



Format No. QSP/7.1/01.F01 (B)

Issue No.05 Rev. No 5 Dated: Jan 1, 2017

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

College of Engineering Studies

Dehradun

COURSE PLAN

Programme : B.Tech (CS+ All IBM Branches)

Course : Data Communication and Computer Networks

Subject Code : CSEG 2009

No. of credits : 3

Semester : IV

Session : Jan 2019 – May 19

Batch : 2017-21

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COURSE PLAN

A. PREREQUISITE:

- a. Basic Knowledge Mathematics.
- b. Basic Knowledge of Data structure
- c. Basic Knowledge of Algorithms

B. PROGRAM OUTCOMES (POs) for DCN:

Program Outcomes for B. Tech. CSE After completion of the program the students will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **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.
6. **The engineer and society:** 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.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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.
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.
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.

PROGRAM SPECIFIC OUTCOMES

13. Perform system and application programming using computer system concepts, concepts of Data Structures, algorithm development, problem solving and optimizing techniques,
14. Apply software development and project management methodologies using concepts of front-end and back-end development and emerging technologies and platforms.
15. Ability to understand and apply Cloud Computing architecture for scalable, secure and dynamically provisioned business oriented environment with optimized performance tuning and data reliability.

C. OBJECTIVES OF COURSE:-

The objectives of this course are to:

1. Students should be able to classify the functions of layers in a network with fine-grained knowledge about classification of functionalities among network layers.
2. Student should be able to classify the network devices on the basis of their functionalities.
3. Student should be able to understand the real time networks including wired and wireless.
4. Students should be able to assess the pros of cons while selecting network devices in any network.

D. COURSE OUTCOMES FOR Data Communication and Computer Networks: At the end of this course student should be able to

CO1: Understand Theoretical Concepts of Network and Transmission Fundamentals.

CO2. Understand Evolution and Layered Architecture of Networks with detail information

about the rationale behind each layer.

CO3. Understand the concept of Errors control and Multiplexing in the transmission Medium. Flow control and LAN protocols and LAN Standards.

CO4: Understanding the IP based networking and the concepts of Routing concepts and relation with Algorithm and Data Structures.

CO5: Understanding the Transport Layer and associated concepts of connection oriented and connection less behavior.

CO6: Understand the concepts of Application Layer concepts and protocols.

Table: Correlation of POs v/s COs

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1							1	1			
CO2									2	2	
CO3	2										
CO4							2				
CO5								3			
CO6								1			

1. WEAK

2. MODERATE

3. STRONG

E. COURSE OUTLINE

Sl. No	Module	Contents
1.	Module 1	Data Communication
2	Module 2	Physical Layer
3	Module 3	Data Link Layer
4	Module 4	Network Layer
5	Module 5	Routing Strategies
6	Module 6	Transport Network and Application Layer

F. PEDAGOGY

1. Class Test
2. Quiz
3. Assignments/ Tutorials
4. Digital and analog Presentations
5. Concept diary (needs to be maintained by students-short and concise notes which include course concepts that he/she has understood.)

G. COURSE COMPLETION PLAN

Total Class room sessions	24
Online Sessions	12
Total Test	01
Total Assignment	02
Total Reflections	02

One Session =60 minutes

H. EVALUATION & GRADING

S. No.	Assessment	Weightage	Schedule
1	Internal Assessment (IA)	30%	Detailed Below
2	Mid-semester Examination (MS)	20%	Academic Calendar
3	End-semester Examination (ES)	50%	Academic Calendar

I1. INTERNAL ASSESSMENT: **WEIGHTAGE – 30%**

Internal Assessment shall be done based on the following:

Assessment	Percentage
Tests – 1	30%
Reflections – 02 (Quiz)	20%
Assignments - 2	40%
Attendance & Performance	10%
Total	100%

I2. Internal Assessment Record Sheet (including Mid Term Examination marks) will be displayed online at the end of semester i.e. last week of regular classroom teaching.

