



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	Optical communication		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	COM 36114		
ECTS Credits	4		
SWL (hr/sem)	100		
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	None	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	40. Studying the optical fiber waveguide and the ray transmission theory 41. Construction of the optical fiber wave guide and studying the effective parameters of the optical fiber 42. Studying the types of the optical fiber and classification based on the index profile. 43. Studying the characteristics of the transmission theory 44. Studying the optical sources such as the laser sources, LED, and studying the laser principles 45. Studying the optical emission in the semiconductor, and studying the optical transmitter and receiver. 46. Studying the principle of the operation detectors.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate the knowledge and understanding of the fundamental concepts, such as principles of optical fiber waveguide and ray transmission theory such as total internal reflection, optical losses, and optical transmitter and receiver to process the problems in optical comm. systems. 2. Understand process construction of optical fiber, types of optical fibers, , understanding the major factors in the optical fiber such as acceptance angle, numerical aperture, critical angle, relative refractive index difference, the internal rays in the optical fiber, . 3. Demonstrate achievement of a subject knowledge, particularly via seminars. 4. Solving additional, more challenging exam problems. 5. Identify appropriate design and governance problems and formulate clear objectives using analytical data.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Course introduction (4 hrs) • Theoretical lectures (28 hrs) • Lap (28)
Description	a- Introduction to optical communications systems: Historical development, The general system, Advantages of optical fiber communication, Optical fiber waveguides, Ray transmission theory, total Internal reflection (TIR): acceptance angle, numerical aperture, relative refractive index difference, meridional and skew ray, Modes in a planar guide, Multimode-step index fiber, Multimode-graded index fiber, single-mode step index fiber, and single-mode graded fiber.



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- b- Transmission characteristics of optical fibers, attenuation, material absorption, intrinsic-absorption, extrinsic absorption, linear scattering losses, Rayleigh scattering, Mie-scattering, non-linear scattering, Stimulated Brillouin scattering, Stimulated Raman scattering, Fiber-bend losses, Dispersion, inter-modal dispersion, material dispersion, waveguide dispersion, intra-modal dispersion, Modal-noise.
- c- Fiber-Joint, fiber Splice, fiber connectors, Fresnel reflection, Optical transmitter, laser basic, optical emission from semiconductors, the $p-n$ junction, spontaneous emission, Optical-receiver, Analog optical receiver noise (shot noise), Optical power budget
- d- photodetectors, photo-detectors principles, Quantum efficiencies, types of photo detectors, $p-n$ photo diode, $p-i-n$ photo diode, Speed of response and traveling-wave photodiodes, Avalanche photodiodes (APD), Phototransistor, Digital optical receiver noise (quantum noise),

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies

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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Student Workload (SWL)

الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	37	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	2.5
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% (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
	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)		



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Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Historical development, The general system, Advantages of optical fiber communication.
Week 2	Optical fiber waveguides, Ray transmission theory, total Internal reflection(TIR): acceptance angle, numerical aperture, relative refractive index difference, meridional and skew ray.
Week 3	Modes in a planar guide, Multimode-step index fiber, Multimode-graded index fiber, single-mode step index fiber, single-mode graded fiber
Week 4	Transmission characteristics of optical fibers, attenuation, material absorption, intrinsic-absorption, extrinsic absorption,
Week 5	linear scattering losses, Rayleigh scattering, Mie-scattering, non-linear scattering, Stimulated Brillouin scattering, Stimulated Raman scattering, Fiber-bend losses,
Week 6	Dispersion, inter-model dispersion, material dispersion,
Week 7	waveguide dispersion, intra-model dispersion, Modal-noise
Week 8	Fiber-Joint, fiber Splice , fiber connectors, Fresnel reflection.
Week 9	Optical transmitter, laser basic, optical emission from semiconductors,
Week 10	The $p-n$ junction, spontaneous emission. Optical-receiver,
Week 11	photodetectors, photo-detectors principles, Quantum efficiency.
Week 12	types of photo detectors , p-n photo diode p-i-n photo diode,
Week 13	Speed of response and traveling-wave photodiodes, Avalanche photodiodes(APD),
Week 14	Phototransistor, Digital optical receiver noise (quantum noise),
Week 15	Analog optical receiver noise (shot noise), Optical power budget



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Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to the lab and get started with use of tools which uses in the experiments.
Week 2	Optical Fiber Communication System- part 1
Week 3	Optical Fiber Communication System- part 2
Week 4	Optical Sources- part 1
Week 5	Optical Sources- part 2
Week 6	Optical Modulators -part1
Week 7	Optical Modulators-part 2
Week 8	Optical Modulators- part 3
Week 9	Optical Fiber Attenuation- part 1
Week 10	Optical Fiber Attenuation-part 2
Week 11	Optical Fiber Attenuation –part 3
Week 12	Digital and analog optical fiber links- part 1
Week 13	Digital and analog optical fiber links- part 2
Week 14	Digital and analog optical fiber links- part 3
Week 15	Preparatory week before the final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	John M. Senior "Optical Fiber Communications Principles and Practice", Third edition, 2009.	Yes

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Recommended Texts	• <i>Harry J. R. Dutton</i> "Understanding Optical Communications", First edition, 1998. • John Wiley: "Fiber optic communications systems", Third edition, 2002.	No
Websites	Microsoft Help, https://support.microsoft.com/en-us/products Learn Microsoft Office, https://www.goskills.com/Microsoft-Office	

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.				