MANIPAL UNIVERSITY JAIPUR

(University under Section 2(f) of the UGC Act)

MANIPAL UNIVERSITY JAIPUR
School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING
Course Hand-out

Data Communications Lab| CC2130| 3 Credits | 0 0 2 1

Session: Aug 2022-Dec 2022 | Faculty: Dr. Arvind Dhaka| Class: B.Tech III SEM

A. **Introduction:** This laboratory course is offered by the Department of Computer and Communication Engineering and aims to facilitate the practical understanding of the concepts and principals being discussed in the course - Data Communications. Students will be able to perform experiments related to digital modulation techniques, analog data to digital signal encoding techniques, multiplexing techniques and multiple accessing techniques & wireless open access research protocol (WARP) boards.

B. **Course Outcomes:** At the end of the course, students will be able to:

[CC 2130.1] Analyze and interpret signals and working of basic equipment (Function Generator and Digital Storage Oscilloscope (DSO)).

[CC 2130.2] Demonstrate various digital modulation, demodulation techniques in data communications.

[CC 2130.3] Identify multiplexing and multiple accessing techniques and trace the corresponding waveforms.

[CC 2130.4] Experiment with packet tracer & wireless open access research protocol (WARP) boards to get real time exposure of Data Link Layer operations.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

[PO.2]. Problem analysis: the sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

[PO.3]. Design/development of solutions: Upon analyzing the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

[PO.4]. Conduct investigations of complex problems: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5]. Modern tool usage: 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.

[PO.6]. The engineer and society: The engineers are terms society builders and transformers. B. Tech CCE graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

[PO.7]. Environment and sustainability: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech CCE should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

[PO.8]. Ethics: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ that an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10]. Communication: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate 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 the engineering and management principles 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 life-long learning in the broadest context of technological change.

D. Program Specific Outcomes (PSOs)

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

E. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous assessment (Lab records, Performance in Lab, Viva-Voce and mini-project)	70
End Term Exam (Summative)	End Term Exam (2 Hr. Lab Exam including Viva-Voce)	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

F. SYLLABUS

Signal Modulation Techniques: ASK, PSK, FSK, Pulse Code Modulation (PCM), Delta Modulation; CDMA; Various Line Coding Techniques; Packet Tracer: Introduction, PC to PC Communication using Crossover Cable, Star Topology Using Hub and Switch as Network Devices; Study using Wireless Open Access Research Platform (WARP).

G. Reference Books

1. W. Stallings, Data and Computer Communications, (10e), Pearson Education, 2014.

2. B. A. Forouzan, Data Communications & Networking, (5e), McGraw Hill, 2013.

3. D. P. Bertsekas, R. G. Gallager, Data Networks, (2e), Prentice Hall of India, 2011.

4. A. S. Tenenbaum, Computer Networks, (5e), Prentice Hall of India, 2008.

5. L. L. Peterson, B. S. Davie, Computer Networks: A Systems Approach, (5e), Morgan Kaufmann Publishers, 2011.

H. Laboratory Plan:

Lab No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture/Discussion	NA	NA
2.	To analyze signal using Function Generator and Digital Storage Oscilloscope (DSO)	To get acquainted with the working of essential equipment (Function Generator and Digital Storage Oscilloscope (DSO))	Demonstration and Practically performing	CC2130.1	Internal Evaluation End Term Exam
3.	To analyze a PCM system and interpret the modulated and demodulated waveforms	To perform and visualize waveforms that occur at various steps involved in PCM; Sampling, Quantization and Encoding.	Demonstration and Practically performing	CC2130.2	Internal Evaluation Project End Term Exam
4.	To analyze a BPSK modulation system and interpret the modulated and demodulated waveforms.	To identify the need of analog modulation and visualize how the two different phases of carrier is used to represent the digital signal	Demonstration and Practically performing	CC2130.2	Internal Evaluation Project End Term Exam
5.	To analyze a DPCM system and interpret the modulated and demodulated waveforms.	To identify the need of DPCM as compared to PCM and visualize the DPCM modulated and demodulated signals.	Demonstration and Practically performing	CC2130.2	Internal Evaluation Project End Term Exam
6.	To analyze a Delta modulation system and interpret the modulated and demodulated waveforms.	To comprehend the advantages of Delta modulation over PCM and understand the issues involved in Delta modulation.	Demonstration and Practically performing	CC2130.2	Internal Evaluation Project End Term Exam
7.	To analyze Frequency Division Multiplexing and De-multiplexing technique and draw its waveforms.	To visualize the FDM multiplexing technique by performing it experimentally	Demonstration and Practically performing	CC2130.3	Internal Evaluation End Term Exam
8.	To analyze a CDMA-DSSS modulation system and interpret the modulated and demodulated waveforms.	To firmly grasp the working principle of spread spectrum and visualize the use of PN Sequence to spread and de-spread the signal at transmitter and receiver.	Demonstration and Practically performing	CC2130.3	Internal Evaluation End Term Exam
9.	To understand working of packet tracer & create star topology using switch.	To get acquainted with the simulated environment of software tool by Cisco.	Demonstration and Practically performing	CC1530.4	Internal Evaluation End Term Exam
10.	To understand working of WARP boards.	To get acquainted with WARP boards.	Demonstration and Practically performing	CC2130.4	Internal Evaluation End Term Exam

11.	To perform networking with WARP boards.	To get acquainted with networking with WARP boards.	Demonstration and Practically performing	CC2130.4	Internal Evaluation End Term Exam

I. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CC 2130.1	Analyze and interpret signals and working of basic equipment (Function Generator and Digital Storage Oscilloscope (DSO)).	3												3		
CC 2130.2	Demonstrate various digital modulation, demodulation techniques in data communications.	3	2	2	2	2								2		
CC 2130.3	Identify multiplexing and multiple accessing techniques and trace the corresponding waveforms.	3	2	2										2	1	
CC 2130.4	Experiment with packet tracer and wireless open access research protocol (WARP) boards to get real time exposure of Data Link Layer operations.	3	2	2	2	2							2	3	2	1

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

J. **Course Outcome Attainment Level Matrix:**

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC 2130.1	Analyze and interpret signals and working of basic equipment (Function Generator and Digital Storage Oscilloscope (DSO)).															
CC 2130.2	Demonstrate various digital modulation, demodulation techniques in data communications.															
CC 2130.3	Identify multiplexing and multiple accessing techniques and trace the corresponding waveforms.															
CC 2130.4	Experiment with packet tracer and wireless open access research protocol (WARP) boards to get real time exposure of Data Link Layer operations.															

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment