# City University
## Department of Computer Science and Engineering
## Faculty of Science and Engineering
## Course Outline

**Course Code : CSE 313**   **Course Title: Data Communication**   **Credit hours: 3**
**Program:** B. Sc. in Computer Science & Engineering (CSE),   **Semester:** Summer 2019
**Total Weeks:** 13   **Hours/Week:** 3   **Total Hours:** $39^+$

**Instructor**: Supta Richard Philip   **Designation**: Senior Lecturer
**Office:** Room 403   **Phone:** 01914818982
**Email:** supta.philip@gmail.com   **Office Hrs:** By appointment

## Course Details
### Rationale
This course covers fundamental concepts of data and computer communications, with problem-solving tutorials on networking related calculations and in-depth discussion and research on leading edge network technologies. The syllabus includes the basic understandings on computer networks and communication protocols as well as expanded coverage of WANs, including TCP/IP, ATM, frame relay, packet switching, and circuit switching, and LANs, including Fast Ethernet.

### Course Objectives
- To learn the basics of data communication and the OSI network model of networks.
- To learn the architecture of communication protocols and digital signal transmission & encoding techniques.
- To learn multiplexing techniques and the concepts and techniques in error detection and correction.
- To learn data link control and its related protocols and LAN architectures and systems.
- To learn switching techniques, protocols and standards of the Internet, addressing, and routing.

## Intended Learning Outcomes (ILOs) of the Course

| | |
|---|---|
| **Knowledge** | **LO 1:** Describe network components and architectures. |
| | **LO 2:** Explain the fundamental principles of computer communication at the physical layer, data link layer and network layer. |
| | **LO 3:** Exercise some Mathematical problems to get an idea on the practical fields including Data, Signals – Analog and Digital, Nyquist Theorem, Shannon's Capacity etc. |
| | **LO 4:** Explain the Network System thoroughly. |
| **Skills** | Evaluate the feasibility of a project and selection of alternative solutions. |
| | Plan and undertake a major individual or team projects. |
| | Use the scientific literature effectively and make discriminating use of online resources. |
| | Create models of requirements using a variety of notations and techniques |
| **Attitude** | Will develop attitude to group dynamics and team work. |
| | Will create attitude to tackle challenges related to signals, network models and fix those. |
| | Will produce optimistic attitude to listen ideas of equals. |

## Mapping of course ILO and PLO

| Learning Outcome (LO) of the Course | Program Learning Outcome (PLO) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **ILO1** | MJ | | | | | MN | | MN | MN | | MJ | |
| **ILO2** | MJ | | MJ | MN | | MN | | | MN | MN | MJ | |
| **ILO3** | MJ | MJ | MJ | MJ | MN | MN | MN | | MN | MN | MJ | MJ |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ILO4** | **MJ** | | **MJ** | **MJ** | **MJ** | **MN** | **MN** | | **MN** | **MJ** | **MJ** | **MJ** |

**Contents**

| SL No | ILO | Topic | Teaching Strategy | Assessment Strategy | Number of Sessions |
|---|---|---|---|---|---|
| 1 | 1, 2 | Introduction to Data Communications TCP/IP protocol suite versus OSI reference model. | Lecture, Example | Q/A | **2** |
| 2 | 1, 2 | Logical connections between layers of the TCP/IP protocol suite. Encapsulation and De-capsulation. | Lecture, Example | Q/A, Quiz | **2** |
| 3 | 2, 3 | Data and Signals - Analog & Digital. | Lecture, Exercise | | **2** |
| 4 | 2, 3 | Frequency, Time Period, Phase, Phase shifts, Wavelength. Signal levels, Bit levels, Bit rate, Analog to digital sampling. | Lecture, Exercise | Q/A | **2** |
| 5 | 2, 3 | New standards of Ethernet. Signal impairment. Attenuation, distortion, SNR. | Lecture, Exercise | Q/A, Quiz | **2** |
| 6 | 2, 3, 4 | Nyquist Bit rate and Shannon capacity. Signal To Noise Ratio practice problems. | Lecture, Example | | **2** |
| | | **MidTerm** | | | |
| 7 | 3, 4 | Digital Transmission: line coding, bit rate, pulse rate | Lecture, Exercise, Assignment | | **2** |
| 8 | 2, 3 | Unipolar encoding, polar encoding | Lecture, Example | | **2** |
| 9 | 3, 4 | Sampling, sampling rate- Nyquist theorem. Transmission mode: parallel , serial mode | Lecture, Example | Q/A, Quiz | **2** |
| 10 | 3, 4 | Analog Transmission: digital to analog modulation Bit rate, baud rate Digital to analog modulation: ASK, FSK, PSK,QAM | Lecture, Example | | **2** |
| 11 | 2, 3, 4 | Multiplexing: categories of multiplexing, Frequency division Multiplexing. | Lecture, Example | | **2** |
| 12 | 3, 4 | Wave division Multiplexing , Time division Multiplexing | Lecture, Example, Assignment | Q/A, Quiz | **1** |
| 13 | 3, 4 | Transmission media: Guided and unguided | Lecture, Example | | **1** |
| **Total** | | | | | **24** |

