

Course Handout for3rd... YearCSE..... PROGRAM

Course Title : Computer Networks
Course Code : PCC-CS 602/PCC-CS 692
L-T-P- Structure : 3L-0T-4P
Credits : 3 + 2
Pre-requisite :NA
Course Coordinator : Prof. Anupam Mukherjee
Team of Instructors :NA
Teaching Associates (For LAB only) :Ms. Lily Chandra, Ms.Banasree Das

Course Objective:

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| 1. To develop an understanding of modern network architectures from a design and performance perspective. |
| 2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs). |
| 3. To provide an opportunity to do network programming |
| 4. To provide a WLAN measurement ideas. |

COURSE OUTCOMES (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and Attitudes.

a) The Students will be able to:

| COs | Outcomes | Target Attainment |
|---------|--|--------------------------------|
| CS602.1 | 1. Define the concepts of Computer Network, its issues and layered architectures to identify error and collision during transmission of data and producing free flow of data by utilizing different protocols.(BT Level 1) | Students will attain 65% marks |
| CS602.2 | 2. Understand the concepts of IP Addressing to solve problems of sub netting and calculate the best possible path in an internetwork by executing different routing algorithms.(BT-LEVEL 2) | Students will attain 65% marks |
| CS602.3 | 3. Apply the concept of process to process delivery of data by employing UDP, TCP protocols and verify Quality of Service.(BT-LEVEL 3) | Students will attain 65% marks |
| CS602.4 | 4. Remember different protocols for real time network applications and analyzing the need of Cryptography in a network.(BT-LEVEL 4) | Students will attain 65% marks |

PROGRAM OUTCOMES(POs):

| PO Number | Description |
|---|--|
| 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 analyse 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 modelling 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. |
| 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.Lifelong 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. |

Mapping of Course Outcomes and Program Outcomes:

| Course Outcomes | Program Outcomes | | | | | | | | | | | | PSOs | |
|-----------------|------------------|-----|-----|-----|-----|----|----|----|----|-----|-----|-----|------|-----|
| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 1. | 2. |
| PCC-CS602.1 | 2 | 2 | - | - | 2 | - | - | - | - | - | - | 2 | 2 | - |
| PCC-CS602.2 | | 2 | 2 | - | 2 | 2 | - | 2 | - | - | - | 1 | 2 | 2 |
| PCC-CS602.3 | 2 | 2 | 2 | - | - | - | - | | - | - | - | 1 | 2 | 2 |
| PCC-CS602.4 | - | - | 2 | 2 | 2 | 2 | - | 2 | - | - | - | 2 | 2 | 2 |
| PCC-CS602 | 1 | 1.5 | 1.5 | 0.5 | 1.5 | 1 | - | 1 | - | - | - | 1.5 | 2 | 1.5 |

- 1 = courses in which the student will be exposed to a topic
 2 = courses in which students will gain competency in that area
 3 = courses in which students will master that skill

SYLLABUS:

| Unit | Content | Hrs/Unit |
|------|---|----------|
| 1 | Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum. | 9 |
| 2 | Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back - N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols - Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA | 8 |
| 3 | Network Layer: Switching, Logical addressing - IPV4, IPV6; Address mapping - ARP, RARP, BOOTP and DHCP-Delivery, Forwarding and Unicast Routing protocols. | 14 |
| 4. | Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm. | 8 |
| 5 | Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography. | 8 |

TEXT BOOKS:

1. B. A. Forouzan - "Data Communications and Networking (3rd Ed.)" - TMH
2. A. S. Tanenbaum - "Computer Networks (4th Ed.)" - Pearson Education/PHI
3. W. Stallings - "Data and Computer Communications (5th Ed.)" - PHI/ Pearson Education
4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP
5. Black, Data & Computer Communication, PHI
6. Miller, data Communication & Network, Vikas
7. Miller, Digital & Data Communication, Jaico
8. Shay, Understanding Data Communication & Network, Vikas

REFERENCE BOOKS:

