MUZAFFARPUR INSTITUTE OF TECHNOLOGY

COURSE FILE OF COMPUTER NETWORKS (05 1513)



Faculty Name: MR. ASHISH KUMAR ASSISTANT PROFESSOR

DEPARTMENT OF INFORMATION TECHNOLOGY



विज्ञान एवं प्रावैधिकी विभाग Department of Science and Technology Government of Bihar

Department of Information Technology

<u>Vision</u>

To achieve global standard in quality of education, research & development in Information Technology by adapting to the rapid technological advancement to empowering the ITindustry with the wings of knowledge and power of innovation though knowledge creation, acquisition and dissemination for the benefit of Society and Humanity.

<u>Mission</u>

- To produce well-rounded, up to date, scientifically tempered, design-oriented engineer and scientists capable of lifelong learning.
- To produce technologically competent and ethically responsible graduates through balanced and dynamic curriculum.
- To develop highly analytical and qualified IT engineers by imparting training on cutting edge technology professional ethics to make the nation as a knowledge power.
- To generate high quality knowledge resource in area of Information Technology and in emerging area to make valuable contribution in IT-Sector for social and economic development of nation and to make organized for identification, monitoring and control of objective attributes of quality for continuous enhancement of academic progress, infrastructure and ambience.

Information Technology Program Educational Objectives

After 4 years of graduation a B. Tech (IT) graduate would be able to

- Plan, design, construct, maintain, analyze, advance, and manage Information Technology projects of moderate complexity
- Pursue professional licensure and certifications
- Engage in life-long learning and pursue advanced level studies
- Demonstrate leadership skills through career advancement and active participation in the Information Technology profession and in the community

Information Technology Programme Outcomes

Students who complete the B. Tech degree in Information Technology will be able to:

- 1. An ability to apply acquired knowledge of mathematics, science and Information Technology to solve engineering problems
- 2. An ability to identify, formulate and analyze engineering problems.
- 3. An ability to design and implement a system, process, component or program to meet desired needs, within realistic constraints such as culture, society, environment, health and safety.
- 4. An ability to conduct investigations of complex problems to reach valid conclusions and to research the contemporary issues.
- 5. An ability to use appropriate skills, modern tools and techniques necessary for computing and engineering practices.
- 6. An ability to demonstrate professional responsibilities pertaining to computer science and engineering by the analysis of societal, health, safety, legal and cultural issues.
- 7. An ability to produce engineering solutions in global and societal context and demonstrate the need for sustainable development.
- 8. Apply ethical principles, professional ethics and norms of computer engineering practices.
- 9. An ability to function effectively as an individual and in multi-disciplinary teams.
- 10. An ability to prepare technical reports and make presentations for the effective delivery of technical information.
- 11. Recognition of the need for an ability to engage in lifelong learning.
- 12. An ability to incorporate appropriate economics and business practices for project, risk and change management.

Course Description

The main emphasis of this course is on the organization and management of local area networks (LANs). The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems. The course introduces computer communication network design and its operations. The course includes the following topics: Open Systems Interconnection (OSI) communication model; error detection and recovery; local area networks; bridges, routers and gateways; network naming and addressing; and local and remote procedures. On completion of the course, the student should be able in part to design, implement and maintain a typical computer network (LAN).

Course Objectives

- 1. Describe how computer networks are organized with the concept of layered approach.
- 2. Implement a simple LAN with hubs, bridges and switches.
- 3. Describe how packets in the Internet are delivered.
- 4. Analyze the contents in a given Data Link layer packet, based on the layer concept.
- 5. Design logical sub-address blocks with a given address block.
- 6. Decide routing entries given a simple example of network topology
- 7. Describe what classless addressing scheme is.
- 8. Describe how routing protocols work.

Course Outcomes

After the course completion, students will be able to:

- CO1: Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
- CO2: Have a basic knowledge of the use of cryptography and network security.
- CO3: Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols.
- CO4: Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure
- CO5: Have a working knowledge of datagram and internet socket programming.

