EXAMINATIONS SECTION

KARAKORAM INTERNATIONAL UNIVERSITY

GILGIT-BALTISTAN, GILGIT

ASSESSMENT FRAMEWORK

FOR

COMPUTER SCIENCE GRADE-XI CURRICULUM 2022-23

ASSESSMENT FRAMEWORK FOR COMPUTER SCIENCE GRADE-XI, CURRICULUM 2022-23

To enhance clarity and accuracy in assessments, the learning outcomes have been divided into two types: formative and summative. This distinction is essential for effectively tracking student progress and understanding. Each Student Learning Outcome (SLO) is clearly labelled as either formative or summative in the newly designed Assessment Framework. Summative SLOs are included in the Final Examination, while formative SLOs are part of regular teaching and learning activities but are not assessed in the Final Examination.

Each SLO is associated with specific cognitive levels: Knowledge (K), Understanding (U), and Application (A). Note that all higher-level cognitive skills are grouped under the "Application" level. For subjects with practical components (lab work), the framework specifies whether an SLO is summative for theoretical exams or for Practical-Based Assessment (PBA). If an SLO is summative for PBA, this means that lab work is required during instruction and will be assessed in the Practical Examination or Practical-Based Assessment.

The Assessment Framework serves as a comprehensive resource for students, teachers, and exam creators. Students can follow clear guidelines for exam preparation, teachers can better understand the curriculum and prepare students effectively, and paper setters can use the framework to guide their question-setting process.

FORMATIVE ASSESSMENT: A KEY COMPONENT OF EFFECTIVE LEARNING

Formative assessment is a fundamental part of the educational process, offering continuous feedback that benefits both students and teachers. Unlike summative assessments, which measure student learning at the end of a term or unit, formative assessments are embedded within the learning process to regularly track student comprehension and inform instructional choices.

The main goal of formative assessment is to identify gaps in understanding and correct misconceptions as they arise, enabling timely support. This responsive approach allows teachers to adjust their methods based on student needs. For example, if a teacher notices through a quick quiz or class discussion that many students are struggling with a particular concept, they can review it, introduce alternative explanations, or employ different teaching strategies. This flexibility is essential for helping students build a stronger grasp of the material.

Formative assessments come in various forms, from informal techniques like discussions, observations, and questioning to more structured methods like quizzes, peer assessments, and self-reflection exercises. These assessments can extend beyond traditional paper tasks and include digital tools that provide instant feedback. This adaptability helps teachers address different learning styles, ensuring that every student is actively engaged and supported in their educational journey.

Additionally, formative assessment fosters a positive classroom environment by shifting the focus from grades to the learning process itself. Students see assessments as opportunities to grow rather than final judgments of their abilities, reducing stress and increasing motivation and engagement in their studies.

In summary, formative assessment is an empowering educational strategy that, when used effectively, enriches the entire learning journey! It offers invaluable insights to both teachers and students, igniting a growth-focused environment and cultivating essential skills along the way. As education evolves, formative assessment will undoubtedly remain at the heart of creating meaningful, impactful, and successful learning experiences for every student.

SUMMATIVE ASSESSMENT: ACHIEVEMENT AND MASTERY THROUGH FINAL EXAMINATIONS

Summative assessment is an exciting culmination of the learning journey, designed to evaluate student achievements at the end of an instructional period. Unlike formative assessments, which provide continuous feedback, summative assessments serve as a conclusive measure of what students have mastered. Conducted at the end of a unit, course, or academic year, summative assessments gauge how well educational goals have been achieved.

The primary purpose of summative assessment is to assess the full impact of learning and teaching, capturing a comprehensive view of students' progress. Through tests, final projects, or standardized exams, these assessments reveal a student's level of mastery in a subject, often culminating in grades or scores that reflect their dedication and hard work throughout a specific period.

Summative assessments also play a pivotal role in shaping students' academic paths, helping to make important decisions about advancement, certification, or placement. Beyond individual evaluation, these assessments provide valuable insights for curriculum development, as educators can analyze results to identify trends, strengths, and areas for growth within instructional methods. This feedback loop is key to refining and enhancing future learning experiences.

Summative assessment is a vital part of the learning journey, offering students an opportunity to demonstrate their achievements and understanding at the end of an instructional period. While formative assessments guide learning along the way, summative assessments provide a focused, culminating moment for students to showcase their hard work and knowledge.

This final evaluation not only highlights each student's growth but also gives educators a valuable measure of the success of their instructional strategies. By analyzing these outcomes, teachers gain insights into what worked well and areas for future enhancement, ultimately strengthening the learning experience for all students. Together, formative and summative assessments create a balanced and supportive framework for learning, combining ongoing feedback with milestone achievements. In this way, summative assessment plays a key role in both celebrating progress and setting the stage for continued academic success.

