



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



## الملحق 4: وصف المادة الدراسية

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Analog Communication		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	COE 207		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UGII	Semester of Delivery	
Administering Department	BSc - COMM	College	College of Engineering
Module Leader	Montadar Abas Taher	e-mail	montadar.abas@uodiyala.edu.iq
Module Leader's Acad. Title	Associated Professor	Module Leader's Qualification	PHD
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	2024/9/1	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	COE 201 : Signals and Systems	Semester	1
Co-requisites module	None	Semester	



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## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Objectives</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. To show the main components of the analog communication systems.</li> <li>2. To introduce the theory behind carrying a signal over another signal.</li> <li>3. To learn how to attach a message signal to the carrier signal.</li> <li>4. To show the various types of modulation techniques.</li> <li>5. To show the effect on the signals.</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Understanding the main components of the analog communication system.</li> <li>2. Show how to recognize the differences between modulation types.</li> <li>3. Show how to distinguish between the different components of modulations.</li> <li>4. List the basic components of the communication systems.</li> <li>5. Understanding linear modulation family.</li> <li>6. Understanding angle/exponential modulation family.</li> <li>7. Show the interaction between message signal and carrier signal.</li> <li>8. Understanding the theory behind the generation of each modulation type.</li> <li>9. Understanding the receivers' systems.</li> <li>10. Understanding the reaction between signals and noise.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<ul style="list-style-type: none"> <li>• Introduction and Definitions of communication systems (4 hrs).</li> <li>• Linear Modulation (16 hrs).</li> <li>• Linear Demodulations (8 hrs).</li> <li>• Angle Modulation (16 hrs).</li> <li>• Noise in Communication Systems (12 hrs).</li> <li>• Receiver Systems (4 hrs).</li> </ul>
<b>Description</b>	<p><b>Introduction to Communication Systems:</b> Analog systems, main components of analog communication systems, definitions of message and carrier signals. <b>Linear modulation:</b> Double Side Band Suppressed Carrier (DSB-SC) amplitude modulation, conventional Amplitude Modulation (AM/DSB-LC), Modulation Index, Spectrum of AM Signal, Single Side Band (SSB), Vestigial Side Band (VSB), Power Calculations in AM Systems, Application of AM Systems. <b>Linear Demodulators:</b> Synchronous/coherent demodulation, carrier recovery (squaring loop and Phase Locked Loop (PLL)), asynchronous/noncoherent demodulation (Diode detector). <b>Angle Modulation:</b> Phase and Frequency Modulation and their Relationship, Phase and Frequency Deviation, Spectrum of an FM Signal, Bandwidth of Sinusoidally Modulated FM Signal, Narrow Band FM (NBFM) Wide Band FM (WBFM), Phasor Diagram for FM Signals. FM Generation: Parameter variation method, indirect method of frequency modulation (Armstrong method), PLL FM Demodulator, pre-emphasis and de-emphasis. <b>Noise In AM &amp; FM Systems:</b> Sources of noise, resistor noise, shot noise, calculation of noise in a linear system, Noise in AM Systems, Noise in Angle Modulation Systems, Comparison between AM and FM with respect to Noise, Threshold Improvement in Discriminators. <b>Receivers:</b> Frequency Translation and Mixing, Interference, Extensions of the super-heterodyne principles.</p>



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### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 including selecting tasks that are appealing to students.
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### Student Workload (SWL)

#### الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	<b>93</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	<b>6</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	<b>32</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	<b>2.1</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>125</b>		

### Module Evaluation

#### تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	5% (10)	2 and 6	LO #1 to #4 and #6 to #10
	Assignments	2	5% (10)	3 and 13	LO #2 to #8
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	12	LO #3, #4 and #7
<b>Summative assessment</b>	Midterm Exam	1hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
<b>Total assessment</b>			<b>100% (100 Marks)</b>		



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### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1</b>	Analog and digital systems, main components of analog communication systems, definitions of message and carrier signals.
<b>Week 2</b>	Double Side Band Suppressed Carrier (DSB-SC) amplitude modulation.
<b>Week 3</b>	conventional Amplitude Modulation (AM/DSB-LC), Power Calculations in AM Systems.
<b>Week 4</b>	Modulation Index, Spectrum of AM Signal, Single Side Band (SSB) Amplitude Modulation.
<b>Week 5</b>	Vestigial Side Band (VSB) Amplitude Modulation, Application of AM Systems.
<b>Week 6</b>	Synchronous/coherent demodulation, carrier recovery (squaring loop and Phase Locked Loop (PLL)).
<b>Week 7</b>	Asynchronous/noncoherent demodulation (Diode detector).
<b>Week 8</b>	Phase and Frequency Modulation and their Relationship, Phase and Frequency Deviation, Spectrum of an FM Signal.
<b>Week 9</b>	Bandwidth of Sinusoidally Modulated FM Signal, Effect of the Modulation Index on bandwidth.
<b>Week 10</b>	Spectrum of Constant Bandwidth FM, Phasor Diagram for FM Signals.
<b>Week 11</b>	FM Generation: Parameter variation method, indirect method of frequency modulation (Armstrong method), PLL FM Demodulator, pre-emphasis and de-emphasis.
<b>Week 12</b>	Sources of noise, resistor noise, shot noise, calculation of noise in a linear system.
<b>Week 13</b>	Noise in AM Systems, Noise in Angle Modulation Systems.
<b>Week 14</b>	Comparison between AM and FM with respect to Noise, Threshold Improvement in Discriminators.
<b>Week 15</b>	Frequency Translation and Mixing, Interference, Extensions of the super-heterodyne principles.



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### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Generation of different message signals including microphone and signal generator.
<b>Week 2</b>	Amplitude modulation using transistor Part – 1 (DSB-LC).
<b>Week 3</b>	Amplitude modulation using diode and Band Pass Filter (BPF) Part – 2 (DSB-LC)
<b>Week 4</b>	Amplitude modulation Part – 3: Design by Student.
<b>Week 5</b>	Amplitude modulation Part – 4: (DSB-SC)
<b>Week 6</b>	Amplitude Demodulation: Part – 1 (using Passive components).
<b>Week 7</b>	Amplitude Demodulation: Part – 2 (using Active components).
<b>Week 8</b>	Amplitude Demodulation: Part – 3, Design by Students.
<b>Week 9</b>	Voltage Controlled Oscillator (VCO) using CD4046.
<b>Week 10</b>	VCO by student design.
<b>Week 11</b>	Phase Locked Loop (PLL) using CD4046.
<b>Week 12</b>	Frequency modulation using CD4046.
<b>Week 13</b>	Frequency modulation using 555 – timer.
<b>Week 14</b>	Frequency modulation using 565 integrated circuit.
<b>Week 15</b>	Frequency modulation by student design.

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>John G. Proakis, Masoud Salehi, Fundamentals of communication systems, second edition, Pearson Education, 2014, SBN: 9780133354850.</li> <li>Simon Haykin, Michael Moher, Introduction to Analog and Digital Communications, Second Edition, John Wiley &amp; Sons, 2007, ISBN: 9780471432227.</li> </ul>	Yes
<b>Recommended Texts</b>	B. P. Lathi & Zhi Ding, Modern digital and analog communication systems, fourth edition, Oxford University Press, 2009, ISBN:9780195331455.	No
<b>Websites</b>	N/A	



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### Grading Scheme

مخطط الدرجات

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