INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

COMPUTER SCIENCE AND ENGINEERING

COURSE DESCRIPTOR

Course Title	COMPUTER NETWORKS				
Course Code	AIT003				
Programme	B.Tech				
Semester	IV	IT	CSE		
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	-	-
Chief Coordinator	Mr. N Poorna Chandra Rao, Assistant Professor				
Course Faculty	Mr. C Raghavendra, Assistant Professor Mr. PV Narasimha Rao, Assistant Professor Ms. J Hareesha, Assistant Professor				

I. COURSE OVERVIEW:

The growing importance of Internetworking in recent years and their use in every field has made Computer Networks a central issue for modern systems. The main objective of the course is to know the functions of various layers of a network model. Topics to be covered include: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
UG	ACS002	II	Data Structures

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Computer Networks	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✔	MOOCs
✔	LCD / PPT	✔	Seminars	✗	Mini Project	✔	Videos
✗	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weight age in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

	Program Outcomes (POs)	Strength	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2	Assignments
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3	Guest Lect`ures
PO4	**Conduct investigations of complex problems**: 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.	2	5 minutes Video/ Seminars
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	3	Seminars / Term Paper / 5 minutes video

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

	Program Specific Outcomes (PSOs)	Strength	Proficiency assessed by
PSO1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	2	Lectures, Assignments
PSO2	**Problem-Solving Skills:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.	2	Seminars
PSO3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	2	Guest Lectures

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Recognize modern network architectures from a design and performance perspective.
II	Understand the basics and challenges of network communication.
III	Provide an opportunity to do network programming using TCP/IP.
IV	Interpret the operation of the protocols that are used inside the Internet.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
CAIT003.01	CLO 1	Understand the importance of data networks and the Internet in supporting business communications and everyday activities.	PO1; PO2	2
CAIT003.02	CLO 2	Classify different network topologies, LANs, MANSs, WANs, internetworks and models such as Open System Interconnect (OSI), TCP/IP.	PO1; PO2	2
CAIT003.03	CLO 3	Understand the significance and purpose of protocols, standards and their key elements use in data communications and networking.	PO2; PO5	3
CAIT003.04	CLO 4	Describe the relationship between data and signals, their types, behavior, properties, characterization and transmission in the physical layer.	PO3	3
CAIT003.05	CLO 5	Understand the basic concepts of data communications including the key aspects of networking and their interrelationship, packet switching, circuit switching as internal external operations, physical structures, types, models and internetworking.	PO2; PO3	3
CAIT003.06	CLO 6	Understand the concept, advantages, analysis of cyclic codes including their algebraic representation and explain the design, implementation, performance of cyclic redundancy check, checksum.	PO2;PO5	3
CAIT003.07	CLO 7	Understand the basic difference between data logical link control, media access control and discuss logical link control with reference to framing, flow and error control.	PO3; PO4	2
CAIT003.08	CLO 8	Describe the reliable inter-node transmission of frames and discuss the ability to compare and contrast high-level data link control protocol and point-to-point protocol (HDLC, PPP).	PO2; PO4	1
CAIT003.09	CLO 9	Understand connecting LAN's, backbone networks, and virtual LAN's and operations of bridges, spanning tree algorithm in networks.	PO2	3
CAIT003.10	CLO 10	Explain the role of data link layer protocols in data transmission and the preparation method of data for transmission on network media.	PO4	2
CAIT003.11	CLO 11	Understand routing principles and algorithms such as distance vector and link state and usage of the routing protocols on the Internet such as RIP, OSPF, and BGP.	PO1; PO2; PO4	2
CAIT003.12	CLO 12	Understand internetworking principles and the operation of Internet protocols IP, IPv4, IPv6 and ICMP.	PO2;PO5	2
CAIT003.13	CLO 13	Explain and demonstrate the mechanics associated with IP addressing, device interface, association between physical and logical addressing.	PO1	3
CAIT003.14	CLO 14	Understand the concepts of transport service, elements of transport protocol and congestion control in the computer networks.	PO5	3
CAIT003.15	CLO 15	Describe the utilization of transport layer protocols in the control congestion on the Internet.	PO2; PO3	2
CAIT003.16	CLO 16	Analyze the correct transport layer protocol, such as TCP and UDP to transfer data segments in the	PO2	3

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
		networks.		
CAIT003.17	CLO 17	Describe the SCTP, RTP protocols and analyze the applications based on these protocols, network activity at the transport layer.	PO2	2
CAIT003.18	CLO 18	Analyze the operations and features of common application layer protocols such as Hyper Text Transfer protocol (HTTP), File transfer Protocol (FTP.)	PO1;PO2	3
CAIT003.19	CLO 19	Describe the operations and features of common application layer protocols such as Dynamic Host Configuration Protocol (DHCP), Simple Mail Transfer Protocol (SMTP).	PO;PO4	2
CAIT003.20	CLO 20	Describe SSH-based applications, socket programming and its role in application processing.	PO4	2
CAIT003.21	CLO 21	Analyze the process of map hostnames to IP addresses using Domain Naming System (DNS) protocol.	PO2	2
CAIT003.22	CLO 22	Understand the concepts of E-mail, telnet, secure shell in computer networks.	PO1; PO4	2
CAIT003.23	CLO 23	Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.	PO1;PO2	2
CAIT003.24	CLO 24	Possess the knowledge and skills currently use in the Internet work and the requirements for designing network protocols.	PO2	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2	1										2		
CLO 2	3	2											3		
CLO 3		3		3										2	
CLO 4			3										3		
CLO 5		3	3										2		
CLO 6	3			3									2		
CLO 7			3	2										2	
CLO 8		1		2									2		
CLO 9		3													
CLO 10				2										3	