I3. CLASS TESTS/QUIZZES: One Class Tests based on descriptive type theoretical & numerical questions will be held after mid semester examination. Those who do not appear in Viva-Voce and quiz examinations shall lose their marks.

The marks obtained by the students will be displayed on Blackboard a week before the start of Mid Term and End Term Examinations respectively.

I4. ASSIGNMENTS: After completion of two units there will be home assignments based on theory, numerical problems and case studies. One assignment based before the mid semester exam and one after mid semester. Those who fail to submit the assignments by the due date shall lose their marks.

I5. GENERAL DISCIPLINE: Based on student's regularity, punctuality, sincerity and behavior in the class.

The marks obtained by the students will be displayed on LMS at the end of semester.

I6. MID TERM EXAMINATION: WEIGHTAGE – 20%

Mode of Mid Term Examination - Offline

Mid Term examination shall be Two Hours duration and shall be a combination of Short and Long theory Questions.

Date of showing Mid Term Examination Answer Sheets: Within a week after completion of mid Sem examination.

17. END SEM EXAMINATION:
WEIGHTAGE – 50%

End Sem Examination shall be Three Hours duration and shall be a combination of Short and Long theory/numerical Questions.

18. GRADING:

The overall marks obtained at the end of the semester comprising all the above three mentioned shall be converted to a grade. Each faculty member will prepare individual award sheet for their respective classes. Common grading will be there.

I. DETAILED SESSION PLAN

Module/ Session	TOPICS	Course Outcomes Addressed	Required Learning Resources (including media)	Pedagogy/ Discussion(s)/ Postings	Assessment
Module 1 data communication *					
1	Introduction to networks, Theoretical Model for Communication	CO1		F2F Lecture	
2	Analog and digital signal, Bandwidth, Noise, Channel Capacity, Data Rate,	CO1		F2F Lecture	
3	Transmission Impairments, Guided Transmission Media, Wireless Transmission Media, Line of Sight	CO1	Online	Readings/ brief video/ presentation	

	Transmission				
4	Concept of circuit, Message, Packet Switching with their timing diagram, Comparison of Switching Techniques	CO2		F2F Lecture	
Module 2 PHYSICAL LAYER					
5	Evolution of computer network, layered network architecture, OSI Model,	CO2		F2F Lecture	
6	ATM, Three Tier Architecture, System Network Architecture, Topology, Line Discipline,	CO2	Online	Readings/ brief video/ presentations	
7	ISDN, Frame Relay	CO2		F2F Lecture	
8	Fast Ethernet	CO2		F2F Lecture	
9	Gigabit Ethernet, FDDI, TCP/IP Model	CO2	Online	Readings/ brief video/ presentations	Assignment 1
Module 3 Data Link Layer*					
10	Error Detection & Correction Techniques, Hamming Code,	CO3		F2F Lecture	Discussion-1 Release

11	CRC, Parity Check	CO3		Readings/ brief video/ presentation s	Reflection - 1
12	ARQ Techniques (Stop and wait Protocol), Go Back N Protocol, Selective Repeat Request, HDLC	CO3	Offline/Online	F2F Lecture	
13	TDM, FDM, CDMA,	CO3	Online	Readings/ brief video/ presentation s	
14	ALOHA: Pure, Slotted ALOHA, CSMA, CSMA/CD	CO3		F2F Lecture	
15	IEEE 802 standards for LAN & WAN: 802.3, 802.4, 802.5, 802.6, 802.2 and Their Comparison	CO3	Online	Readings/ brief video/ presentation s	
Module 4 Network Layer*					
16	Network Layer Service, Datagram and VC services,	CO4		F2F Lecture	
17	IP Datagram format and Types of Services,	CO4		F2F Lecture	
18	Datagram Encapsulation and Fragmentation, IP	CO4	Online	Readings/ brief video/	