B. Tech. IV Semester (Information Technology) 05 1513 Computer Networks

L-T-P	Total	Max Marks:	100
3-0-0	3	Final Exam:	70 Marks
		Sessional:	20 Marks
		Internals:	10 Marks.

1. Introduction: Network Hardware & Software, OSI Reference Model, TCP/IP Model, Comparison of the OSI & TCP/IP model.

2. The Physical Link layer: Guided Transmission Media, Physical Layer Standard.

3. The Data Link Layer: Need for Data Link Control, Service provided by the Data Link Layer, Frame Design Consideration, Flow control Mechanism, Data Link Error control, Error Control in Stop-and-wait Mechanism & Sliding Window Mechanism, Sequence numbering, Piggybacking Acknowledgements, Data Link Management.

4. MAC Protocols: Random access Protocols – ALOHA.

5. IEEE 802.3 Ethernet: Contention Access, CSMA/CD, Physical Topology of Ethernet, Ethernet Repeater, Types of Ethernet.

6. Bridges and Layer-2 Switches: LAN Bridge, Transparent Bridges, Spanning tree algorithm. Source routing bridge, route discovery in source routing, layer 2 Ethernet switches.

7. The network layer: network layer design issue, purpose of network layer, Functions of the Network Layer.

8. Introduction to Internet Protocol: IPv4 Format, ICMP.

9. Routing Algorithms: Static Routing, Dynamic Routing, Distance Vector Routing Algorithm, Routing Information

Protocol, Link State Routing, OSPF Routing Protocol. Interior and Exterior Protocol, and Border Gateway Protocol.

10. Introduction to Transport Layer: TCP & UDP.

11. Introduction to Application Layer: TCP/IP Application Protocol.

Text Books:

- 1. Data Communication & Networking by Forouzan, Tata McGraw Hill.
- 2. Computer Network, 4e, by Andrew S. Tenenbaum, Pearson Education/ PHI.
- 3. Data Communication and Computer Networks, by Prakash C.Gupta, PHI.
- 4. Networking Ali-in-one Desk Reference by Doug Lowe, Wiley Dreamtech

Reference Book:

1. Computer Networking: A Top-Down Approach featuring the Internet, 3e by James F.Kurose.

- 2. Computer Network by Godbole, Tata McGraw Hill.
- 3. Computer Networking, by Stanford H. Rowe, Marsha L. Schuh

GATE SYLLABUS

Computer Networks

Question: - 15%(Average)

Marks: 15/100(Average)

Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.



Muzaffarpur Institute of Technology (MIT), Muzaffarpur

(Under the Department of Science & Technology Govt. of Bihar, Patna)