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NATIONAL CURRICULUM OF PAKISTAN 2022-2023
ASSESSMENT FRAMEWORK COMPUTER SCIENCE (THEORY)
DETAILS OF CONTENT AREAS/ SLOS GRADE XI

Keys for the Document

1. **(Number of Periods Required, 1 period=40 minutes)**
2. **Summative. Summative assessment is an assessment administered at the end of an instructional unit in a course. Unlike formative assessment, this assessment model is intended to evaluate student learning by comparing performance to a standard or benchmark. (Question(s) will be asked in annual examination)**
3. **Formative. Formative assessment includes both formal and informal techniques of assessment that teachers employ during the learning process. It is also referred to as formative evaluation, formative feedback, or assessment for learning, including diagnostic testing. The objective is to improve student achievement by modifying teaching and learning activities. (Question(s) will not be asked in annual examination)**
4. **Cognitive Levels (K=Knowledge, U= Understanding and A=Application)**

Content Domain / Area	SLO No.	Description	Form of Assessment	Cognitive Level	Number of Periods Required
A: Computer Systems	**[SLO CS-11-A-01]**	Students will be able to understand and apply logic gates in digital systems, define and create truth tables using Boolean operators like AND, OR, NOT, NAND, XOR) and logic diagrams. Students will understand: • Boolean functions • Boolean expressions • Boolean identities • Duality • What is digital logic • What makes analog and digital signals different • What are logic gates	Summative for Theory and Practical Based Assessment	K/U/A	**30**

		• What are truth tables • What are switches Students will be able to • Construct Boolean functions, expressions, and identities. • Recognize duality • Identify different logic gates and explain their uses • Create truth tables for expressions up to 3 inputs • Draw logic gates for a Boolean expression • Draw a truth table for a logic gate to identify the outputs Student will know • Key terms: Karnaugh maps, AND, OR, NOT, NAND gates, XOR • How to create truth tables • How to identify logic gates and understand their usage			
	[SLO CS-11-A-02]	Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies. Students will understand that • What is a Software Development Life Cycle(SDLC) o What are the different activities involved in each phase of the SDLC • (Advanced) What are basic software processes and Agile, Water fall software process models Students will know • Key terms: SDLC, bug, Agile, Waterfall, debugging, testing, design patterns, UML. • Key activities in software development and the role of software development processes • The engineering nature of software development • Key concepts in software development such as risk and quality Students will be able to • Relate the different stages of SDLC(analysis, design, coding, testing etc.) to a case study	Summative for Theory	K/U	

		• Plan a software project from beginning (design) to end(test and launch) • (Advanced)Explain common software development processes(agile etc.) • Explain black box and white box testing			
	[SLO CS-11-A-03]	Students will be able to understand and explain the scalability and reliability of networking systems via network topology Students will understand… • Different types of network topologies • Design, common access, and use of topologies • Scalability and reliability • Preparing for scale and reliability through load and system testing • Scalability and reliability in cloud computing Students will know • Key terms: Network topology, Bus, Ring, Tree, Star, Mesh, Hybrid, Ethernet, CSMA, Token passing, client, Server, root, node… • Advantages and disadvantages of each network topology Students will be able to • Measure availability of a system • Prepare systems so they run with high reliability and can scale well • Test the scalability and reliability of a system	Summative for Theory	K/U	
	[SLO CS-11-A-04]	Understand and explain the need for cyber security and contrast different methods of encryption to transmit data. Students will understand… • Cybersecurity • Encryption • Ways a system can be attacked • Basic security frameworks • Security analysis and proactive protection of systems against cyberattacks • Data policies and privacy policies and how they can help keep your information safe	Summative for Theory	K/U	

		Students will know • Key terms: Cryptography, 2FA, firewall, DDoS, Hacking, Authentication, Authorization, Hashing, Malware, Phishing, XSS, Plaintext, Ciphertext, Encryption, Decryption…. Students will be able to • Protect their computers and setup online access taking into account the security risks they are prone to • Understand how basic cyberattacks are constructed and applies to real systems • Analyze cyber security risk and create a plan to prioritize risk decisions • Understand basic encryption techniques and algorithms used to protect sensitive data • How to protect sensitive apps and data through strong passwords, 2 factor authentication and encryption techniques.			
B: Computational Thinking and Algorithms	**[SLO CS-11-B-01]**	Plan, develop, systematically test, and refine computational artifacts for problem solving such as pseudocode, etc. Students will understand • How to use different methods to design and construct a solution to a computational problem Students will be able to • Create pseudocode to address computational problems in the correct font, size, style, indentation, case, line numbers, comments, data type keywords, variable assignments & declarations, common operators, and key commands • Systematically test computational artifacts • Analyse an algorithm presented as a flow chart in terms of include tracing an algorithm as well as assessing its correctness.	Summative for Theory and Practical Based Assessment	K/U/A	**20**
	[SLO CS-11-B-01]	Plan, develop, systematically test, and refine computational artifacts for problem solving such as pseudocode, etc.	Summative for Theory and	K/U/A	

