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| **Subject** | |
| Computer Science | |
| **Grade** | |

**SLOs for Assessment Key:**
1. Ambiguous                                    - (Grey)                                2.
Not assessable in Summitive              - (Grey)
3. Repetitive (with in same grade)          - (Grey)
4. Repetitive ( with in same learning level)   - (Grey)

| S # | Domains | Standards | Benchmarks | Topic/ Title | NCP-SLO No. | NCP (2022)-SLOs description | Status of SLOs | SLOs for Assessment | Cognitive Domain |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Domain A: Computer Systems | Students will learn about components and interactions between computer systems, stages of software development, data representation and transmission across networks of computing systems, and the implications on usability, reliability, security, etc | Benchmark I: Students will identify and analyze logic gates in digital systems<br>Benchmark II: Students will identify stages of system software development<br>Benchmark III: Students will learn about scalability, reliability, and security of computer networks | | SLO CS-12-A-02 | Explain human interaction with computer systems in terms of: Usability, Common problems, Methods for improvements, Ethical, social, economic, and environmental implications | Matched SLO | | Remember |
| 2 | Domain A: Computer Systems | Students will learn about components and interactions between computer systems, stages of software development, data representation and transmission across networks of computing systems, and the implications on usability, reliability, security, etc | Benchmark I: Students will identify and analyze logic gates in digital systems<br>Benchmark II: Students will identify stages of system software development<br>Benchmark III: Students will learn about scalability, reliability, and security of computer networks | | SLO CS-12-A-03 | Identify and explain tradeoffs between the usability and security of computing systems, recommend cybersecurity measures by considering different factors such as efficiency, cost, privacy, and ethics | Matched SLO | | Understand |
| 3 | Domain B: Computational Thinking & Algorithms | Students will identify and decompose simple and complex problems, create & evaluate appropriate solutions using computational approaches, and understand and apply common algorithms used in solving computational problems | Benchmark II: Students have core concepts of basic data structures and algorithms used extensively in computer science and knowledge of how to apply these techniques toward solving more complex and real-life problems. | | SLO CS-12-B-01 | Understand and evaluate the computational solutions in terms of efficiency, clarity, and correctness | Matched SLO | | Analyse |
| 4 | Domain B: Computational Thinking & Algorithms | Students will identify and decompose simple and complex problems, create & evaluate appropriate solutions using computational approaches, and understand and apply common algorithms used in solving computational problems | Benchmark II: Students have core concepts of basic data structures and algorithms used extensively in computer science and knowledge of how to apply these techniques toward solving more complex and real-life problems. | | SLO CS-12-B-02 | Understand and apply complex algorithms on data structures such as trees and binary search | Matched SLO | | Apply |
| 5 | Domain C: Programming Fundamentals | Students will create and debug projects in programming languages Python, HTML, and JavaScript, learning how to translate algorithms into code and define & apply fundamental programming constructs such as sequence, selection, and iteration | Benchmark II: Students will develop, test, debug command-line interface (CLI) applications in Python | | SLO CS-12-C-01 | Students should be able to understand and evaluate applications of various programming paradigms. | Matched SLO | | Analyse |
| 6 | Domain C: Programming Fundamentals | Students will create and debug projects in programming languages Python, HTML, and JavaScript, learning how to translate algorithms into code and define & apply fundamental programming constructs such as sequence, selection, and iteration | Benchmark II: Students will develop, test, debug command-line interface (CLI) applications in Python | | SLO CS-12-C-02 | Students should be able to use more advanced programming constructs such as data structures (lists etc.), file handling (disk IO to write to storage), and databases in Python. | Matched SLO | | Apply |
| 7 | Domain C: Programming Fundamentals | Students will create and debug projects in programming languages Python, HTML, and JavaScript, learning how to translate algorithms into code and define & apply fundamental programming constructs such as sequence, selection, and iteration | Benchmark II: Students will develop, test, debug command-line interface (CLI) applications in Python | | SLO CS-12-C-04 | Students should be able to implement complex algorithms that use lists etc. in Python | Matched SLO | | Apply |
| 8 | Domain C: Programming Fundamentals | Students will create and debug projects in programming languages Python, HTML, and JavaScript, learning how to translate algorithms into code and define & apply fundamental programming constructs such as sequence, selection, and iteration | Benchmark II: Students will develop, test, debug command-line interface (CLI) applications in Python | | SLO CS-12-C-05 | Students will determine more advanced techniques (unit tests, breakpoints, watches) for testing and debugging their code in Python | Matched SLO | **Not assessable in summative** | Evaluate |
| 9 | Domain D:  Data and Analysis | Standard 1:  Students will be able to understand the scope of data science, how computer systems collect, store, process, visualize, and interpret data | Benchmark II:  Students will be able to represent databases using UML diagrams and extract data using queries, and create data visualizations using software tools | | SLO CS-12-D-01 | Students will be able to analyse data and identify key model performance metrics of real-world machine learning models. | Matched SLO | | Analyse |
| 10 | Domain D:  Data and Analysis | Standard 2: Students will get an introduction to the relational data model, relational database engines, and SQL and how to design good schemas. | Benchmark II:  Students will be able to represent databases using UML diagrams and extract data using queries, and create data visualizations using software tools | | SLO CS-12-D-02 | Students will explain and create a data visualization using Structured Query Language (SQL), or Python, or R | Matched SLO | | Apply |