Department of Information Technology

List of Students

S. No	Reg. No.	Roll No.	Name		
1.	15106107251	15IT35	Dolly Kumari		
2.	16106107028	16IT02	Amisha		
3.	16106107033	16IT04	Ayushman		
4.	16106107006	16IT09	Aditya Singh		
5.	16106107036	16IT10	Apoorva Rathore		
6.	16106107029	16IT14	Aman Kr. Dwivedi		
7.	16106107008	16IT16	Aakash Roy		
8.	16106107019	16IT18	Aman Kumar		
9.	16106107013	16IT19	Anshuli Kumari		
10.	16106107024	16IT20	Vivek Kr. Paswan		
11.	16106107018	16IT25	Janu Kumar Jha		
12.	16106107011	16IT26	Ruby Kumari		
13.	16106107039	16IT27	Md Shaquib Ullah		
14.	16106107017	16IT28	Md Kaifee		
15.	16106107030	16IT29	Raima		
16.	16106107004	16IT31	Megha Sinha		
17.	16106107032	16IT32	Aditya Ranjan		
18.	16106107003	16IT33	Aparna Kumari		
19.	16106107037	16IT34	Archana Kumari		
20.	16106107002	16IT35	Tanweer Hasan		
21.	16106107031	16IT36	Gaurav Kumar		
22.	16106107014	16IT37	Sanjay Kumar		
23.	16106107005	16IT38	Shweta Kumari		
24.	16106107026	16IT39	Deepa Kumari		
25.	16106107015	16IT40	Md Nizamuddin		
26.	16106107012	16IT41	Priya Bharti		
27.	16106107009	16IT42	Vivek Raj Singh		
28.	16106107022	16IT43	Anurag Kumar Gupta		
29.	16106107034	16IT44	Rashmi Kumari		
30.	16106107007	16IT45	Shagufta Shaheen		
31.	16106107023	16IT46	Kumari Jahanvi		
32.	16106107016	16IT47	Vicky Kumar		
33.	16106107001	16IT48	Ishita Shreya		
34.	16106107027	16IT49	Navneet Kaushik		
35.	16106107025	16IT50	Saurabh Mishra		
36.	16106107010	16IT51	Beauty Kumari		
37.	16106107020	16IT52	Nishi Anand		
38.		17(LE)IT01	Kajal Kumari		
39.		17(LE)IT02	Tulsi Kumari		
40.		17(LE)IT03	Md Asif Equbal		

Institute / School Name	Muzaffarpur Institute of Technology				
Program Name	B.Tech.				
Course Code	05 1513				
Course Name	Computer Networks				
Labs (per week)	3	Course Credits	2		
Course Coordinator Name	Ashish Kumar				

1. <u>Scope and Objectives of the Course</u>

The main emphasis of this course is on the organization and management of local area networks (LANs). The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems. The course introduces computer communication network design and its operations. The course includes the following topics: Open Systems Interconnection (OSI) communication model; error detection and recovery; local area networks; bridges, routers and gateways; network naming and addressing; and local and remote procedures. On completion of the course, the student should be able in part to design, implement and maintain a typical computer network (LAN).

Course Objectives

- **1.** Describe how computer networks are organized with the concept of layered approach.
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- **6.** Decide routing entries given a simple example of network topology
- 7. Describe what classless addressing scheme is.
- **8.** Describe how routing protocols work.

2. <u>Textbooks</u>

- 1. Data Communication & Networking by Forouzan, Tata McGraw Hill.
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- 3. Computer Networking, by Stanford H. Rowe, Marsha L. Schuh

3. Other readings and relevant websites

S.	Link of Journals, Magazines, websites and Research Papers
No.	
1.	https://www.geeksforgeeks.org/computer-network-tutorials/
2.	https://onlinecourses.nptel.ac.in/noc18_cs38
3.	http://www.nptelvideos.in/2012/11/computer-networks.html

4. <u>Course Plan</u>

S. No.	Topics	No. of Lectures
1.	Introduction: Network Hardware & Software, OSI Reference Model, TCP/IP Model, Comparison of the OSI & TCP/IP model.	2
2.	The Physical Link layer: Guided Transmission Media, Physical Layer Standard.	2
3.	The Data Link Layer: Need for Data Link Control, Service provided by the Data Link Layer, Frame Design Consideration, Flow control Mechanism, Data Link Error control, Error Control in Stop-and-wait Mechanism & Sliding Window Mechanism, Sequence numbering, Piggybacking Acknowledgements, Data Link Management.	8
4.	MAC Protocols: Random access Protocols – ALOHA.	2
5.	IEEE 802.3 Ethernet: Contention Access, CSMA/CD, Physical Topology of Ethernet, Ethernet Repeater, Types of Ethernet.	5
6.	Bridges and Layer-2 Switches: LAN Bridge, Transparent Bridges, Spanning tree algorithm. Source routing bridge, route discovery in source routing, layer 2 Ethernet switches.	5
7.	The network layer: network layer design issue, purpose of network layer, Functions of the Network Layer.	5
8.	Introduction to Internet Protocol: IPv4 Format, ICMP.	2
9.	Routing Algorithms: Static Routing, Dynamic Routing, Distance Vector Routing Algorithm, Routing Information Protocol, Link State Routing, OSPF Routing Protocol. Interior and Exterior Protocol, and Border Gateway Protocol.	10
10.	Introduction to Transport Layer: TCP & UDP.	1
11.	Introduction to Application Layer: TCP/IP Application Protocol	1

