Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	**Technology college**	
Department	**Information and Communication Technology Engineering (ICTE)**	
Module Name	**ANALOG COMMUNICATION**	
Module Code	**ANC304**	
Degree	**Technical Diploma** I **Bachelor** I **High Diploma** **Master** **PhD**	
Semester	**3rd semester**	
Qualification	**Electrical and Electronic Engineering**	
Scientific Title	**Assistant Lecturer**	
ECTS (Credits)	**5**	
Module type	**Prerequisite** **Core** I **Assist.**	
Weekly hours	**4**	
Weekly hours (Theory)	**(2)hr Class**	**(135)Total hrs Workload**
Weekly hours (Practical)	**(2)hr Class**	**(135) Total hrs Workload**
Number of Weeks	**12**	
Lecturer (Theory)	**Jabbar Majeed Sadeq**	
E-Mail & Mobile NO.	**jabbar.sadeq@epu.edu.iq**	**07504487044**
Lecturer (Practical)	**Jabbar Majeed Sadeq**	
E-Mail & Mobile NO.	**jabbar.sadeq@epu.edu.iq**	**07504487044**
Websites		

Course Book

<table>
<tr><td>Course Description</td><td colspan="5">Communication Principles is a foundational course for those majoring in the communication option in final year. This course introduces students to: (i) the essential approaches, fundamental concepts and design issues in communication engineering. The course emphasizes the understanding of engineering principles. Mathematics is used only at a level that is absolutely necessary; (ii) basic concepts of modulation techniques including amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) that are widely used in analogue communication systems, and basic techniques for analysing such systems in the time and frequency domains; (iii) basic concepts of a digital communication system including sampling theorem, pulse code modulation (PCM) and principles of digital data transmission, and basic techniques for analysing such systems in the time and frequency domains and all types of communication filters such as Low pass, High pass, Band pass and Bans stop filters.</td></tr>
<tr><td>Course objectives</td><td colspan="5">1.To provide the concepts about analysis and design of analog communication systems.
2.To teach analog amplitude and exponential modulation types and their analysis methods.
3.To prepare students for advanced level digital communication courses.
4. Impart the basic concepts of analog modulation schemes.
5. Describe different types of noise and predict its effect on various analog communication systems.
6. Know the techniques of analog communication and noise analysis in analog communication.</td></tr>
<tr><td>Student's obligation</td><td colspan="5">The student should be attended to the class every week four hours and prepare himself for weekly quizzes and do assignments and home works in the theory class and must be write a report for every experiment done weekly</td></tr>
<tr><td>Required Learning Materials</td><td colspan="5">1- Power point presentation 2-white board 3- sheets 3- seminars zoom meeting and Moodle program.</td></tr>
<tr><td rowspan="3"></td><td colspan="2">Task</td><td>Weight (Marks)</td><td>Due Week</td><td>Relevant Learning Outcome</td></tr>
<tr><td colspan="2">Paper Review</td><td></td><td></td><td></td></tr>
<tr><td>Assignments</td><td>Homework</td><td>5</td><td>3-6-9-12</td><td>Designing passive frequency filters, Understanding AM modulation and how to calculate upper and lower sideband frequencies</td></tr>
</table>

		Class Activity	2	Over all weeks	Design filters circuits, AM and FM modulation and demodulation problems
		Report	5	4	After each chapter completing student submits a report on their activities
		Seminar	5	6	Inspect and test operation of telecommunications equipment
		Essay			
		Project		6-11	Mini projects
	Quiz		8	Every week	Weekly outcomes
	Lab.		10	Over all weeks	Designing and analysing frequency curves and frequency spectrum for both passive and active filters, calculating modulation index for both AM and FM modulation
	Midterm Exam		25	12	
	Final Exam		40	15	All the outcomes
	Total		100		
Specific learning outcome:	On Completion of this course the students will be able to: • Analyze analog communications in time domain and frequency domain. • Distinguish between different analog modulation techniques. • Understand the importance of noise considerations in communication systems. • Understanding the importance of communication filters • Understanding the modulation and demodulation techniques of analogue and digital communication • Understanding the effect of noise on the transmitted signal to the receiver during the medium.				
Course References:	1- Electronic communications by M. LANDA 2- Local area networks by GRED 3- Digital communication by: A.Glover&P.M Grant 4- Modern communication circuits by: J.Smith 5- Electronic communication www.electronic.com 6- Mobile communications www.google				

Course topics (Theory)	Week	Learning Outcome
Introduction to communications, communication signals, the frequency range used in communications.	1	Understanding the principles of communication system
Frequency filter circuit, types of filters, passive filters.	2	Designing passive frequency filters
Active filters, design filter circuits, Examples on filter circuits.	3	Designing active frequency filters
RF tuned amplifier (specification of tuned amplifiers, Design and analysis of RF tuned amplifiers.	4	Design and analysis of RF tuned amplifiers.
Modulation (the purpose of modulation), types of modulations.	5	Understanding principles of modulation
AM (amplitude modulation, specification of AM)	6	Understanding AM modulation and how to calculate upper and lower sideband frequencies
AM power calculations, AM frequency Spectrum.	7	Calculation power of sideband and total power of AM modulation
AM signal generation methods, AM modulators, AM signal detection methods, envelope detector, synchronous detector.	8	Understanding the methods of AM generation and detection
FM modulation, specification of FM, Power calculations of FM by using Bessel function table.	9	Understanding FM modulation and power calculation
Methods of generation of FM signal, Sketch of FM signal spectrum, Methods of FM detection.	10	Student able to sketch signal spectrum
Noise, Noise factors, calculating noise factors (FT).	11	Effect of Noise on the transmitted signal in the medium
Satellite communication	12	To understand the PCM principles
Practical Topics	**Week**	**Learning Outcome**
Oscilloscope trace for a low- pass filter, Cut-off frequency for a low- pass filter.	1	Student understand to design passive low pass filter
Oscilloscope trace for a high- pass filter, Cut-off frequency for a high- pass filter	2	Student understand to design passive High pass filter
Oscilloscope trace for a band-pass filter, Bode plot for a band-pass filter.	3	Student understand to design passive band pass filter
Oscilloscope trace for a band- stop filter Bode plot for a band-stop filter.	4	Student understand to design passive bans stop filter
Principle of AM: Oscilloscope measurement, Experiment: Modulation depth	5	Student understand to design the AM modulation circuit
AM - Demodulation	6	Student understand to design the AM de -modulation circuit

