**Course Description Form of Communications II**

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| 1. Course Name:
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| Communications II |
| 1. Course Code:
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| **WBM-42-03** |
| 1. Semester / Year:
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| Semester |
| 1. Description Preparation Date:
 |
| 2024-03-19 |
| 1. Available Attendance Forms:
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| presence in the classroom |
| 1. Number of Credit Hours (Total) / Number of Units (Total)
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| 60 Hours / 3 Units |
| 1. Course administrator's name (mention all, if more than one name)
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| Name: Ahmed Mohammed MerzaEmail: ahmed.merza@uowa.edu.iq |
| 1. Course Objectives
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| **Course Objectives** | ■ clearly understand the meaning of terms like: ‘Band-limited Signals’, Nyquist rate, Aliasing, etc., derive the low pass sampling theorem and explain its implication.■ explain the basic concept of time-division-multiplexing,■ understand the way the amplitude of each sample of a continuous-time band-limited signal, is represented in PAM, PDM and PPM,■understand the need for and the effect of quantization, different types of quantizers, and the need for companding of speech signals in PCM systems,■explain the relationship between Q , the number of quantization levels; n, the bits per codeword; r, the bit-rate and BT , the transmission bandwidth of a pulse-code modulated signal,■determine the signal-to-quantization noise ratio as well as signal-to-noise ratio for PCM systems■explain the operation of DM, ADM, DPCM, systems using the block diagrams of their transmitters and receivers,■view information as removal of uncertainty, is familiar with the ‘measure’ of information and can determine the average rate at which a Discrete Memory Source (DMS) is giving information,■understand the need for source coding’ and can encode the output from a discrete memoryless source using Fano coding, Huffman coding.■relate the concept of ‘Mutual information’ of a channel to information transfer through the channel and understands that Shannon’s Information capacity theorem sets a fundamental limit on the rate at which error-free transmission can be achieved over power-limited, band-limited Gaussian channels. |
| 1. Teaching and Learning Strategies
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| **Strategy** | **1.Theoretical Lectures:** Instructors provide lectures on fundamental concepts, theories, and principles of communication engineering. This helps students understand the theoretical underpinnings of different communication systems and technologies.**2. Practical Demonstrations:** Instructors demonstrate the practical applications of communication engineering concepts using real-world examples, simulations, and case studies. This helps students visualize how theoretical concepts are applied in practice.**3. Assessments**: Students are assessed through a combination of quizzes, exams, assignments, and practical assessments to evaluate their understanding of communication engineering concepts. Feedback from assessments helps students identify areas for improvement. |
| 1. Course Structure
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| **Week**  | **Hours**  | **Required Learning Outcomes** | **Unit or subject name**  | **Learning method**  | **Evaluation method**  |
| 1 | 2 | **Basics of digital communication** | **Introduction to digital communication:** General block diagram of digital communication, Advantage and disadvantage of digital communication, digital coding, Sampling theorem | Lectures presented in PDF format | Daily exams + homework assignments + monthly exams |
| 2 + 3 | 4 | **Analog Pulse Modulation techniques** | **Analog Pulse Modulation:** Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Pulse width and Pulse Position Modulation (PWM & PPM), S/N in analog pulse modulation. | Lectures presented in PDF format | Daily exams + homework assignments + monthly exams |
| 4 + 5 | 4 | **Digital Pulse Modulation techniques** | **Digital Pulse Modulation:** Pulse Code Modulation PCM: quantization, Transmission Bandwidth in PCM, PCM Receiver, Noise Consideration in PCM, PCM TDM System, Limitation and Modifications of PCM, Information Capacity of PCM. | Lectures presented in PDF format | Daily exams + homework assignments + monthly exams |
| 6 | 2 | **Delta Modulation operation** | **Delta Modulation (DM):** Delta Modulation Transmitter, Delta Modulation Receiver, Advantages and disadvantages of Delta Modulation, Line Coding. | Lectures presented in PDF format | Daily exams + homework assignments + monthly exams |
| 7 + 8 | 4 | **Digital Modulation techniques** | **Digital Modulation:** Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK). | Lectures presented in PDF format | Daily exams + homework assignments + monthly |
| 9 | 2 | **Information Theory definition**  | **Information Theory:** Review of related probability and statistics related topics, Information Contain of a Discrete Memoryless Source, Average Information or Entropy. | Lectures presented in PDF format | Daily exams + homework assignments + monthly |
| 10 + 11 | 4 | **Information Theory** | **Information theory**, random variable, source entropy, marginal entropies, channel capacity, channel efficiency, redundancy, entropy of continues signals, symmetric channel, non-symmetric channel. | Lectures presented in PDF format | Daily exams + homework assignments + monthly |
| 12+13 | 4 | **Information Theory** | **Information Theory**: channel efficiency, redundancy, entropy of continues signals, symmetric channel, non-symmetric channel. | Lectures presented in PDF format | Daily exams + homework assignments + monthly |
| 14 | 2 | Data compression | **Source coding** of discrete source, Shannon, Shannon Fano, Huffman. | Lectures presented in PDF format | Daily exams + homework assignments + monthly |
| 15 | 2 | Review of modern systems of digital comm. | **Selected topics in digital communication,** satellite communications, optical fiber communications. | Lectures presented in PDF format | Daily exams + homework assignments + monthly |
| 1. Course Evaluation
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|  Daily exams with practical and scientific questions. ‏ Participation scores for difficult competition questions among students Establishing grades for environmental duties and the reports assigned to them Semester exams for the curriculum, in addition to the mid-year exam and final exam |
| 1. Learning and Teaching Resources
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| Required textbooks (curricular books, if any) | -(McGraw) Schaum's Outlines of Signals & Systems.-(Communications Engineering) Michael Fitz-Fundamentals of Communications Systems-McGraw-Hill Professional (2007) |
| Main references (sources) | Theory and Problems of Analog and Digital Communications\_2nd\_Ed\_Schaum’s Outline Series. |
| Recommended books and references (scientific journals, reports...) | All reputable scientific journals that are related to the broad concept of mathematical theories and their results |