5. Evaluation Scheme:

Component 1	Mid Semester Examination			
Component 2	Assignment Evaluation	10		
Component 3** End Term Examination**		70		
	Total	100		

** The End Term Comprehensive examination will be held at the end of semester. The mandatory requirement of 75% attendance in all theory classes is to be met for being eligible to appear in this component.

SYLLABUS

Topics	No of lectures	Weightage
Introduction: Network Hardware & Software, OSI Reference	2	5%
Model, TCP/IP Model, Comparison of the OSI & TCP/IP model.		
The Physical Link layer: Guided Transmission Media,	2	5%
Physical Layer Standard.		570
The Data Link Layer: Need for Data Link Control, Service	8	19%
provided by the Data Link Layer, Frame Design	0	1770

Consideration, Flow control Mechanism, Data Link Error control, Error Control in Stop-and-wait Mechanism & Sliding Window Mechanism, Sequence numbering, Piggybacking Acknowledgements, Data Link Management.		
MAC Protocols: Random access Protocols – ALOHA.	2	5%
IEEE 802.3 Ethernet: Contention Access, CSMA/CD, Physical Topology of Ethernet, Ethernet Repeater, Types of Ethernet	5	12%
Bridges and Layer-2 Switches: LAN Bridge, Transparent Bridges, Spanning tree algorithm. Source routing bridge, route discovery in source routing, layer 2 Ethernet switches.	5	12%
The network layer: network layer design issue, purpose of network layer, Functions of the Network Layer.	5	12%
Introduction to Internet Protocol: IPv4 Format, ICMP.	2	5%
Routing Algorithms: Static Routing, Dynamic Routing, Distance Vector Routing Algorithm, Routing Information Protocol, Link State Routing, OSPF Routing Protocol. Interior and Exterior Protocol, and Border Gateway Protocol.	10	25%
Introduction to Transport Layer: TCP & UDP. Introduction to Application Layer: TCP/IP Application Protocol	2	5%

This Document is approved by:

Designation	Name	Signature
Course Coordinator	Mr. Ashish Kumar	
HOD	Mr. Vijay Kumar	
Principal	Dr. J N Jha	

Evaluation and Examination Blue Print:

Internal assessment is done through quiz tests, assignments and project work. Two sets of question papers are asked from each faculty and out of these two, without the knowledge of faculty, one question paper is chosen for the concerned examination. Examination rules and regulations are uploaded on the student's portal. The components of evaluations along with their weightage followed by the University is given below

Mid Semester Examination	20%
Assessment	10%
End term examination	70%



Muzaffarpur Institute of Technology (MIT), Muzaffarpur

(Under the Department of Science & Technology Govt. of Bihar, Patna)

Department of Information Technology TIME TABLE FOR B. TECH 5th SEMESTER (JULY-DECEMBER 2018)

Room No.: EB5, (Electronics Block, Room No. 5)

↓ DAY TIME	09:00-10:00	10:00-11:00	11:00-12:00	12:00-1:00	1:00-2:00	2:00-3:00		3:00-4:00		4:00-5:00	
MONDAY	Г	р	D	C		2:00-2:30	2:30-3:00	3:00-3:30	3:30-4:00	4:00-4:30	4:30-5:00
WIONDAY	F 1	D 1	\mathbf{D}_1	C_2		WT(A)	WT(B)	WT(E)	WT(C)	WT(D)	WT(F)
TUESDAY	\mathbf{A}_1	E ₂	B ₂	F2	L	Web Technology					
WEDNESDAY		Cı	B 3		U N	Introduction to Communication Systems					
THURSDAY	D ₂	C ₃			С	Compiler Design					
FRIDAY	E ₂	\mathbf{A}_2	F3		н	System Programming					
SATURDAY	E ₃	D ₃	A 3								

