



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTION FORM

Course Title	DATA COMMUNICATION			
Course Code	A40409			
Regulation/Academic	R15 – JNTUH/2016-17			
Course Structure	Lectures	Tutorials	Practicals	Credits
	5	1	-	4
Course Coordinator	Mrs. J.Sravana, Assistant Professor			
Team of Instructors	Mrs. J.Sravana, Assistant Professor			

I. Course Overview:

The present course gives comprehensive idea of the basic concepts of communication system, data communications and transmissions of digital signals. The course creates the background in the communication techniques and will be a pre requisition for computer networks i.e., the students can easily understand the concepts of computer networks.

II. Prerequisite(s):

Level	Credits	Periods/ Week	Prerequisites
UG	4	5	Basic knowledge of physics and computers

III. Marks Distribution:

Sessional Marks	University End Exam marks	Total marks
Mid Semester Test There shall be 2 midterm examinations. Each midterm examination consists of subjective type and Objective type tests. The subjective test is for 10 marks, with duration of 1 hour. Subjective test of each semester shall contain 4 questions. The student has to answer 2 questions, each carrying 5 marks. The objective type test is for 10 marks with duration of 20minutes. It consists of 10 Multiple choice and 10 objective type questions. The student has to answer all the questions and each carries half mark. First midterm examination shall be conducted for the first unit of syllabus and second midterm examination shall be conducted for the remaining portion. Five marks are earmarked for assignments. There shall be three assignments in every theory course. Marks shall be awarded considering the average of two assignments in each course reason whatsoever, will get zeromarks(s).	75	100

IV. Evaluation Scheme:

Mid Semester Test	25 marks
End Semester Examination	75 marks

V. Course Objectives:

This course has the basics of computer networks along with the concepts of mobile communication, telephone communication and satellite communication.

1. To understand the basic concepts of data communications like architectures and protocols, the basic properties of a signal, concept and types of modulation.
2. To understand the concept of multiplexing and its types and various transmission media
3. To understand the working of a basic telephone system
4. To understand the GSM architecture and cellular communication and to learn the methods to control the errors in data transmission.
5. To understand the various data communication equipment such as DSU, CSU and modems

VI. Course Outcomes:

After completing this course, the student will be able to:

1. Get clear understanding of communications standards and protocols.
2. Understand the various data communication circuit arrangements and transmission modes.
3. Calculate the signal to noise ratio and bit rates and modulation and encoding techniques
4. Understand the various wired communication media used in digital communication.
5. Understand the telephone, mobile, satellite communication and paging systems.
6. Understand the error detection and correction methods.
7. Know the functionality of various data communication equipment and understand the significance of the various parameters like BER, etc.,

VII. How Course Outcomes are assessed:

	Program Outcomes	Level	Proficiency assessed by
PO1	Ability to apply acquired knowledge of science and engineering fundamentals in problem solving.	H	Assignment, Exercises
PO2	Ability to undertake problem identification, formulation and providing optimum solution in software applications.	S	Exercises
PO3	Ability to utilize systems approach in designing and to evaluate operational performance of developed software.	S	Exercises
PO4	Graduates will demonstrate an ability to identify, formulate and solve complex information technology related problems.	N
PO5	Graduate will be capable to use modern tools and packages available for their professional arena.	H	Design, Exercises
PO6	Understanding of the social, cultural responsibilities as a professional engineer in a global context.	N
PO7	Understanding the impact of environment on engineering designs based on the principles of inter-disciplinary domains for sustainable development.	H	Assignment, Exercises
PO8	Ability to understand the role of ethics in professional environment and implementing them.	S	Seminars, Discussions

PO9	Competency in software development to function as an individual and in a team of multidisciplinary groups.	H	Workshop
PO10	Ability to have verbal and written communication skills to use effectively not only with engineers but also with community at large.	S	Seminars, Paper presentations
PO11	Ought to have strong fundamentals in Information Technology and be able to have lifelong learning required for professional and individual developments.	H	Design Exercises, Discussions
PO12	Be able to design, implement and manage projects in Information Technology with optimum financial resources with, environmental awareness and safety aspects.	S	Exams, Discussions