1. Kurose and Rose – “Computer Networking -A top down approach featuring the internet” – Pearson Education
2. Leon, Garica, Widjaja – “Communication Networks” – TMH
3. Walrand – “Communication Networks” – TMH.
4. Comer – “Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)” – Pearson Education/PHI

COURSE DELIVERY PLAN:

| Week | Sess. No. | CO | Topic (s) | Book No [CH No][Page No] | Teaching-Learning Methods | Planned Date | Execution Date |
|------|-----------|-----|---|---|--|--------------|----------------|
| 1 | 1 | CO1 | Data communication Components:Representation of data and its flow Networks, | 1[1][3-9] | T: Chalk & Talk L: Define | 4/1/2023 | |
| | 2 | CO1 | Various Connection Topology | 1[1][9-13] | T: Chalk & Talk/PPT L: Define | 9/1/2023 | |
| | 3 | CO1 | Protocols and Standards, OSI model | 1[1][18], 1[2][29-35], 1[Appendix C][873-877] | T: Chalk & Talk L: Define | 10/1/2023 | |
| 2 | 4 | CO1 | Transmission Media, | 1[7][173-190] | T: PPT L: Define understands | 11/1/2023 | |
| | 5 | CO1 | LAN: Wired LAN, Wireless LANs, | 1[14][334-352] 1[15][361-379] | T: PPT L: understands | 16/1/2023 | |
| | 6 | CO1 | Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization | 1[16][387-403] | T: PPT L: understands | 17/1/2023 | |
| 3 | 7 | CO1 | Multiplexing-Frequency division, | 1[6][150-155] | T: PPT L: understands | 18/1/2023 | |
| | 8 | CO1 | Time division and Wave division, | 1[6][157-165] | T: PPT L: understands | 24/1/2023 | |
| | 9 | CO1 | Concepts on spread spectrum. | CLASS Note | T: PPT L: understands | 25/1/2023 | |
| | 10 | CO2 | Data Link Layer and Medium Access Sub Layer: | 1[11][267-281] | T: PPT demonstration, L: understand | 30/1/2023 | |

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| 4 | 11 | CO2 | Error Detection and ErrorCorrection-Fundamentals | 1[10][243-260] | T: PPT L: understand, Practice by doing, Problem solving | 31/1/2023 | |
| | 12 | CO2 | Blockcoding,HammingDistance | Class Note | T: PPT L: understand, Practice by doing, Problem solving | 6/2/2023 | |
| 5 | 13 | CO2 | CRC | 1[10][249] | T: PPT L: understands, Problem solving | 7/2/2023 | |
| | 14 | CO2 | FlowControlandErrorcontrol protocols-StopandWait | 1[10][268-272] | T: PPT L: Define, Understands, Problem solving | 8/2/2023 | |
| | 15 | CO2 | Goback-NARQ,SelectiveRepeatARQ, | 1[10][272-277] | T: PPT L: Define, Understands, Problem solving | 13/2/2023 | |
| 6 | 16 | CO2 | Sliding Window, Piggybacking, | 1[10][272,277,280] | T: PPT L: Define, Understands, Problem solving | 14/2/2023 | |
| | 17 | CO2 | RandomAccess,Multipleaccessprotocols-PureALOHA | 1[13][311-313] | T: PPT L: Define, Understands | 15/2/2023 | |
| | 18 | CO2 | SlottedALOHA,CSMA/CD,CDMA/CA | 1[13][314-316] | T: PPT L: Define, Understands | 20/2/2023 | |
| 7 | 19 | CO3 | NetworkLayer:Switching,Logicaladdressing | 1[19][472-476] | T: PPT L: Define, Understands | 21/2/2023 | |
| | 20 | CO3 | IPV4 | 1[19][477-486] | T: PPT L: Define, Understands | 22/2/2023 | |
| | 21 | CO3 | IPV4 | 1[19][478-494] | T: PPT L: Define, Understands, Problem based learning | 27/2/2023 | |
| 8 | 22 | CO3 | IPV6 | 1[20][528-533] | T: PPT L: understands | 28/2/2023 | |
| | 23 | CO3 | Addressmapping-ARP | 1[20][514-517] | T: PPT L: Define, Understands | 6/3/2023 | |
| | 24 | CO3 | RARP, BOOTP | Class note | T: PPT L: Define, Understand | 13/3/2023 | |
| | 25 | CO3 | DHCP-Delivery, Forwarding | Class Note | T: PPT L: Define, Understand | 14/3/2023 | |

