THEORY and CODING DESIGN" by: Roberto Togneri and Christopher J.S. deSilva.</i> • <i>"FUNDAMENTALS OF COMMUNICATION SYSTEMS " Second Edition, by: John G. Proakis and Masoud Salehi.</i> • <i>"Information coding techniques " second edition, by: R Avudaiammal.</i> • <i>"ESSENTIALS OF ERROR-CONTROL CODING" by: Jorge Castiñeira Moreira and Patrick Guy Farrell</i>
Main references (sources)	• Lectures given by the subject teacher • Books available in the college library
Recommended books and references (scientific journals, reports, etc.)	All solid scientific magazines and periodicals related to information theory and all its techniques
Electronic references, websites	All websites that specialize in explaining information theory

1. Program Vision

The department going to develop the curriculum in line with modern scientific developments in the field of communications engineering in addition to completing all the special requirements of scientific laboratories in the department. We seek to improve the staffed of teaching by dispatching members of Department of postgraduate in both inside and outside the country, and configure the appropriate conditions for scientific research in order to get Degrees required to be a Department able to compete in its own right and marked with the corresponding sections only local of which or the Arab and international Our ambitions We aspire to open graduate studies for a master's certificate in the disciplines of engineering various communication to be Department of scientific expertise to attract local and international center of which to open the horizons of cooperation through conferences, consulting, training, scientific research and development through broad and orderly opening to the community.

2. Program Mission

Expanding educational base and their applications in modern field of telematics and communications across both the international network and devices and cellular all advanced communication systems form that meets the need of institutions, both belonging to the state or the private sector through education, training and rehabilitation input from Human Resources (students) and make them able to deal with modern techniques and working in different institutions efficiently and effectively serve our dear country march.

3. Program Objectives

Teach students studying in the department on techniques required in all areas of modern communication systems and their applications in scientific and field state departments. Qualify graduates capable of working in government departments and the private sector engineering staff specialist efficiently and effectively. Contribute to provide an advanced level of related activities and the realization of the institutions experience and lead to the fulfillment of their need of human resources in order to achieve their success and the evolution and continuation.

4. Program Accreditation

None

5. Other external influences

None

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution requirements	5	6	4.24%	
College requirements	9	20	14.20%	
Department requirements	46	115	81.56%	
Summer Training				Graduation Requirements
Others				

7. Program Description

Course Name	Course Code	Level/Year	Credit Hours	
			Practical	Theory
Democracy & human Rights	U 101	Second - First	-	2
Workshop skills	COE 107	Second - First	3	-
Computer skills	U 103	First - First	3	1
English Language	U 104	First - First	-	2
Engineering Drawing	COE 106	First - First	3	-
Mathematics -I	E 101	First - First	-	4
Mathematics -II	E 102	Second - First	-	4
Electronic Physics	COE 104	Second - First	-	4
C++ Programming	COE 105	Second - First	3	1
Digital Techniques	COE103	First - First	2	4
Electrical Engineering Fundamentals I	COE 101	First - First	2	6
Electrical Engineering Fundamentals II	COE102	Second - First	2	6
Arabic Language	U 108	Second - First	-	2
Applied Mathematics –I	E201	First - Second	-	4
Applied Mathematics –II	E202	Second -Second	-	4
Electronic Circuits I	COE201	First - Second	2	2
Signals and Systems	COE202	First - Second	2	3

Communication Transmission Lines	COE203	First - Second	-	2
Probability and Random Processes	COE204	First - Second	-	4
Electric Circuits I	COE205	First - Second	2	3
Electromagnetic Fields I	COE206	First - Second	-	2
MATLAB Programming	COE207	First - Second	2	1
Electromagnetic Fields II	COE208	Second -Second	-	3
Analog Communication Systems	COE209	Second -Second	2	3
Electric Circuits II	COE210	Second -Second	2	3
Electronic Circuits II	COE211	Second -Second	2	2
Neural Network Engineering	COE212	Second -Second	2	1
Numerical Methods	COE213	Second -Second	2	2
Automatic Control Theory	COE214	Second -Second	-	2
Engineering Economy	E301	First - Third	-	2
Engineering Analysis	COE301	First - Third	-	2
Digital Communication I	COE302	First - Third	2	3
Antenna Theory and Design	COE303	First - Third	2	3
Digital Signal Processing	COE304	First - Third	2	3
Microcontroller and DSP Systems	COE305	First - Third	2	2
Communication Electronics -I	COE306	First - Third	2	3
Optical Communication Systems	COE307	First - Third	-	2
Detection and Estimation Theory	COE308	Second -Third	-	3
Digital Communication II	COE309	Second -Third	2	3
Image Processing	COE310	Second -Third	2	2
Information Theory	COE311	Second -Third	-	3
Radar Systems	COE312	Second -Third	2	2
Computer Networks	COE313	Second -Third	2	2
Waves Propagation	COE314	Second -Third	-	2
Communication Electronics -II	COE315	Second -Third	2	2
Engineering Profession Ethics	E401	First - Fourth	-	1
Graduation Project	E402	Fourth	8	-
Microwave Engineering-I	COE401	First - Fourth	2	3
Modern Communication Systems	COE402	First - Fourth	-	3
Cellular Mobile Networks	COE403	First - Fourth	-	2
Cryptography for Communication Systems	COE404	First - Fourth	-	2
Satellite Communication Systems	COE405	First - Fourth	-	2
Microwave Engineering-II	COE406	Second - Fourth	2	3
Global Positioning Systems	COE407	Second - Fourth	-	2
Multimedia Communication	COE408	Second - Fourth	-	2
Telecom Switching Systems	COE409	Second - Fourth	-	2
Television and Broadcasting Systems	COE410	Second - Fourth	-	2