**Teaching Learning Methods**

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|---|
| Analyze and solve knowledge-based problems for practical situation |
| Group discussion |
| Lecture slides, presentations, audio and video |
| Analytical and critical thinking approach to understand real life system and models |

**Assessment Schedule**

| Assessment 1 | Quizzes | Week 4, Week 10 |
|---|---|---|
| Assessment 2 | Assignments | Week 5, Week 11 |
| Assessment 3 | Presentation | Week 5, Week 11 |
| Assessment 4 | Mid-Term Exam | Week 6 |
| Assessment 5 | Final Exam | Week 12 |

**Weights of Assessments**

| Assessments | % |
|---|---|
| Mid-Term Exam | 30 |
| Final Exam | 40 |
| Quizzes | 10 |
| Assignments | 10 |
| Presentation | 10 |
| **Total** | **100** |

**List of References**

**Recommended Book (Text Book):**
1. Behrouz A. Forouzan: Data Communication and Networking

**Essential Books (Text Books):**
2. Prakash C Gupta- Data Communication
3. W. Stallings, Macmillan- Data and Computer Communications

**Recommended Reference Books:**
4. F.Halsall, Adison-Wesly- Data Communication and Computer Networks Tanenbaum, A. S- Computer Networks
5. Comer, D.E, Stevens, D.L - Internetworking with TCP/IP

**Facilities Required for Teaching and Learning**

Projector, Whiteboard, Internet access from classroom computer, Audio/Visual equipment.

**Course Policies and Procedures**

- Class attendance: Regular attendances of classes are mandatory and students will be assigned F automatically if he/she misses 6 consecutive classes.
- Late submission of work: Late submission will be followed by penalty, please maintain deadlines.
- Unfair means /plagiarism: Plagiarism will be dealt with severe penalty. Original work is encouraged as they will carry value marks.

**Appendix-1: Program Learning Outcome (PLO)**

| PLO No. | PLO |
|---------|-----|
| 1. | **Engineering Knowledge** |
| 2. | **Problem Analysis** |
| 3. | **Design/Development of Solutions** |
| 4. | **Investigation** |
| 5. | **Modern Tool Usage** |
| 6. | **The Engineer and Society** |
| 7. | **Environment and Sustainability** |
| 8. | **Ethics** |
| 9. | **Communication** |
| 10. | **Individual and Team Work** |
| 11. | **Life Long Learning** |
| 12. | **Project Management and Finance** |

**Professional/Generic Skills (Detailed):**

1. **Engineering Knowledge (T)** -Apply knowledge of mathematics, sciences, engineering fundamentals and manufacturing engineering to the solution of complex engineering problems;
2. **Problem Analysis (T)** – Identify, formulate, research relevant literature and analyze complex engineering problems, and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences;
3. **Design/Development of Solutions (A)** –Design solutions, exhibiting innovativeness, for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, economical, ethical, environmental and sustainability issues.
4. **Investigation (D)** Conduct investigation into complex problems, displaying creativeness, using research-based knowledge, and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;
5. **Modern Tool Usage (A & D)** -Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations;
6. **The Engineer and Society (ESSE)** -Apply reasoning based on contextual knowledge to assess societal, health, safety, legal, cultural, contemporary issues, and the consequent responsibilities relevant to professional engineering practices.
7. **Environment and Sustainability (ESSE)** -Understand the impact of professional engineering solutions in societal, global, and environmental contexts and demonstrate knowledge of and need for sustainable development.
8. **Ethics (ESSE)** –Apply professional ethics with moral values and commit to responsibilities and norms of professional engineering code of practices.
9. **Communication (S)** -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.
10. **Individual and Team Work (S)** -Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
11. **Life Long Learning (S)** -Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
12. **Project Management and Finance (S)** -Demonstrate knowledge and understanding of engineering management and financial principles and apply these to one's own work, as a member and/or leader in a team, to manage projects in multidisciplinary settings, and identify opportunities of entrepreneurship.

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*Course Coordinator/ Teacher*                        *Head of the Department*

*Date*:                                                              *Date:*