**COURSE DESCRIPTION FORM: CS-3001 Computer Networks**

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**INSTITUTION**  FAST School of Computing, National University of Computer and Emerging Sciences, Peshawar

BS-CS– Summer 2022

**PROGRAM TO BE EVALUATED**

**Course Description**

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| --- | --- | --- | --- | --- |
| **Course Code** | CS3001 | | | |
| **Course Title** | Computer Networks | | | |
| **Credit Hours** | 3 | | | |
| **Prerequisites by Course(s) and Topics** | CS2001 | | | |
| **Grading Policy** | Absolute grading | | | |
| **Policy about missed assessment items in the course** | Retake of missed assessment items (other than midterm/ final exam) will not be held.  For a missed midterm/final exam, an exam re-take/ pre-take application along with necessary evidence are required to be submitted to the department secretary. The examination assessment and retake committee will decide the exam re-take/ pre-take cases. | | | |
| **Course Plagiarism Policy** | Plagiarism in project or midterm/final exam may result in F grade in the course.  Plagiarism in an assignment will result in zero marks in that assignment. | | | |
| **Assessment Instruments with Weights** (homework, quizzes, midterms, final, programming assignments, lab work, etc.) | Assessment Items   |  |  |  | | --- | --- | --- | | **Assessment Item** | **Number** | **Weight (%)** | | Assignments | 3 | 10 | | Quizzes | 3 | 10 | | Midterm Exam | 2 | 30 (15 each) | | Final Exam | 1 | 50 | | | | |
| **Course Instructors** | Zeshan Khan | | | |
| **Lab Instructors (if any)** | Khuram Shahzad | | | |
| **Course Coordinator** | Zeshan Khan | | | |
| **URL (if any)** |  | | | |
| **Current Catalog Description** | The learning and skill-based objectives of this course resolve around the following questions:   * How does the global network infrastructure work and what are the design principles on which it is based? * In what ways are these design principles compromised in practice? * How should Internet applications be written, so they can obtain the best possible performance both for themselves and for others using the infrastructure? * How do we ensure that it will work well in the future in the face of rapidly growing scale and heterogeneity?   The course will focus on the design & undergraduate level analysis of large-scale networked systems and tool (wireshark, packet tracer) based implementation and evaluation of small-scale networked systems in the Lab. | | | |
| **Textbook** (or **Laboratory Manual** for Laboratory Courses) | Computer Networking: A Top-Down Approach Featuring the Internet, 6th edition by James F. Kurose and Keith W. Ross | | | |
| **Reference Material** | 1. Computer Networks, 5th Edition by Andrew S. Tanenbaum 2. Data and Computer Communications, 10th Edition by William Stallings 3. Data Communication and Computer Networks, 5th Edition by Behrouz A. Forouzan | | | |
| **Course Learning Outcomes** | |  | | --- | | **A. Course Learning Outcomes (CLOs)** | | On successful completion of this course students will have to know how of:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | CLO | Name | Domain | Taxonomy Level | PLO | Tools | | 1 | Describe the key terminologies and technologies of  computer networks | Cognitive | C2 (Understanding) | 3 | S, F, Q | | 2 | Explain the services and functions provided by each layer  in the Internet protocol stack. | Cognitive | C2 (Understanding) | 3 | A, S, F | | 3 | Identify various internetworking devices and protocols, and  their functions in a network. | Cognitive | C4 (Analysis) | 3 | A, S, F | | 4 | Analyze working and performance of key technologies,  algorithms and protocols. | Cognitive | C4 (Analysis) | 5 | P, F | | 5 | Build Computer Network on various Topologies [5, Lab] | Psychomotor | C3 (Applying) |  |  |   Tools description: A: Assignments, F: Final, S: Sessional, P: Project, Q: Quizzes   |  |  | | --- | --- | | **B. Program Learning Outcomes** | | | For each attribute below, indicate whether this attribute is covered in this course or not. Leave the cell blank if the enablement is little or non-existent. | | | |  |  | | --- | --- | | 1. Computing Knowledge | Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to the solution of complex computing problems. | |  | | |  |  | | --- | --- | | 2. Problem Analysis | Identify, formulate, research literature, and analyze complex computing problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, and computing sciences. | |  | | |  |  | | --- | --- | | 3. Design/ Develop Solutions | Design