N = None

S = Supportive

H = Highly Related

VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

PROGRAM SPECIFIC OUTCOMES		LEVEL	PROFICIENCY ASSESSED BY
PSO 1	PROFESSIONAL SKILLS: An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex systems.	H	Lectures and Assignments
PSO 2	Software Engineering practices: The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	S	Tutorials
PSO 3	Successful Career And Entrepreneurship: An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.	S	Seminars and Projects

N - None

S - Supportive

H – Highly Related

IX. Syllabus:

UNIT - I

INTRODUCTION TO DATA COMMUNICATIONS AND NETWORKING:

Standards Organizations for Data Communications, Layered Network Architecture, Open Systems Interconnection, Data Communications Circuits, Serial and parallel Data Transmission, Data communications Circuit Arrangements, Data communications Networks, Alternate Protocol Suites.

SIGNALS, NOISE, MODULATION, AND DEMODULATION:

Signal Analysis, Electrical Noise and Signal-to-Noise Ratio, Analog Modulation Systems, Information Capacity, Bits, Bit Rate, Baud, and *M*-ary Encoding, Digital Modulation.

UNIT - II

MULTIPLEXERS: Advantage of multiplexers, Frequency division multiplexing, Time division multiplexing, Statistical Time division multiplexing, concentrators, Switching Techniques.

TRANSMISSION MEDIA:

Introduction, Communication Channel-channel Bands, Channel services, channel standard interfaces, open wire lines, twisted pair wires/cables, Coaxial cables, optical fiber communication advantages and disadvantages of optical fiber communication, wireless communication –satellite and cellular radio communication, typical broadband LANs

UNIT - III

TELEPHONE INSTRUMENTS AND SIGNALS:

The Subscriber Loop, Standard Telephone Set, Basic Telephone Call Procedures, Call Progress Tones and Signals, Cordless Telephones, Caller ID, Electronic Telephones, Paging systems.

THE TELEPHONE CIRCUIT:

The Local Subscriber Loop, Telephone Message- Channel Noise and Noise Weighting, Units of Powers Measurement, Transmission Parameters and Private-Line Circuits, Voice-Frequency Circuit Arrangements, Crosstalk.

UNIT - IV

CELLULAR TELEPHONE SYSTEMS:

First- Generation Analog Cellular Telephone, Personal Communications system, Second-Generation Cellular Telephone Systems, N-AMPS, Digital Cellular Telephone, Interim Standard, North American Cellular and PCS Summary, Global system for Mobile Communications, Personal Communications Satellite System.

DATA COMMUNICATIONS CODES, ERROR CONTROL, AND DATA FORMATS:

Data Communications Character Codes, Bar Codes, Error Control, Error Detection, Error Correction, Character Synchronization.

UNIT - V

DATA COMMUNICATIONS EQUIPMENT:

Digital Service Unit and Channel Service Unit, Voice- Band Data Communication Modems, Bell Systems-Compatible Voice- Band Modems, Voice- Band Modem Block Diagram, Voice- Band Modem Classifications, Asynchronous Voice-Band Modems, Synchronous Voice-Band Modems, Modem Synchronization, ITU-T Voice- Band Modem Specifications, 56K Modems, Modem Control: The AT Command Set, Cable Modems, Probability of Error and Bit Error Rate.

TEXT BOOKS:

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education.
2. Data and computer communications, Guru deep S.Hura, Mukeshsinghal , CRC Press

REFERENCE BOOKS:

1. Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.TMH.
2. Understanding Data Communications And networks, 3rd Edition William A Shay,B.S.Publications.
3. Computer Communications and Networking Technologies, Gallow, Second Edition Thomson.
4. Computer Networking and Internet, Fred Halsll, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education.

