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| A picture containing diagram  Description automatically generated | **AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)**  Faculty of Science and Technology (FST)  Department of Computer Science (CS)  Undergraduate Program |



**I**. **Course Code and Title**

COE 3206: Computer Networks

**II**. **Credit**

3 credit hours (3 hours of theory per week)

**III**. **Nature**

Core Course for CS, CSE, CSSE, SE, CIS, COE

**IV**. **Prerequisite**

COE 3103: Data Communication

**V. Vision:**

Our vision is to be the preeminent Department of Computer Science through creating recognized professionals who will provide innovative solutions by leveraging contemporary research methods and development techniques of computing that is in line with the national and global context.

**VI. Mission:**

The mission of the Department of Computer Science of AIUB is to educate students in a student-centric dynamic learning environment; to provide advanced facilities for conducting innovative research and development to meet the challenges of the modern era of computing, and to motivate them towards a life-long learning process.

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| **COURSE PLAN** | **SEMESTER: Fall 2024-2025** |



## **VII - Course Description:**

* Illustrate basic concepts of OSI model.
* Use FLSM and VLSM for subnetting a network.
* Apply the concept of DHCP for allocating IP addresses to different devices.
* Demonstrate how to use different datalink layer protocols for sharing a transmission medium among multiple devices.
* Change a LAN into multiple VLANs for ensuring better security and easy management.
* Apply various congestion and flow control mechanisms to limit the network congestion and data flow.
* Perform configuration of switch and routers for designing and implementing computer networks
* Use IPv6 address to configure a network.
* Determine the best routing path using different routing protocols such as RIP, EIGRP, OSPF etc.
* Apply NAT to allow many devices to be connected to the Internet with a limited number of public IP addresses.
* Use the concepts of error control techniques, HDL, and fragmentation for reliable communications.

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## **VIII - Course outcomes (CO) Matrix:**

By the end of this course, students should be able to:

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| **COs**\* | **CO Description** | Level of Domain\*\*\* | | | PO Assessed \*\*\*\* | |
| C | P | A |
| CO1  \*\* | *Demonstrate* various subnetting techniques to *design* subnets and *determine* the parameters of the subnets | 4 |  |  | PO-c-3 | |
| **CO2 \*\*** | ***Use* tools for modeling of different network topologies considering the practice in engineering discipline.** |  | **4** |  | **PO-e-2** | |
| CO3 | *Use* error control codes to detect and/or correct transmission error with a trade-off between error detection capability and throughput. | 3 |  |  | PO-a-4 | |
| **CO4** | ***Calculate and demonstrate* various types of IP addressing techniques.** | **5** |  |  | **PO-b-3** | |
| CO5 | *Investigate* solution of complex engineering problem by synthesis of information to provide valid conclusions. | 5 |  |  | PO-d-3 | |
| *C: Cognitive; P: Psychomotor; A: Affective Domain*  *\* CO assessment method and rubric of COs assessment is provided in later section*  *\*\* COs will be mapped with the Program Outcomes (POs) for PO attainment \*\*\* The numbers under the ‘Level of Domain’ columns represent the level of Bloom’s Taxonomy each   CO corresponds to.*  *\*\*\*\* The numbers under ‘PO Assessed’ column represent the POs each CO corresponds to.* | | | | | |

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## **IX - Topics to be covered in the class and/or lab: \***

