



Ministry of Higher Education and
Scientific Research - Iraq
Al-Mansour University College
Department of Communication Engineering



الملحق 4: وصف المادة الدراسية

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Digital Communication II		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	COM 36109		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	UGIII	Semester of Delivery	
Administering Department	BSc - COMM	College	Al-Mansour University College
Module Leader			e-mail
Module Leader's Acad. Title			Module Leader's Qualification
Module Tutor	Name (if available)		e-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	13-9-2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Digital Communication I COM 35102		Semester
Co-requisites module	None		Semester



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Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	27. Understand and model fading multipath channels and their impact on digital communication. 28. Study and apply diversity techniques and error control coding (e.g., convolutional, TCM). 29. Analyze binary/M-ary signaling and spread spectrum systems (DS, FH, CDMA) with Rake receivers. 30. Explore multiple access techniques (TDMA, FDMA, CDMA, SDMA) and system capacity. 31. Evaluate path loss, shadowing, and channel capacity in AWGN and fading environments.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	6. Describe and analyze fading channels and their statistical models. 7. Apply diversity and coding techniques to improve system performance. 8. Design and evaluate spread spectrum and multi-access systems (e.g., CDMA, TDMA, FDMA). 9. Use simulation tools to model channel behavior and assess error performance. 10. Evaluate system capacity in AWGN and fading environments with/without channel state information.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Course introduction (2 hrs) • Working with tutorial (15 hrs) • Theoretical lectures (30 hrs) • Lap (32 hrs)
Description	This course provides an advanced treatment of digital communication systems in practical wireless environments. It covers the characterization of multipath fading channels, statistical models, and their impact on system performance. Students will study binary and M-ary signaling schemes, diversity techniques, and error control coding such as convolutional and trellis coded modulation. The course also introduces spread spectrum systems (DS, FH, CDMA), multiple access techniques (TDMA, FDMA, CDMA, SDMA), and the concepts of path loss, shadowing, and channel capacity in AWGN and fading channels. Laboratory sessions and simulation exercises using tools like MATLAB are integrated to strengthen both theoretical knowledge and practical skills.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم



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Strategies	Lectures: Provide theoretical foundations and mathematical modeling of fading channels, coding, and modulation schemes. Tutorials/Problem-Solving Sessions: Reinforce concepts through exercises, analytical derivations, and case studies. Laboratory Work: Hands-on experiments and simulations (e.g., MATLAB/Simulink) to demonstrate digital communication techniques and channel effects. Assignments/Projects: Individual and group tasks focusing on simulation, coding, and performance evaluation of digital systems. Seminars/Presentations: Encourage critical discussion and deeper understanding of advanced topics such as spread spectrum and multi-access systems.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (5)	6 and 12	LO #1 to #3 and #4 to #6
	Assignments	2	10% (5)	2 and 13	LO #3 to #6
	Projects / Lab.	1	10% (10)	Continuous	All



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	Report	1	10% (10)	13	LO #3, #4 and #6
Summative assessment	Midterm Exam	2hr	10% (10)	9	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction: Elements of digital communication systems, communication channels.
Week 2	Pulse Modulation Techniques: PAM, PWM, PPM – principles and applications.
Week 3	Pulse Code Modulation (PCM), Differential PCM (DPCM), Delta Modulation (DM).
Week 4	Adaptive Delta Modulation (ADM) and noise in pulse modulation systems.
Week 5	Digital Modulation: Amplitude Shift Keying (ASK), Phase Shift Keying (PSK).
Week 6	Frequency Shift Keying (FSK), Quadrature PSK (QPSK).
Week 7	Differential PSK (DPSK), Differential Encoded PSK (DEPSK), Minimum Shift Keying (MSK).
Week 8	M-ary Modulation: M-ary FSK, M-ary PSK.
Week 9	Quadrature Amplitude Modulation (QAM), M-ary QAM.
Week 10	Optimum receivers for AWGN channel – receiver design principles.
Week 11	Performance of modulation schemes in AWGN channels.
Week 12	Trade-offs in digital communication: power, bandwidth, data rate, and error probability.
Week 13	Multiplexing Techniques: Time Division Multiplexing (TDM).
Week 14	Multiplexing Techniques: Frequency Division Multiplexing (FDM).



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Week 15	Applications of TDM and FDM in digital communication systems – case studies and review.
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Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Representation of digital signals (time and frequency domain).
Week 2	Pulse Amplitude Modulation (PAM) experiment.
Week 3	Pulse Code Modulation (PCM) and Delta Modulation (DM).
Week 4	Adaptive Delta Modulation (ADM) with noise effects.
Week 5	ASK Modulation and Demodulation.
Week 6	PSK Modulation and Demodulation.
Week 7	FSK Modulation and Demodulation.
Week 8	QPSK Modulation and Performance Measurement.
Week 9	M-PSK Modem experiment.
Week 10	M-FSK Modem experiment.
Week 11	QAM Modulation and Demodulation.
Week 12	M-ary QAM Modem experiment.
Week 13	TDM Implementation experiment.
Week 14	FDM Implementation experiment.
Week 15	Integrated case study: performance analysis of modulation and multiplexing techniques.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	- Principles of Communication, Sanjay Sharma, S.K. Kataria & Sons, New Delhi. J. G. Proakis & M. Salehi, Digital Communications, McGraw-Hill.	yes
Recommended Texts	- Simon Haykin, Communication Systems, Wiley. - Bernard Sklar, Digital Communications: Fundamentals and Applications, Prentice Hall. B. P. Lathi & Zhi Ding, Modern Digital and Analog Communication Systems, Oxford University Press.	No



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Websites

- MIT OpenCourseWare – *Digital Communication*: <https://ocw.mit.edu>
- IEEE Xplore Digital Library: <https://ieeexplore.ieee.org>

Grading Scheme

مخطط الدرجات

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

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