S. No.	Course Code / Subject Name	Faculty Name
Α	05 1x11/ Formal Languages & Automata Theory	Prof. Rajeev Kumar
В	05 1x13 / Computer Network	Prof. Ashish Kumar
С	05 1x16 / Compiler Design	Prof. Sumit Kumar
D	06 1x02 / Web Technology	Prof. Abhishek Kumar
Е	04 1x03 / Introduction to Communication Systems	Prof. Mohit Kumar, ECE
F	05 1x03 / System Programming	Prof. Rakesh Ranjan

Laboratory / Faculty Name
Introduction to Comm. Systems / Prof. Mohit Kumar
Compiler Design / Prof. Sumit Kumar & Prof. Rakesh Ranjan
Web Technology / Prof. Abhishek Kumar & Prof. Sumit
Kumar
System Programming / Prof. Savyasachi & Prof. Rakesh
Ranjan
WT* \rightarrow Weekly Test
Lab Assistants for IT Labs: Mr. Shekhar, Mr. Vikram & Mr. Rajesh, Location: I-Way, First Floor Com. Systems lab Assist: Mr. Bharat Kumar

Ashisthuma

Time Table In-charge (Department of IT)

Code : 051513

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B.Tech 5th Semester Exam., 2017

COMPUTER NETWORK

Time : 3 hours

Full Marks : 70

Instructions :

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- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt FIVE questions in all.
- (iv) Question No. 1 is compulsory.
- 1. Answer any seven of the following questions :
 - 2×7=14
 - (a) Write any two functions of the session layer in OSI model.
 - (b) What is Hamming code?
 - (c) What is the significance of the twisting in twisted-pair cable?
 - (d) What do you mean by piggybacking?
 - (e) What is the purpose of the jam signal in CSMA/CD?
 - (f) What are the advantages of dividing an Ethernet LAN with a bridge?
 - (g) What does the term 'best effort' mean in context with IP?

(2)

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- (h) Why is there no need of CSMA/CD in a full-duplex switched Ethernet?
- (i) How does redundancy facilitate error detection?
- 2. (a) Describe the architecture and working of ring topology. What are its advantages and disadvantages?
 - (b) Compare and contrast between the OSI model and the TCP/IP model. akubihar.com
- (a) Describe the working of fiber-optic cables. Briefly explain different propagation modes used in fiber-optic cables.
 - (b) Explain Go-Back-N ARQ as a sliding window mechanism for error control. 7
- (a) Describe how the two-dimensional parity check is able to detect errors. Consider

'1100101100110000110100101101'

as the data that is to be sent over the network. akubihar.com

7

7

7

7

(b) Draw a flowchart and explain the working procedure of the pure ALOHA protocol.

(3) akubihar.com

- Explain in detail Fast Ethernet. Describe the structure of the physical layer and various implementation types at this layer. 14
- With the help of a neat and labelled diagram, explain the message format of ICMP. Explain various types of ICMP error messages and query messages.
 14
- (a) What do you mean by layer 2 switching? Explain in detail the functioning of layer 2 switches. akubihar.com 7
 - (b) Discuss the functions and the design issues of the network layer in the OSI model.
- (a) Describe bridge in terms of a networking device. What are different types of network bridge?
 7
 - (b) Differentiate between Static Routing and Dynamic Routing. 7
- Explain the following terms : 7×2=14
 - (a) Border Gateway Protocol
 - (b) User Datagram Protocol

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* * *

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