|  |
| --- |
| **IUT_LOGO**  **IUT_LOGOISLAMIC UNIVERSITY OF TECHNOLOGY**  **Course Outline and Course Plan** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Name of the Teacher** | **Md. Sakhawat Hossen** | | | **Position** | | **Assistant Professor** | | |
| **Department** | **Computer Science and Engineering (CSE)** | | | **Programme** | | **B.Sc. Eng.** | | |
| **Course Code** | **CSE 4405** | | | **Course Title** | | **Data and Telecommunications** | | |
| **Academic Year** | **2019-20** | | | **Semester** | | **Summer** | | |
| **Contact Hours** | **4** | | | **Credit Hours** | | **4** | | |
| **Text books and Reference books** | 1. **Data Communication and Networking, 4th edition.** 2. **Data and Computer Communication, 7th edition.** 3. **Wireless communication: Principles and Practice, Prentice Hall, 2nd Edition** 4. **Principles and Applications of GSM, Prentice Hall, 1st Edition,** | | | **Authors of the books** | | 1. **Behrouz A Forouzan** 2. **William Stallings** 3. **T. Rappaport** 4. **Vijay K. Garg, Joseph E. Wilkes** | | |
| **Prerequisites**  **(If any)** |  | | | | | | | |
| **Course Homepage** |  | | | | | | | |
| **Teaching Methods/**  **Approaches** | **Lecture√** | **Group discussion√** | | | **Demonstration√** | | | **Problem solving√** |
| **Project√** | **Others:** | | | | | | |
| **Teaching aids** | **Multi-media √** | | **OHP** | | **Board and Marker√** | | **Others** | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Assessment Method** | | | | | | | | |
| **Attendance (10%)** | **Quiz 15% of Total Marks (Best 3 out of 4)** | | | | | | **Mid Semester (25%)** | **Semester Final (50%)** |
|  | **1st Quiz** | **2nd Quiz** | **3rd Quiz** | **4th Quiz** | **Others** | | **Week/Date** | **Week/Date** |
| **Week/Date** | **Week/Date** | **Week/Date** | **Week/Date** | **Assignment** | **Homework** |
| **4th Week** | **6th Week** | **10th Week** | **13th Week** | **2**  **Assignments** | **Will be given time to time** | **8th Week** | **16th Week** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Grading Policy** | | | | | |
| **Marks out of 100** | **Letter Grade** | **Grade Point** | **Marks out of 100** | **Letter Grade** | **Grade Point** |
| 80 - 100 | A+ | 4.00 | 55 - 59 | B- | 2.75 |
| 75 - 79 | A | 3.75 | 50 - 54 | C+ | 2.50 |
| 70 - 74 | A- | 3.50 | 45 - 49 | C | 2.25 |
| 65 - 69 | B+ | 3.25 | 40 – 44 | D | 2.00 |
| 60 - 64 | B | 3.00 | 00 - 39 | F | 0.00 |

|  |
| --- |
| **Course Contents** |
| Basic concepts: Concepts and Terminology, Data representation, Data flow, Networks and network models, Protocol and standards, OSI reference model, TCP/IP protocol suite.  Data and signals: Analog and Digital data, Time and frequency domain concepts; Transmission impairment; Noisy and Noiseless channel.  Digital and Analog Transmission: Line coding scheme; Pulse code modulation; Delta Modulation; Amplitude shift keying; Frequency shift keying; Phase shift keying; Amplitude, Frequency and Phase modulation.  Multiplexing: Frequency-division multiplexing; Wavelength-division multiplexing; Time-division multiplexing, spread spectrum; Frequency hopping and Direct sequence spread spectrum.  Multiple Access Techniques: Random Access (ALOHA, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Reservation, Polling, Token Passing) Channelization (FDMA, TDMA, SDMA, OFDMA, CDMA)  Transmission Media: Guided Media-Twisted pair cable; Coaxial cable; Fiber-optic cable; Unguided media- Radio wave; Microwave; Infrared and satellite communication.  Switching Network: Circuit switching network; Space and Time division switching; Control signaling; Soft switch architecture; Packet switching; Packet switching technique; Datagram and virtual circuit packet switching.  Error Detection and Correction: Types of error; Block coding; Linear block codes; Hamming code; Cyclic code Convolution codes; Trellis code.  Data link Control Protocols: Flow control; Error control; High level data link control.  Mobile communication: GSM Architecture, CDMA Architecture, Cellular concept: Frequency reuse; Handoff; Channel assignment; Co-channel and adjacent channel interference; Cluster size; Cell size; Coverage; Capacity; Cell splitting, Sectoring, Power control, Frequency hopping. Radio Propagation and channel modelling: Signal propagation mechanisms; Multipath propagation characteristics; Signal fading; Pathloss; Propagation models: Radio wave propagation modelling; Free space propagation model; Radio wave reflection: Ground reflection model; Diffractions; Scattering; Deterministic model; Outdoor propagation model: Okumura model, Hata model. |