(CLOs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
CLO 11	3	2		3										2	
CLO 12		1			3								2		
CLO 13	3													2	
CLO 14					3									2	
CLO 15		2	3										2	3	
CLO 16		2												2	
CLO 17		2												3	
CLO 18	3	3												2	
CLO 19	3			1									2		
CLO 20				3										2	
CLO 21		2													2
CLO 22	3			2											
CLO 23	3	1													
CLO 24		2													

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1;PO2; PO3;PO4; PO5	SEE Exams	PO1;PO2; PO3;PO4; PO5	Assignments	PO1	Seminars	PO2
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	INTRODUCTION TO PHYSICAL LAYER
Networks, network types, internet history, standards and administration; Network models: Protocol layering, TCP/IP protocol suite, the OSI model; Introduction to physical layer: Data and signals, transmission impairment, data rate limits, performance; Transmission media: Introduction, guided	

media, unguided media; Switching: Introduction, circuit switched networks, packet switching.

Unit-II	**INTRODUCTION TO DATA LINK LAYER**

Link layer addressing; Error detection and correction: Cyclic codes, checksum, forward error correction; Data link control: DLC services, data link layer protocols, HDLC, point to point protocol, media access control: Random access, controlled access, channelization, connecting devices and virtual LAN: Connecting devices, virtual LAN.

Unit-III	**THE NETWORK LAYER**

Network layer design issues, routing algorithms, congestion control algorithms, quality of service, and internetworking.

The network layer in the internet: IPv4 addresses, IPv6, internet control protocols, OSPF (Open Shortest Path First), BGP (Border Gateway Protocol), IP, (Internet Protocol), ICMP (internet control message protocol

Unit-IV	**THE TRANSPORT LAYER**

The transport service, elements of transport protocols, congestion control; The internet transport protocols: UDP (User Datagram Protocol), TCP (Transport Control Protocol), performance problems in computer networks, network performance measurement.

Unit-V	**INTRODUCTION TO APPLICATION LAYERL**

client server programming, WWW (World Wide Web) and HTTP (Hyper Text Transfer Protocol), FTP (File Transfer Protocol), E-mail, telnet, secure shell, DNS(Domain Naming System), SNMP (Simple Network Management Protocol).

Text Books:

1. Andrew S. Tanenbaum, David.J.Wetherall, ―Computer Networks‖, Prentice-Hall, 5th Edition, 2010
2. Behrouz A. Forouzan, ―Data Communications and Networking‖, Tata McGraw-Hill, 5th Edition, 2012

Reference Books:

1. Douglas E. Comer, ―Internetworking with TCP/IP ―, Prentice-Hall, 5th Edition, 2011.
2. Peterson, Davie, ―Computer Networks‖, Elsevier, 5th Edition, 2011.
3. Comer, ―Computer Networks and Internets with Internet Applications‖, 4th Edition, 2004.
4. Chwan Hwa Wu, Irwin, ―Introduction to Computer Networks and Cyber Security‖, CRC Publications, 2014.

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Understand and explore the basics of computer networks and various network Types.	CLO 1	T1:2.1
2	Recognize knowledge on previous versions of internet	CLO 2	T1:2.3
3	Understands on the various standards and administrations	CLO 2	T1:2.3.1
4-5	Discuss on networks models and understand layering scenarios and protocols	CLO 4	T1:7.2,7.3
6-9	Demonstrate on TCP/IP model	CLO 4	T1:10.3.1
10-11	Understand on Data, signal and Transmission Impairments.	CLO 7	T1:11.2, 12.1.1, 12.1.2,
12-13	Demonstrate on Guided and Unguided medium.	CLO 9	T1:13.3.2, 13.4.1

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
14	Understand the addressing mechanism of network layer.	CLO 9	T1:17.1.1, 17.1.3
15-17	Demonstrate on Error detection and correction Cyclic codes, checksum, and forward error correction.	CLO 11	T1:18.1, 18.2.1
18-19	Explain HDLC, Point To Point Protocol	CLO 11	T1:20.2
20-25	Explain Random access, controlled access, channelization	CLO 13	T1:18.3.4, 18.3.4.1
26-27	Understand Networking Devices and virtual LAN	CLO 11	T1:22.12, 19.1.2
28	Understand Network layer services provided to transport layer	CLO 9	T1:18.4, 18.4.3
29-31	Discuss Static and Non static routing algorithms	CLO 14	T1:19.2, 18.4.4
32-35	Demonstrate on various congestion control algorithms	CLO 14	T1:23.1.1, 23.1.3
36	Understand quality service provided by network layer and discuss on internetworking	CLO 14	T1:18.3.4, 18.3, 4.1
37-45	Explain IPv4 IPv6 IP addressing, OSPF, BGP protocols	CLO 14	T1:24.2,28.4
46-48	Discuss about TCP and UDP	CLO 14	T1:24.3.1, 24.3.3,24.3.4
49	Explain Performance problems in computer networks, network performance measurement.	CLO 17	T1:24.3.6, 24.3.9
50-52	Discuss about application layer and client server programming	CLO 17	T1:25.1,25.1.2
53-56	Discuss WWW, DNS SNMP and HTTP protocols	CLO 19	T1:26.1.2, 26.2, 26.3, 26.4,26.5

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Physical Layer Implementation with LIVE examples	Work Shops/ Guest Lectures / NPTEL/ Laboratory Practices	PO2;PO3	PSO 1,PSO2
2	Working Process of Networking Devices	Work Shops/ Laboratory Practices	PO1;PO3;PO5	PSO2;PSO2
3	Laboratory Practice on Error Handling Like CRC	Work Shops/ Laboratory Practices/ Guest Lectures	PO1;PO2;PO3; PO 4	PSO1;PSO2

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