8. Expected learning outcomes of the program	
Knowledge	
A. Cognitive goals A1. - Understanding and teaching the student the principles of how signal work and how to deal with communication algorithms. A2- Enabling students to obtain knowledge and understanding in working on and designing signal and system . A3- The student understands the methods of forming signal and system parts and their interconnection. A4- Enabling students to obtain knowledge and understanding of designing everything related to optical signal and system. A5- Enabling students to obtain knowledge and understanding of diagnosing faults and maintaining various signal and system devices. A6- The student understands the foundations of solving communication problems, cellular networks, and etc.	
Skills	
A. The skills goals special to the program. B1 - Explanation of communication principles topics by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning. B2 - Providing them with skills to solve practical problems related to various communication systems and algorithms for addressing and solving technical problems in various fields of Communication engineering. B3 – Obtaining experience to explore and develop communication systems and its algorithms.	
Ethics	
A. Affective and value goals C1- Enabling students to think and analyze topics related to the engineering framework, such as various logical circuits. C2- Enabling students to think and analyze topics related to Communication systems related to the engineering framework. C3- Enabling students to think and analyze topics related to solving practical problems.	

9. Teaching and Learning Strategies	
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engineering topics that require thinking and analysis.

- ☐ Asking students a set of thinking questions during lectures, such as (what, how, when, why) for specific topics.

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Assist. Prof.	Physics	Nano technology			1	
Assist. Prof.	Communications	Communications			1	
Assist. Prof.	Info. & Comm. Eng.	Image processing			1	
Assist. Prof.	Elect. & Electronic Eng.	Communications				1
Assist. Prof.	Electro-optics and laser	Optoelectronics			1	
Lecturer	Elect. & Electronic Eng.	Electronics			1	1

Lecturer	Communications	Communications			1	1
Assist. Lecturer	Communications	Communications			3	
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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
Third/Second	COE 313	Computer networks	Basic	√	√	√	√	√	√	√		√	√	√	

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

Course Description Form

1. Course Name:					
Computer Networks					
2. Course Code:					
COE 313					
3. Semester / Year:					
Second/Third					
4. Description Preparation Date:					
24-4-2024					
5. Available Attendance Forms:					
None					
6. Number of Credit Hours (Total) / Number of Units (Total)					
2/4					
7. Course administrator's name (mention all, if more than one name)					
Name: Riyadh K. Ahmed Email: riyadh_alazawi_eng@uodiyala.edu.iq					
8. Course Objectives					
Course Objectives		In this course, –students will learn: - Network-Centric World. - Application Layer Functionality and Protocols. - Configuring Cisco Devices. - Computer networking devices.			
9. Teaching and Learning Strategies					
Strategy	1) Understanding the basics of computer networks 2) Learning about the CISCO devices				
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1,2,3	6	Understanding the principles of computer networks	Introduction to computer networks,	Visual	Discussion and quiz
4.5.6	6	Understanding Communicating in a	Communicating in a Network-Centric World	Visual	Discussion and quiz

		Network-Centric World			
7,8,9	6	Understanding OSI model	OSI model	Visual	Discussion and quiz
10,11,12	6	Understanding Configuring Cisco Devices	Configuring Cisco Devices	Visual	Discussion and quiz
13,14,15	6	Understanding Ethernet. Planning and Cabling Networks.	Ethernet. Planning and Cabling Networks.	Visual	Discussion and quiz

11. Course Evaluation					
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports.....etc					
12. Learning and Teaching Resources					
Required textbooks (curricular books, if any)					
Main references (sources)					
Recommended books and references (scientific journals, reports...)					
Electronic References, Websites					

Text book

- Computer Networks, Behrouz A. Fourouzan, Firouz Masharraf, McGraw-Hill

Main references

- Computer Networks, a System approach, 4th Edition, by Larry Peterson, MK 2007

Recommended book

Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 5th ed, 2011