	Addressing: Subnetting and Supernetting			presentations	
Module 5 Routing Strategies					
19	Routing: Link State Routing, Distance Vector Routing,	CO4		F2F Lecture	
20	Hierarchical Routing, Multicast Routing,	CO4		F2F Lecture	
21	RIP, OSPF, BGP	CO4	Online	Readings/ brief video/ presentations	
22	IPv4: Frame Formats,	CO4		F2F Lecture	
23	Introduction to ICMP,	CO4		F2F Lecture	
24	DHCP, and NAT, IPv6: Frame Formats,	CO4	Online	Readings/ brief video/ presentations	Assignment 2
25	Network Management: SNMP and RMON models	CO4		F2F Lecture	
Module 6 Transport Layer and Application Layer*					
26	Transport Layer Services, Relationship with network and application layer	CO5		F2F Lecture	

27	Multiplexing and Demultiplexing, UDP	CO5	Online	Readings/ brief video/ presentations	
28	TCP: Header, Segment Structure, Services,	CO5		F2F Lecture	
29	Connection Establishment and Termination, Flow Control and Window Size Advertising,	CO5		F2F Lecture	
30	TCP timeout and re-transmission, Congestion control,	CO5	Online	Readings/ brief video/ presentations/Web Search	Class Test-1,
31	TCP Fairness, Delay Modelling,	CO5		F2F Lecture	
32	Application Layer Protocols: HTTP	CO6		F2F Lecture	
33	FTP	CO6	Online	Readings/ brief video/ presentations/Web Search	
34	SNMP	CO6		F2F Lecture	
35	DNS	CO6		F2F Lecture	

36	(Based on complete syllabus)		Online	Readings/ brief video/ presentation s/Web Search	Reflection -2
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Suggested Readings:

Text Book

T1: Data Communications and Networks, Behrouz A. Forouzan

Reference Books

R1: Computer Networks 3/e , Andrew S. Tanenbaum

GUIDELINES

Cell Phones and other Electronic Communication Devices: Cell phones and other electronic communication devices (such as Blackberries/Laptops) are not permitted in classes during Tests or the Mid/Final Examination. Such devices **MUST** be turned off in the class room.

E-Mail and online learning tool: Each student in the class should have an e-mail id and a pass word to access the LMS system regularly. Regularly, important information – Date of conducting class tests, guest lectures, via online learning tool. The best way to arrange meetings with us or ask specific questions is by email and prior appointment. All the assignments preferably should be uploaded on online learning tool. Various research papers/reference material will be mailed/uploaded on online learning platform time to time.

Attendance: Students are required to have **minimum attendance of 75%** in each subject. Students with less than said percentage shall **NOT** be allowed to appear in the end semester examination.

Course outcome assessment: To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfilment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the student survey which needs to be designed by the faculty (sample format is given below) and



it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement.

Passing criterion: Student has to secure minimum 35% marks individually in both the 'End-Semester examination' and 'Total Marks' in order to pass in the paper.

Sample format for Indirect Assessment of Course outcomes

NAME:
ENROLLMENT NO:
SAP ID:
COURSE:
PROGRAM:

Please rate the following aspects of course outcomes of Data Communication and Computer Networks.

Use the scale 1-4*

Sl. No.		1	2	3	4
1	CO1: Understand Theoretical Concepts of Network and relate with Telephone Network.				
2	CO2: Understand Evolution and Layered Architecture of Networks with detail information about the rationale behind each layer.				
3	CO3: Understanding of TCP/IP layered stack and correlation with OSI.				
4	CO4: Understand the concept of Errors, Error Correction and Error Detection and Multiplexing of the transmission Medium.				
5	CO5: Understand the function of Data Link Layer and Flow control in Layer 3.				
6	CO6: Understand the working and Evolution of MAC Layer historic and evolved LAN Standards.				
7	CO7: Understanding the IP based networking.				
8	CO8: Understand the concept of Routing concepts and relation with Algorithm and Data Structures.				
9	CO9: Understanding the Transport and Application Layer concepts and protocols.				

*

1

Below Average

3

Good

2

Average

4

Very Good