| | Domain | Standard | Benchmark | | SLO Code | SLO Description | | | Bloom's Level |
|---|---|---|---|---|---|---|---|---|---|
| 11 | Domain E: Applications of Computer Science | Standard 1: Students will understand computer technologies such as Blockchain / AI / IoT / Cloud Computing / Game design and development | Benchmark I: Students learn about different technologies that support the latest applications of CS and their relevance to Pakistan. Benchmark II: Students learn about data techniques in AI applications and the social implications of technology. | | SLO CS-12-E-01 | Students should be able to design ideas of applications relevant to Pakistan using IoT, Cloud computing, and Blockchain | Matched SLO | | Apply |
| 12 | Domain E: Applications of Computer Science | Standard 2: Students should be able to understand how computers learn, make decisions, and the applications, challenges, and social implications of AI | Benchmark I: Students learn about different technologies that support the latest applications of CS and their relevance to Pakistan. Benchmark II: Students learn about data techniques in AI applications and the social implications of technology. | | SLO CS-12-E-02 | Students should be able to describe deep learning and its applications | Matched SLO | | Remember |
| 13 | Domain E: Applications of Computer Science | Standard 2: Students should be able to understand how computers learn, make decisions, and the applications, challenges, and social implications of AI | Benchmark I: Students learn about different technologies that support the latest applications of CS and their relevance to Pakistan. Benchmark II: Students learn about data techniques in AI applications and the social implications of technology. | | SLO CS-12-E-03 | Students should be able to assess policies that can help protect different stakeholders' interests | Matched SLO | | Understand |
| 14 | Domain E: Applications of Computer Science | Standard 2: Students should be able to understand how computers learn, make decisions, and the applications, challenges, and social implications of AI | Benchmark I: Students learn about different technologies that support the latest applications of CS and their relevance to Pakistan. Benchmark II: Students learn about data techniques in AI applications and the social implications of technology. | | SLO CS-12-E-04 | Students should be able to evaluate scenarios with data sharing and privacy conflicts and suggest policy decisions that can help achieve acc | Matched SLO | | Analyse |
| 15 | Domain F: Impacts of Computing | Standard 1: Students will be able to understand ethics and laws related to computing and the use of computing devices, media, data, the internet, and the application of personal privacy and network security. | Benchmark I: Students will interpret documents related to computing systems and evaluate their legal and ethical implications. Benchmark II: Students will be able to illustrate how they can maintain privacy online and address security concerns they may encounter with the use of computing devices and applications Benchmark III: Students will demonstrate their ability to collaborate and communicate on the design of computing applications | | SLO CS-12-F-01 | Identify and apply safe practices when collaborating on digital or online platforms. | Matched SLO | | Apply |
| 16 | Domain F: Impacts of Computing | Standard 2: The environmental, cultural, and human impact of computing and assistive technologies for the modern world. | Benchmark I: Students will interpret documents related to computing systems and evaluate their legal and ethical implications. Benchmark II: Students will be able to illustrate how they can maintain privacy online and address security concerns they may encounter with the use of computing devices and applications Benchmark III: Students will demonstrate their ability to collaborate and communicate on the design of computing applications | | SLO CS-12-F-02 | Discuss security threats and mitigation such as 2FA, biometric verification, and secure techniques for transmitting data etc. | Matched SLO | | Remember |
| 17 | Domain F: Impacts of Computing | Standard 2: The environmental, cultural, and human impact of computing and assistive technologies for the modern world. | Benchmark I: Students will interpret documents related to computing systems and evaluate their legal and ethical implications. Benchmark II: Students will be able to illustrate how they can maintain privacy online and address security concerns they may encounter with the use of computing devices and applications Benchmark III: Students will demonstrate their ability to collaborate and communicate on the design of computing applications | | SLO CS-12-F-03 | Collaborate on strategies to provide equity and equal access to information | Matched SLO | **Not assessable in summative** | Analyse |
| 18 | Domain G: Digital Literacy | Standard: Collect & analyze information and publish to various audiences using digital tools and media-rich resources, and use digital tools to design and develop a significant digital artefact through research design, data collection, and communication. | Benchmark II: Use digital tools to design and develop a significant digital artefact through research design, data collection, and communication. | | SLO CS-12-G-01 | Students will create an artefact that answers a research question, communicates results and conclusions through digital resources or tools | Matched SLO | | Apply |