|  |
| --- |
| **Course Objectives** |
| The subject aims to equip the student with such that after completion to the course the students should be able to do the followings:   1. Use data communication vocabulary appropriately when discussing issues with other networking professionals. 2. Understand and be able to explain the principles of a layered protocol architecture; be able to identify and describe the system functions in the correct protocol layer and further describe how the layers interact. 3. Understand, explain and calculate the physical phenomenon that can be used for digital transmission over different types of communication media. 4. Describe the principles of access control and data-link control to shared media and perform performance calculations. 5. Familiar themselves to basic protocols and infrastructure of telecommunication network, introduce themselves to advanced communication and networking concepts, and prepare themselves for the advanced courses in the area of data communication and networking. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Mapping with CO, PO and Bloom’s Taxonomy** | | | |
| **CO No.** | **Course Outcomes (CO) Statement** | **Levels of Bloom’s Taxonomy** | **Matching with Program Outcome (PO)** |
| **CO1** | Illustrate the TCP/IP protocol suite and OSI model so that the system function in the correct protocol layer can be identified and described. | C2 | PO1 |
| **CO2** | Explain the physical phenomenon that can be used for digital transmission over different types of communication media. | C2 | PO1, PO2 |
| **CO3** | Describe the principles of access control, error control and data-link control of the shared media so that appropriate techniques can be determined at the time of communication system design. | C5 | PO1, PO2 |
| **CO4** | Comprehend a cellular network architecture(GSM/LTE/4G/5G and beyond) so that its different components and functions can be identified and described | C2 | PO1,PO2,PO3,  PO12 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Weekly plan for course content and mapping with CO** | | | | |
| **Weeks** | | **Topics** | | **COs** |
| **1** | | Basic concepts: Concepts and Terminology, Data representation, Data flow, Networks and network models, Protocol and standards. | | CO1 |
| **2** | | OSI reference model, TCP/IP protocol suite. | | CO1 |
| **3** | | Data and signals: Analog and Digital data, Time and frequency domain concepts; Transmission impairment; Noisy and Noiseless channel. | | CO2 |
| **4** | | Digital and Analog Transmission: Line coding scheme; | | CO2 |
| **5** | | Digital and Analog Transmission: Pulse code modulation; Delta Modulation: Amplitude shift keying; Frequency shift keying; Phase shift keying; Amplitude, Frequency and Phase modulation. | | CO2 |
| **6** | | Multiplexing: Frequency-division multiplexing; Wavelength-division multiplexing; Time-division multiplexing. Spread spectrum; Frequency hopping and Direct sequence spread spectrum. | | CO2 |
| **7** | | Transmission Media: Guided media-Twisted pair cable; Coaxial cable; Fiber-optic cable; Unguided media- Radio wave; Microwave; Infrared and satellite communication. Unguided media- Radio wave; Microwave; Infrared and satellite communication. | | CO2 |
| **8** | | Midterm examinations | |  |
| **9** | |
| **10** | | Switching Network: Circuit switching network; Space and Time division switching; Control signaling; Soft switch architecture. Packet switching; Packet switching technique; Datagram and virtual circuit packet switching. | | CO3 |
| **11** | | Error Detection and Correction: Types of error; Block coding. Linear block codes; Hamming code; Cyclic code. | | CO3 |
| **12** | | Data link Control Protocols: Flow control; Error control; High level data link control. | | CO3 |
| **13** | | Multiple Access Techniques: Random Access (ALOHA, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Reservation, Polling, Token Passing) Channelization (FDMA, TDMA, SDMA, OFDMA, CDMA) | | CO3 |