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| **Time Frame** | **CO**  **Mapped** | **Topics** | **Teaching**  **Activities** | **Assessment Strategy(s)** |
| Week 1 | CO1, CO4 | Brief review of OSI model, Networking basics  LAB: IP addressing | Lecture, Question-answer, Lab Practice | Quiz, Lab Exam |
| Week 2 | CO1, CO4 | Application layer protocols: DNS, HTTP, FTP  Basics of IP addressing  LAB: IP addressing | Lecture, Question-answer, Lab Practice | Quiz, Lab Exam |
| Week 3 | CO1, CO5 | Data Link layer protocol (part 1): Channelization and controlled multiple access technique.  LAB: VLSM, Cabling, and connection | Lecture, Question-answer, Lab Practice | Lab Exam, Term Exam |
| Week 4 | CO1, CO2, CO5 | Data Link layer protocol (part 2): Aloha, CSMA, CSMA/CD, CSMA/CA  LAB: Basic network design | Lecture, Question-answer, Lab Practice | Lab Exam, Term Exam |
| Week 5 | CO1, CO2, CO5 | Routing, static and dynamic routing, RIP V1 & V2  LAB: Basic network design with VLSM and RIP | Lecture, Question-answer, Lab Practice | Lab Exam, Term Exam |
| Week 6 | CO1, CO2 | Application layer protocol: DHCP, Network Layer protocol: ARP  LAB: Recap the topics and Practice | Lecture, Question-answer, Lab Practice | Lab Exam |
| Week 7 | CO5 | Review of the topics  LAB: Lab Evaluation | Lecture, Question-answer, Lab Practice | Term Exam |
| Midterm (Week 8) | | | | |
| Week 9 | CO2, CO3 | Error Control mechanism: Cyclic redundancy check, Linear block code  LAB: Implementation of DHCP server, DNS server and Email server | Lecture, Question-answer, Lab Practice | Lab Exam, Quiz |
| Week 10 | CO2, CO5 | Switched network: Illustrate Virtual Local Area Network (VLAN), Inter-VLAN, and Virtual Trunk Port (VTP)  LAB: Implementation of VLAN & VTP | Lecture, Question-answer, Lab Practice | Lab Exam, Term Exam |
| Week 11 | CO2, CO5 | Routing: EIGRP and OSPF  LAB: Implementation of ROAS with EIGRP | Lecture, Question-answer, Lab Practice | Lab Exam, Term Exam |
| Week 12 | CO2, CO5 | Introduction to Logical addressing (IPv6): Explain IPv6 addresses, Special addressing of IPv6, address mapping.  LAB: Implementation of Inter-VLAN, DHCP, OSPF routing | Lecture, Question-answer, Lab Practice | Lab Exam, Term Exam |
| Week 13 | CO2, CO5 | Network Address Translation (NAT): Explain NAT and Port Address Translation (PAT)  LAB: Implementation of VLAN-VTP, DHCP, and OSPF | Lecture, Question-answer, Lab Practice | Lab Exam, Term Exam |
| Week 14 | CO2, CO5 | Transport layer protocol (part 1): TCP (TCP three-way handshake), Scenarios of error control mechanism), UDP  LAB: Implementation of NAT with OSPF | Lecture, Question-answer, Lab Practice | Lab Exam, Term Exam |
| Week 15 | CO2, CO5 | Transport layer protocol (part 2): Congestion control algorithm (Reno), Sliding window technique.  LAB: Recap the topics and Practice | Lecture, Question-answer, Lab Practice | Lab Exam, Term Exam |
| Week 16 | CO5 | HDLC, Fragmentation  LAB: Lab Evaluation | Lecture, Question-answer | Term Exam |
| Final term (Week 17) | | | | |

*\* The faculty reserves the right to change, amend, add, or delete any of the contents.*



## **X - Mapping of PO to Courses and K, P, A**

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| PO Indicator ID | PO Indicators Definition (As per the requirement of WKs) | Domain | K | P | A |
| PO-c-3 | Develop solutions that meet specified needs with appropriate environmental considerations. | Cognitive Level 4 (Evaluating) | K5 | P1  P2  P6 |  |
| PO-e-2 | Use tools for prediction and modeling of complex engineering problems considering the practice in engineering discipline | Psychomotor Level 4 (Articulation) |  | P1  P4  P5 |  |
| PO-a-4 | Apply information and concepts in *specialized engineering sciences* with the in-depth of analysis of a complex engineering problem. | Cognitive Level 3 (Evaluating) | K4 | P1  P3  P7 |  |
| PO-b-3 | Analyze solutions for complex engineering problem reaching substantiated conclusion. | Cognitive Level 5 (Evaluating) | K3 | P1  P3  P7 |  |
| PO-d-3 | Investigate solution of complex engineering problem by synthesis of information to provide valid conclusions. | Cognitive Level 5 (Evaluating) | K8 | P1  P4  P5 |  |