DSB: Oscilloscope measurements, Frequency spectra of AM and DSB	7	Student understand to design the AM frequency spectrum
SSB based on AM- SSB based on DSB	8	Students able to draw the SSB signals
SSB demodulation	9	Understand the student to sketch the demodulated SSB signals
Principle of frequency modulation- Frequency swing- Frequency modulation spectrum	10	To understanding principles of FM modulation
Modulation index-Phase swing	11	Students able to calculate the index and phase swing of FM
Demodulation of an FM signal.	12	Student able to sketch the FM demodulation signals

Questions Example Design

19. Examinations:

Q1/ what is the name given to the following expressions and sketch the block diagram for each with an example:

1- One –way communication

2- A simultaneous two way communication

3-Two way communication in which each parts takes turn transmission

2. fill in the blanks examples:

Q2/Fill in the blanks with suitable terms .

1) The types of digital carrier systems are --------- ,----------, ---------- .

2) The pulse position modulation is also called pulse ---------- modulation

3) The network terminals are classified as --------- , --------- ,------- --.

4) The message switching systems also known as ---------- systems .

5) The logical structure of the packet depends on ---------- , and doesn't depend on .....

3. Multiple choices:

Chose the correct answer for the following statement

Q3/ Choose the correct answer for each of the following statements:

The signals which are obtained by encoding each quantized signal into a digital word is called as:

a) PAM signal b) PCM signal c) FM signal d) Sampling and quantization

2. Quantization noise can be reduced by ..... the number of levels.

a) Decreasing b) Doubling c) Increasing d) Squaring

3. In PCM encoding, quantization level varies as a function of……. .

a) Frequency b) Square of frequency c) Square of amplitude d) Amplitude

4. Pulse width modulation is also called .....modulation.

a) Pulse position b) Pulse code c) Pulse duration d) Pulse delta

5. The satellite is in orbit somewhere 8000 km and 18000 km above the earth's surface is:

a) Molniya orbit satellite b) Geostationary earth orbit c) Low earth orbit d) Medium earth orbit

6. Quadrature Amplitude Modulation (QAM) has same advantages as……

ASK and FSK b) ASK and PSK c) FSK and PSK d) All the above.

7. ASK, PSK, FSK, and QAM are examples of .....conversion.

Digital to digital b) Analog to digital c) Analog to analog d) Digital to analog.

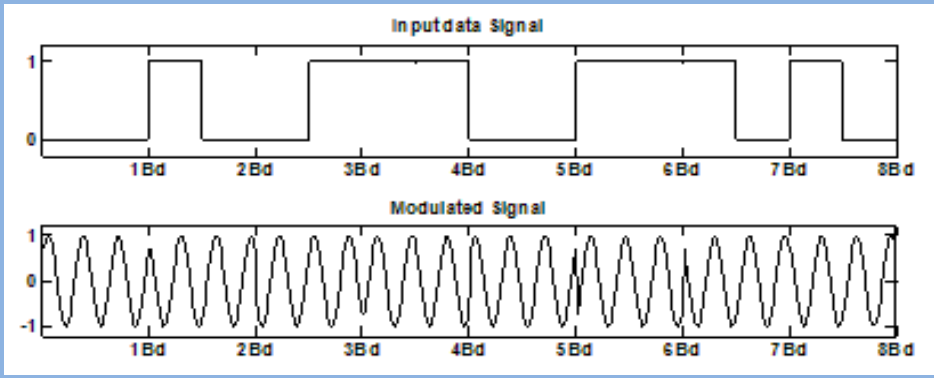
8. Which of the following techniques uses digital modulation?

a) PAM b) PWM c) PPM d) PCM

9. What type of modulation the figure below indicates?

Pulse width modulation b) Unipolar PAM c) Bipolar PAM d) Pulse position modulation

10. What type of analog modulation the figure below indicates?



ASK b) PSK c) FSK d) QAM

20. Extra notes:

Q4/A receiver with **300Ω** input resistance, operates at temperature of **77F°**, the received signal at **88 MHz** with bandwidth of **5.5MHz**. The received signal voltage of **8.6μV** is applied to an amplifier with noise figure of **2.5 dB** calculate:

1- The input noise power (5M)
2- The input signal power (5M)
3- The S/N in decibels. (5M)
4- The noise factor and S/N of the amplifier (5M)
5- The noise temperature of amplifier (5M)

Extra notes:

External Evaluator

1- The course book of communication system is completely related to the syllabus of communication system of practical syllabus and satisfy the goal of communication subjects.

2- The practical course is completely defined the theoretically lectures.

Brzo Aziz Qader: Lecturer at oil technology department