X. Course Plan:

At the end of the course, the students are able to achieve the following course learning outcomes:

Lecture No.	Course Learning Outcomes	Topics to be covered	Reference
1-2	Understand the need for standardization and standards organizations	Introduction to data communications , Standards Organizations for Data Communications	T1
3	understand the need for layered network architecture	Layered Network Architecture	T1
4	understand the working of layered network architecture in OSI model	Open Systems Interconnection	
5-6	Understand the modes of transmission	Data communications circuits , Serial and parallel Data Transmission, Data communications Circuit Arrangements	T1
7	Identify various network topologies	Data communications Networks	T1
8-9	understand basics of TCP/IP	Alternate Protocol Suites	
10	understand the basics of signals	Signal Analysis	T1
11	understand the basics of noise	Electrical Noise and Signal-to-Noise Ratio, Analog Modulation Systems	T1
12	understand the types of modulation	Analog Modulation Systems	T1
13-14	understand the concept of bit rate and encoding	Information Capacity, Bits, Bit Rate, Baud, M-ary Encoding,	T1
15	understand digital modulation techniques	Digital Modulation.	
16	Define multiplexing & de-multiplexing	MULTIPLEXERS: introduction, advantages	T1
17-18	understand various transmission techniques	Frequency division multiplexing, Time division multiplexing, Statistical Time division multiplexing, concentrators, Switching Techniques	T1
19	Understand various transmission media.	TRANSMISSION MEDIA : Introduction	T1
20-21	understand the channel services	Communication Channel-channel Bands, Channel services, channel standard interfaces	T1
22-23	understand various types of cables	open wire lines, twisted pair wires/cables Coaxial cables	T1
24-25	Know the OFC advantages and disadvantages	optical fiber communication advantages and disadvantages of optical fiber communication	T1
26-27	Know the basics of wireless communication and satellite communication	wireless communication –satellite and cellular radio communication, typical broadband LANs	T1
28	To understand the concept of telephone signals and instruments	The Local Subscriber Loop	T1
29-30		Standard Telephone Set, Basic Telephone Call Procedures, Call Progress Tones and Signals	T1
31-32		Cordless Telephones, Caller ID	T1
33		Electronic Telephones, Paging systems.	T1
34-35		The Local Subscriber Loop, Telephone Message-Channel Noise and Noise Weighting, Units of Powers Measurement	T1
36-37		Transmission Parameters and Private-Line Circuits	T1
38		Voice-Frequency Circuit Arrangements, Crosstalk	T1
39-40			CELLULAR TELEPHONE SYSTEMS:

	Understand the concepts of cellular telephone systems	First- Generation Analog Cellular Telephone		
41-42		Personal Communications system	T1	
43		Second-Generation Cellular Telephone Systems	T1	
44		N-AMPS	T1	
45		Digital Cellular Telephone, Interim Standard	T1	
46-47		North American Cellular and PCS Summary	T1	
48	Understand the architecture of GSM	Global system for Mobile Communications	T1	
49	Understand PCSS operation	Personal Communications Satellite System.	T1	
50-51	Have knowledge of barcodes	Data Communications Character Codes, Bar Codes	T1	
52-53	Detect and correct the errors in data	Error Control, Error Detection, Error Correction, Character Synchronization	T1	
54	To have basic knowledge of data communication Equipment	DATA COMMUNICATIONS EQUIPMENT: introduction	T1	
55-56		Digital Service Unit and Channel Service Unit	T1	
57		Voice- Band Data Communication Modems	T1	
58		Bell Systems- Compatible Voice- Band Modems	T1	
59-60		Voice- Band Modem Block Diagram, Voice- Band Modem Classifications,	T1	
61		Asynchronous Voice-Band Modems, Synchronous Voice-Band Modems	T1	
62-63		Modem Synchronization, ITU-T Voice- Band Modem Specifications	T1	
64		56K Modems, Modem Control: The AT Command Set, Cable Modems,	T1	
65		Able to calculate the bit error rate and probability of occurrence of errors	Probability of Error and Bit Error Rate.	T1

The course plan is meant as a guideline. There may probably be changes.

X1. Mapping course objectives leading to the achievement of the Programme outcomes:

Course Outcomes	PROGRAM OUTCOMES												SPECIFIC PROGRAM OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	H	H	S	S	S		S			S	S		S		
2	S	S	S			H						S	S		
3	S							H		S	S		S		
4	H	H		S		S	H		S			S	S		
5	H	S	S					S					S		

XII. Mapping course outcomes leading to the achievement of the program outcomes:

Course Outcomes	PROGRAM OUTCOMES												SPECIFIC PROGRAM OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	H	H	S	S	S		S			S	S		S		
2	S					H						S	S		
3	S							H		S	S		S		
4	H	H		S		S	H		S			S	S		
5	H	S	S					S					S		
6	S												S		
7	S												S		

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