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	**Core**		☒Theory ☐Lecture ☒Lab ☒ Tutorial ☐Practical ☐Seminar	
Module Code	**COM 35102**			
ECTS Credits	**6**			
SWL (hr/sem)	**150**			
Module Level	UGIII	**Semester of Delivery**	1	
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	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	5. Introduce the basic concepts and mathematical foundations of digital communication systems. 6. Impart knowledge on pulse modulation techniques (PAM, PCM, DM, ADM) and their applications. 7. Impart knowledge on digital modulation schemes (ASK, PSK, FSK, QPSK, QAM, M-ary) and performance in AWGN channels. 8. Impart knowledge on multiplexing techniques (TDM, FDM) and their role in digital communication.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate knowledge and understanding of the fundamental concepts of digital communication, including pulse modulation and digital modulation schemes, with performance evaluation in noisy channels. 2. Understand system design and use integrated approaches to analyze and solve problems in digital communication systems. 3. Demonstrate achievement of subject knowledge through theoretical analysis, laboratory work, and seminars. 4. Solve additional, more challenging problems related to digital modulation, multiplexing, and error performance. 5. Identify appropriate design challenges in digital communication and formulate clear objectives using analytical methods and simulation tools.
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	Fundamental Concepts: Basic elements of digital communication systems, communication channels, signal representation. Pulse Modulation Techniques: PAM, PWM, PPM, PCM, DPCM, DM, ADM; noise in pulse modulation systems. Digital Modulation Techniques: ASK, PSK, FSK, QPSK, DPSK, DEPSK, MSK, M-ary FSK, M-ary PSK, QAM, M-ary QAM. Optimum Receivers

	for AWGN Channels: Receiver design for signals corrupted by AWGN, performance of modulation schemes, trade-off among power, bandwidth, data rate, and error probability. Multiplexing Techniques: Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM), applications in digital communication. Laboratory Work: Representation of digital signals, implementation of pulse modulation schemes, M-PSK modem, M-FSK modem, QAM modem, TDM and FDM experiments.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	In this course, students are guided by: • Using illustrative examples to explain pulse and digital modulation techniques. • Applying problem-solving sessions that link theory with practical experiments. • Encouraging discussions to analyze system performance under noise and bandwidth constraints. • Integrating simulation tools (e.g., MATLAB/Simulink) to support understanding of digital communication concepts. • Laboratory experiments to strengthen the connection between theoretical principles and real-world applications.

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 #4
	Assignments	2	10% (5)	2 and 13	LO #3 to #6
	Projects / Lab.	1	10% (10)	Continuous	All
	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).
Week 15	Applications of TDM and FDM in digital communication systems – case studies and review.

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	Yes
Recommended Texts	• J. G. Proakis & M. Salehi, Digital Communications, McGraw-Hill. • 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
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.