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| 9 | 26 | CO3 | Unicast Routing protocols | 1[21][54 3-545] | T: PPT L: Define, Understand | 15/3/2 023 | |
| | 27 | CO3 | Distance Vector Routing | 1[21][54 5-548] | T: PPT L: Define, Understands, Problem based learning | 20/3/2 023 | |
| 10 | 28 | CO3 | Link State Routing | 1[21][54 8-557] | T: PPT L: Define, Understands, Problem based learning | 21/3/2 023 | |
| | 29 | CO3 | RIP | 1[21][54 6-548] | T: PPT L: Define, Understands, Problem based learning | 22/3/2 023 | |
| | 30 | CO3 | OSPF | 1[21][54 8-556] | T: PPT L: Define, Understands, Problem based learning | 27/3/2 023 | |
| 11 | 31 | CO3 | OSPF | 1[21][54 8-556] | T: PPT L: Define, Understands, Problem based learning | 28/3/2 023 | |
| | 32 | CO3 | BGP | 1[21][55 7-560] | T: PPT L: Define, Understand | 29/3/2 023 | |
| | 33 | CO4 | Transport Layer: Process to Process Communication, | 1[22][59 3-600] | T: PPT L: Define understands | 5/4/20 23 | |
| 12 | 34 | CO4 | User Datagram Protocol (UDP) | 1[22][60 1-602] | T: PPT L: Define understands, Apply in program | 10/4/2 023 | |
| | 35 | CO4 | Transmission Control Protocol (TCP), | 1[22][60 3-609] | T: PPT L: Define understands, Apply in program | 11/4/2 023 | |
| | 36 | CO4 | SCTP Congestion Control | 1[23][63 8-639] | T: PPT L: Define understands | 12/4/2 023 | |
| | 37 | CO4 | Quality of Service, | 1[23][64 3-645] | T: PPT L: Define understands | 17/4/2 023 | |
| | 38 | CO4 | QoS improving techniques: Leaky Bucket | 1[23][64 6] | T: PPT L: Define understands | 18/4/2 023 | |

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| 13 | 39 | | TokenBucketalgorithm. | 1[23][64 7] | T: PPT L: Observes , understands | 19/4/2 023 | |
| 14 | 40 | | ApplicationLayer:DomainNam eSpace(DNS) | Class Note | T: PPT L: Define understands | 24/4/2 023 | |
| | 41 | | DDNS | Class Note | T: PPT L: Define understands, Apply in program | 25/4/2 023 | |
| | 42 | | TELNET | Class Note | T: PPT L: Define understands, Apply in program | 26/4/2 023 | |
| 15 | 43 | | EMAIL | Class Note | T: PPT L: Define understands | 8/5/20 23 | |
| | 44 | | File Transfer Protocol (FTP),WWW | Class Note | T: PPT L: Define understands, Apply in program | 9/5/20 23 | |
| | 45 | | HTTP,SNMP | Class Note | T: PPT L: Define understands, | 10/5/2 023 | |
| 16 | 46 | | Bluetooth,Firewalls, | Class Note | T: PPT L: Define understands, | 15/5/2 023 | |
| | 47 | | BasicconceptsofCryptography | 1[23][79 5-810] | T: PPT L: Define understands, | 16/5/2 023 | |

WEEKLY HOMEWORK ASSIGNMENTS/ PROBLEM SETS/OPEN ENDED PROBLEM-SOLVING EXERCISES etc.