## **XI – K, P, A Definitions**

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| **Indicator** | **Title** | **Description** |
| **K3** | Theory based engineering fundamentals | A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline |
| **K4** | Forefront specialist knowledge for practice | Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline |
| **K8** | Research Literature | Engagement with selected knowledge in the research literature of the discipline |
| **P1** | Depth of knowledge required | Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach |
| **P2** | Range of conflicting requirements | Involve wide-ranging or conflicting technical, engineering, and other issues |
| **P3** | Depth of analysis required | Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models |
| **P4** | Familiarity of issues | Involve infrequently encountered issues |
| **P5** | Extent of applicable codes | Are outside problems encompassed by standards and codes of practice for professional engineering |
| **P6** | Extent of stakeholder involvement and conflicting requirements | Involve diverse groups of stakeholders with widely varying needs |
| **P7** | Interdependence | Are high level problems including many component parts or sub-problems |



## **XII – Mapping of CO Assessment Method and Rubric**

The mapping between Course Outcome(s) (COs) and The Selected Assessment method(s) and the mapping between Assessment method(s) and Evaluation Rubric(s) is shown below:

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| **COs** | **Description** | **Mapped**  **POs** | **Assessment Method** | **Assessment Rubric** |
| **CO1** | Demonstrate various subnetting techniques to design subnets and determine the parameters of the subnets | PO-c-3 | LAB Exam | Rubric for Midterm Lab Exam |
| **CO2** | Use tools for modeling of different network topologies considering the practice in engineering discipline. | PO-e-2 | LAB Exam | Rubric for Final Term Lab Exam |
| **CO3** | Use error control codes to detect and/or correct transmission error with a trade-off between error detection capability and throughput. | PO-a-4 | Quiz | Rubric for Quiz |
| **CO4** | Calculate and demonstrate various types of IP addressing techniques. | PO-b-3 | Quiz | Rubric for Quiz |
| **CO5** | Investigate solution of complex engineering problem by synthesis of information to provide valid conclusions. | PO-d-3 | Term Exam | Rubric for Term Exam |

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## **XIII – Evaluation and Assessment Criteria**

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| **CO1:** Demonstrate various subnetting techniques to design subnets and determine the parameters of the subnets | | | | | |
| **Assessment Criteria** | **Not Attended/ Incorrect (0)** | **Inadequate  (1-2)** | **Average (3)** | **Good  (4)** | **Excellent (5)** |
| **Evaluation Criteria** | **Evaluation Definition** | | | | |
| Content knowledge | Demonstrate a clear understanding of subnetting techniques | | | | |
| Creation of the subnets | Properly create the subnets and clarify the concept. | | | | |
| Calculation of FLSM/VLSM | Values are calculated correctly with proper logic. | | | | |
| Submission | The solution is submitted within due time. | | | | |

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| **CO2:** Use tools for modeling different network topologies considering the practice in the engineering discipline. | | | | | |
| **Assessment Criteria** | **Not Attended/ Incorrect (0)** | **Inadequate  (1-2)** | **Average (3)** | **Good  (4)** | **Excellent (5)** |
| **Evaluation Criteria** | **Evaluation Definition** | | | | |
| Problem Analysis | Clearly identifies and summarizes a particular task. | | | | |
| Correctness | The task is properly solved and demonstrated. | | | | |
| Submission | The solution is submitted within due time following instructions. | | | | |

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| **CO3:** Use error control codes to detect and/or correct transmission errors with a trade-off between error detection capability and throughput. | | | | | |
| **Assessment Criteria** | **Not Attended/ Incorrect (0)** | **Inadequate  (1-2)** | **Average (3)** | **Good  (4)** | **Excellent (5)** |
| **Evaluation Criteria** | **Evaluation Definition** | | | | |
| Necessity | Can explain the knowledge of error detection and correction. | | | | |
| Correctness | The given problem is perfectly calculated with proper logic. | | | | |
| Argumentation | Whether a comprehensive argument is presented to clarify the concept. | | | | |

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| **CO4:** Calculate and demonstrate various types of IP addressing techniques. | | | | | |
| **Assessment Criteria** | **Not Attended/ Incorrect (0)** | **Inadequate  (1-2)** | **Average (3)** | **Good  (4)** | **Excellent (5)** |
| **Evaluation Criteria** | **Evaluation Definition** | | | | |
| Content knowledge | Demonstrate a clear understanding of IP addressing techniques | | | | |
| Correctness | The given problem is solved correctly, and values are demonstrated | | | | |