| **14** | | Mobile communication: GSM Architecture, CDMA Architecture, Cellular concept: Frequency reuse; Handoff; Channel assignment; Co-channel and adjacent channel interference; Cluster size; Cell size; Coverage; Capacity; Cell splitting, Sectoring, Power control, Frequency hopping | | CO4 |
| **15** | | Radio Propagation and channel modelling: Signal propagation mechanisms; Multipath propagation characteristics; Signal fading; Pathloss; Propagation models: Radio wave propagation modelling; Free space propagation model; Radio wave reflection: Ground reflection model; Diffractions; Scattering; | | CO4 |
| **16** | | Deterministic model; Outdoor propagation model: Okumura model, Hata model. | | CO4 |
| **17** | | Review classes and discussion. | | -- |
| **18** | | Final Examinations | |  |
| **19** | |
| **Program Outcomes** | | | | |
| **PO 1** | | **Engineering Knowledge:**  Apply knowledge of **mathematics, natural science**, **engineering** fundamentals and system fundamentals, software development, networking & communication, and information assurance & security to the solution of complex engineering problems in computer science and engineering. | | |
| **PO 2** | | **Problem Analysis:**  Ability to **identify**, **formulate** and **analyze complex** Computer Science and Engineering problems in the areas of hardware, software, theoretical Computer Science and applications to reach significant conclusions by applying Mathematics, Natural sciences, Computer Science and Engineering principles. | | |
| **PO 3** | | **Design/ Development of Solutions:**  **Design solutions** for complex computer science and engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. | | |
| **PO 4** | | **Investigation:**  Ability to use **research based knowledge** and **research methods** to perform literature survey, design experiments for complex problems in designing, developing and maintaining a computing system, collect data from the experimental outcome, analyze and interpret valid/interesting patterns and conclusions from the data points. | | |
| **PO 5** | | **Modern Tool Usage:**  Ability to create, select and apply **state of the art tools** and techniques in designing, developing and testing a computing system or its component. | | |
| **PO 6** | | **The Engineer and Society:**  Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to **professional engineering practice** in system development and solutions to **complex engineering problems** related to system fundamentals, software development, networking & communication, and information assurance & security. | | |
| **PO 7** | | **Environment and Sustainability:**  Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to **professional engineering practice** in system development and solutions to **complex engineering problems** related to system fundamentals, software development, networking & communication, and information assurance & security. | | |
| **PO 8** | | **Ethics:**  Apply **ethical principles** and commit to **professional ethics** and **responsibilities** and norms of computer science and engineering practice. | | |
| **PO 9** | | **Individual Work and Teamwork:**  Ability to function as an individual and as a team player or leader in multidisciplinary teams and strive towards **achieving a common goal.** | | |
| **PO 10** | | **Communication:**  **Communicate effectively** on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | | |
| **PO 11** | | **Project Management and Finance:**  Demonstrate knowledge and understanding of engineering management principles and economic decision making and apply these to one’s own work, as a member and leader in a team, to **manage projects** and in multidisciplinary environments. | | |
| **PO 12** | | **Life-long learning:**  Recognize the need for, and have the preparation and ability to **engage in independent** and **lifelong learning** in the broadest context of technological change. | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping of COs and POs [Correlation level 1 for low, 2 for moderate and 3 for high]** | | | | | | | | | | | | |
| **Course Outcomes** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 |  |  |  |  |  |  |  |  |  |  |  |
| **CO2** | 3 | 3 |  |  |  |  |  |  |  |  |  |  |
| **CO3** | 3 | 3 |  |  |  |  |  |  |  |  |  |  |
| **CO4** | 3 | 3 | 1 | 1 |  |  |  |  |  |  |  | 1 |