solutions for complex computing problems and design systems, components, and processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. | |  | | |  |  | | --- | --- | | 4. Investigation & Experimentation | Conduct investigation of complex computing problems using research-based knowledge and research-based methods. | |  | | |  |  | | --- | --- | | 5. Modern Tool Usage | Create, select, and apply appropriate techniques, resources and modern computing tools, including prediction and modeling for complex computing problems. | |  | | |  |  | | --- | --- | | 6. Society Responsibility | Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues relevant to context of complex computing problems. | |  | | |  |  | | --- | --- | | 7. Environment and Sustainability | Understand and evaluate sustainability and impact of professional computing work in the solution of complex computing problems. | |  | | |  |  | | --- | --- | | 8. Ethics | Apply ethical principles and commit to professional ethics and responsibilities and norms of computing practice. | |  | | |  |  | | --- | --- | | 9. Individual and Teamwork | Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. | |  | | |  |  | | --- | --- | | 10. Communication | Communicate effectively on complex computing activities with the computing community and with society at large. | |  | | |  |  | | --- | --- | | 11. Project Management and Finance | Demonstrate knowledge and understanding of management principles and economic decision making and apply these to one’s own work as a member or a team. | |  | | |  |  | | --- | --- | | 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 changes. | |  | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **C. Mapping of CLOs on PLOs**  (CLO: Course Learning Outcome, PLOs: Program Learning Outcomes) | | | | | | | | | | | | | | | |  | | **PLOs** | | | | | | | | | | | | | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |  | | **CLOs** | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  | | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  | | 3 |  |  |  |  |  |  |  |  |  |  |  |  |  | | 4 |  |  |  |  |  |  |  |  |  |  |  |  |  | | | | | |
| **Topics covered in the course with number of lectures on each topic** (Assume 15 weeks of instruction and 1 hour lecture duration) | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | **Topics to be covered** | | | | | | **List of Topics** | | **Week** | **No. of Weeks** | **Contact Hours** | **CLO(s)** | | 1.1 - Introduction, Course  1.2-1.3 - Network Edge, Network Core (ISPs,  internet Vs. intranet, Internet)  1.4 - ISPs and Internet Backbones (Tiers of ISPs),  Delay, Loss and Throughput in Packet- Switched  Networks  1.5 - Protocol Layers, Service Model  1.6-1.7 Network Under Attacks, History | | **1** | **1** | **3** | **1** | | 2.1 Principles of network Applications2.2 - Web and HTTP  2.3-2.4 Electronic Mail and DNS  2.5 – P2P Distributions  2.6 Video Streaming and Content Distribution | | **2** | **1** | **3** | **2** | | 3.1-3.2 – Transport Layer service, Multiplexing  and De-multiplexing  3.3 – Connectionless Transport UDP  3.4 – Principles of Reliable data transport | | **3** | **1** | **3** | **2** | | ***WEEK 4*** | ***Midterm Exam*** | | | | | | *3.5 Connection Oriented Transport: TCP*  3.6 Principles of Congestion Control  *3.7 - TCP Congestion Control* | | **5** | **1** | **3** | **3** | | 4.1 – Network Layer Overview  4.2 – What’s Inside a Router  4.3 – Internet Protocol  4.3 – Internet Protocol Continued | | **6** | **1** | **3** | **3** | | 5.4. Routing Amount the ISP  5.6 – ICMP  5.7 – Network Management | | **7** | **1** | **3** | **4** | | 8.1 Security | | **8** | **1** | **3** | **4** | | ***Week 09*** | ***Final Exam*** | | | | | | *Total* | |  | **9** | **26** |  | | | | |
| **Laboratory Projects/Experiments Done in the Course** |  | | | |
| **Programming Assignments Done in the Course** | Various. Semester Projects will target Network Application which uses cloud components to implement various domains.  Socket Programming | | | |
| **Class Time Spent** (in percentage) | **Theory (%)** | **Problem Analysis (%)** | **Solution Design (%)** | **Social and Ethical Issues (%)** |
| 40 | 30 | 25 | 5 |
| **Oral and Written Communications** | Every student is required to submit at least 1 written report of typically 10 pages in IEEE research report format. Students will also be called for viva/presentation of the project and any assignment where necessary | | | |

**Instructor Name: Zeshan Khan**

**Instructor Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date: July 04, 2022**