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| **CO5:** Investigate solutions to complex engineering problems by synthesis of information to provide valid conclusions. | | | | | |
| **Assessment Criteria** | **Not Attended/ Incorrect (0)** | **Inadequate  (1-2)** | **Average (3)** | **Good  (4)** | **Excellent (5)** |
| **Evaluation Criteria** | **Evaluation Definition** | | | | |
| Problem Analysis | Able to analyze a particular given computer networking problem. | | | | |
| Content Knowledge | Demonstrates knowledge of computer networking for a particular given problem. | | | | |
| Completeness | The problem is solved correctly in time. | | | | |
| Argumentation | A comprehensive argument is presented to clarify the concept. | | | | |

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## **XIV- Course Requirements**

* Students are expected to attend at least 80% of the class.
* Students are expected to participate actively in the class.
* For both terms, there will be at least 2 quizzes based on the theoretical knowledge and conceptual understanding of the topic covered discussed in the classes.
* Submit a report based on the given course-related problems.
* Submission of assignments and projects should be in due time.

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## **XV – Evaluation & Grading System\***

The following grading system will be strictly followed in this class.

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| **MID TERM** | | **FINAL TERM** | |
| Attendance | 10% | Attendance | 10% |
| Quiz | 20% | Quiz | 20% |
| Lab Exam | 20% | Lab Exam | 20% |
| Midterm written exam | 50% | Final term written exam | 50% |
| Total | 100% | Total | 100% |
| **Grand Total 100% = 40% of Midterm + 60% of Final Term** | | | |

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| **Letter** | **Grade Point** | **Numerical %** |
| A+ | 4.00 | 90-100 |
| A | 3.75 | 85 - < 90 |
| B+ | 3.50 | 80 - < 85 |
| B | 3.25 | 75 - < 80 |
| C+ | 3.00 | 70 - < 75 |
| C | 2.75 | 65 - < 70 |
| D+ | 2.50 | 60 - < 65 |
| D | 2.25 | 50 - < 60 |
| F | 0.00 | < 50 |
| I |  | Incomplete |
| W |  | Withdrawal |
| UW |  | Unofficially Withdrawal |

*\* The evaluation system will be strictly followed as par the AIUB grading policy.*

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## **XVI – Textbook/ References**

1. B. A. Forouzan, Data Communications and Networking, McGraw-Hill, Inc., Fourth Edition, 2007, USA.
2. J. F., Kurose, K. W. Ross, Computer Networking: A Top-Down Approach, Pearson Education, Inc., Sixth Edition, USA.
3. W. Odom, Official Cert Guide CCNA 200-301, vol. 1,, Cisco Press, First Edition, 2019, USA.
4. T. Lammle, CCNA Routing and Switching, John Wily & Sons, Second Edition, 2016, USA.
5. B. A. Forouzan, TCP/IP Protocol Suite, McGraw-Hill, Inc., Fourth Edition, 2009, USA.
6. W. Stallings, Data and Computer Communication, Pearson Education, Inc., Tenth Education, 2013, USA.

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## **XVII - List of Faculties Teaching the Course**

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| --- | --- |
| **FACULTY NAME** | **SIGNATURE** |
| Dr. Md Mehedi Hasan |  |
| Dr. Md. Sohidul Islam |  |
| Sharifa Rania Mahmud |  |
| Syeda Nishat Tasnim |  |
| Umme Sadia Salsabil |  |
| Md. Hasibul Islam |  |
| Quazi Fariha Tasnim |  |



## **XVI – Verification**

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| **Prepared by:**  ---------------------------------  **Dr. Md Mehedi Hasan**  *Assistant Professor*  *Department of Computer Science*  Date:........................................ | **Moderated by:**  ---------------------------------  **Dr. Akinul Islam Jony**  *Point of Contact*  *OBE Implementation Committee for CS*  Date:......................................... | |
| **Checked by:**  ................................................  **Dr. Md. Abdullah-Al-Jubair**  *Head (Undergraduate Program)*,  *Department of Computer Science*  Date:........................................ | **Certified by:**  ................................................  **Dr. Dip Nandi**  *Director*,  *Faculty of Science & Technology*  Date:....................................... | **Approved by:**  ................................................  **Mr. Mashiour Rahman**  *Associate Dean*,  *Faculty of Science & Technology*  Date:........................................ |