| Week | Assignment/Quiz | Topic | Details | CO |
|------|-----------------|------------------------|--|---------|
| 3 | A01 | Basics of Networking | Quiz on Topology, OSI Model Question: Explain the functionality of each layers in OSI model. | CO1 |
| 5 | A02 | Flow & Error Control | Numerical problems Explain ARQ? | CO1 |
| 7 | A03 | IP addressing | Quiz & Numerical problems What is the network address of 192.168.10.56/28? | CO2 |
| 9 | A04 | Routing | Numerical problems Explain distance vector and link state routing | CO2 |
| 11 | A05 | UDP, TCP, Cryptography | Quiz, Problem solving Briefly explain UDP Packet format? | CO3,CO4 |

COURSE TIME TABLE

| Class/Day | Monday | Tuesday | Wednesday | Thursday | Friday |
|------------|----------------|---------------------|---------------------|---------------|---------------|
| Theory | 3:00PM -3:50PM | 10:50 AM - 11:40 AM | 10:50 AM - 11:40 AM | -- | -- |
| Laboratory | -- | -- | -- | 2:10PM-4:40PM | 2:10PM-4:40PM |

REMEDIAL CLASSES: If required by the students

Supplement course handout Link:

[1] Parziale, L., Liu, W., Matthews, C., Rosselot, N., Davis, C., Forrester, J., & Britt, D. T. (2006). TCP/IP tutorial and technical overview.

[2] Egevang, K., & Francis, P. (1994). *The IP network address translator (NAT)* (No. rfc1631).

[3] Xie, Y., Yu, F., Achari, K., Gillum, E., Goldszmidt, M., & Wobber, T. (2007, August). How dynamic are IP addresses?. In *Proceedings of the 2007 conference on Applications, technologies, architectures, and protocols for computer communications* (pp. 301-312).

DELIVERY DETAILS OF CONTENT BEYOND SYLLABUS:

Content beyond syllabus covered (if any) should be delivered to all students that would be planned, and schedule notified accordingly.

| S.No | Advanced Topics, Additional Reading, Research papers and any | CO | POs & PSOs | ALM | References/MOOCs |
|------|--|----|------------|-----|------------------|
| 1 | NA | NA | NA | NA | NA |
| 2 | NA | NA | NA | NA | NA |
| 3 | NA | NA | NA | NA | NA |
| 4 | NA | NA | NA | NA | NA |

EVALUATION: AS PER MAKAUT GUIDELINES

Schedule for Continuous Assessment (CA):

| CA | Assessment By | Schedule |
|--------|---|--------------------------|
| CA-I | Presentation, Quiz | As per Academic Calendar |
| CA-II | Assignment/Report writing | |
| CA-III | Class test in pen and paper mode to be conducted at the College Level | |
| CA-IV | Centralized online test to be arranged by the University | |
| PCA1 | Rubrics based weekly Lab Evaluation | |
| PCA2 | Rubrics based Evaluation during End semester Lab Examination and Viva -Voce | |

ATTENDANCE POLICY

Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfil all other tasks assigned to him/her in every course. For Promotion, a Minimum of 50% of internal marks must be obtained. In every course, student has to maintain a minimum of 75% attendance to be eligible for appearing in Semester end examination of the course, for cases of medical issues and other unavoidable circumstances the students will be condoned if their attendance is between 60% to 75% in every course, subjected to submission of medical certificates, medical case file and other needful documental proof to the concerned departments.

DETENTION POLICY

In any course, a student has to maintain a minimum of 75% attendance and must secure a minimum of 50% marks in In-Semester Examinations to be eligible for appearing to the Semester End Examination, failing to fulfill these conditions will deem such student to have been detained in that course.

PLAGIARISM POLICY

Use of unfair means in any of the evaluation components will be dealt with strictly, and the case will be reported to the examination committee.

GENERAL INSTRUCTIONS

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

NOTICES

All notices will be communicated through the institution email.

All notices concerning the course will be displayed on the respective Notice Boards.

Signature of COURSE COORDINATOR:

Anupam Mukherjee

HEAD OF DEPARTMENT:

@Anupam

Head of the Department
Computer Science & Engineering
Siliguri Institute of Technology

Approval from: Head of the Institutions
(Sign with Office Seal)

@Deen
2/2/23

Principal
Siliguri Institute of Technology