**Course Description Form of Communications II**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Course Name: | | | | | | | | |
| Communications II | | | | | | | | |
| 1. Course Code: | | | | | | | | |
| **WBM-42-03** | | | | | | | | |
| 1. Semester / Year: | | | | | | | | |
| Semester | | | | | | | | |
| 1. Description Preparation Date: | | | | | | | | |
| 2024-03-19 | | | | | | | | |
| 1. Available Attendance Forms: | | | | | | | | |
| presence in the classroom | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | | | | | | | |
| 60 Hours / 3 Units | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: Ahmed Mohammed Merza  Email: ahmed.merza@uowa.edu.iq | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **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 | | | | | | | | |
| **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 | | | | | | | | |
| **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 | | | | | | | | |
|  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 | | | | | | | | |
| 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 | | |