		Students will understand • How to use different methods to design and construct a solution to a computational problem Students will be able to • Create pseudocode to address computational problems in the correct font, size, style, indentation, case, line numbers, comments, data type keywords, variable assignments & declarations, common operators, and key commands • Systematically test computational artifacts • Analyse an algorithm presented as a flow chart in terms of include tracing an algorithm as well as assessing its correctness. • Evaluate algorithms in terms of their efficiency, correctness, and clarity	Practical Based Assessment		
	[SLO CS-11-B-02]	Apply common search, and sort algorithms Students will understand • Problem solving methods using simple example of a. Abstraction b. Decomposition c. Pattern recognition • Algorithmic approaches to solve practical exercises of algorithms • When to use various search and sort algorithms such as linear search, binary search, insertion sort, bubble sort, etc. Students will be able to • Use and adapt classic algorithms to solve computational problems (e.g. sorting and searching algorithms such as linear search, binary search, insertion sort, bubble sort, etc.)	Summative for Theory and Practical Based Assessment	K/U/A	
C: Programming Fundamentals	**[SLO CS-11-C-01]**	Students should understand the importance of computer programming and applications Students will understand… • Programs use the basic components of a computer to take inputs, process the input, and produce output	Summative for Theory and Practical Based Assessment	K/U/A	**40**

		• The Agile and Waterfall are models of the Software Development Life cycle and are used to gather requirements and implement software Students will be able to… • Take a real-world problem, propose a software solution, and implement it.			
	[**SLO CS-11-C-02]**	Students should be able to write and execute simple programs in Python. Students will understand… • What is Python, why is it used • What type of problems can be solved using Python • Input/Output handling • Variables in Python • Operators in Python • Sequence, Selection, Repetition in Python Students will be able to… • Write and execute a program in Python using an IDE like replit.com (online) VS Code(offline) that uses variables, sequence, selection, and repetition	Summative for Theory and Practical Based Assessment	K/U/A	

	[SLO CS-11-C-03]	Students should be able to draw shapes using Turtle Graphics functions in Python
		
		Students will understand…
		• How to use the Python Turtle Library
		  • Turtle methods
		  • Methods of screen
		  • Turtle motion
		  • Use of events
		  • Create/draw shapes
		  • Compound Shapes
		• How to create shapes by means of instructions to a “turtle” to move in a given direction
			Summative for Theory and Practical Based Assessment	K/U/A	

		• How to create more complex shapes by allowing the "turtle" to lift the pen while moving Students will be able to… • Write and execute a program in Python to create complex shapes using the Turtle library			
	[SLO CS-11-C-04]	Students should be able to understand the need for libraries and learn the use of some simple libraries in Python. Students will understand… • The concept of abstraction allows the use of complex libraries without knowing their internal implementation Students will be able to… • Find and use a third-party Python library that is simple to use but has a complex implementation	Summative for Theory and Practical Based Assessment	K/U/A	
	[SLO CS-11-C-05]	Students should be able to translate simple algorithms that use sequence and repetition in Python. Students will understand… • What are variables, sequence, repetition, and lists in Python • How to use sequence and repetition to manipulate lists in Python Students will be able to… • Write and execute a Python program that uses variables, sequence, and repetition to populate a list • Write and execute a Python program that uses variables, sequence, and repetition to find an element in a list	Summative for Theory and Practical Based Assessment	K/U/A	
	[SLO CS-11-C-06]	Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python Students will understand… • Why we need functions • How to decompose a large problem into sub-problems • How to identify duplication in their code • How to move duplicated code into a function • How to create/define/invoke a function	Summative for Theory and Practical Based Assessment	K/U/A	

		• Types of Functions • Function parameters/arguments • Scope of variables • Returning value from a function • Pass by value Students will be able to… • Write and execute a Python program that solves a large problem by decomposing into sub-problems • Write a Python program that invokes functions within loops • Write a Python program that performs some mathematical operation on a value passed to it, and returns the updated value (for example Celsius to Fahrenheit conversion etc.)			
	[SLO CS-11-C-07]	Students will determine ways of debugging their code in Python Students will understand… • Code written outside of a function is hard to test • Code written inside a function can be tested • That they can write code that calls functions to ensure the results are correct • Using a debugger allows programmers to set a breakpoint to stop execution of their code to see the state of variables mid-execution for the purpose of discovering errors in their code Students will be able to… • Write code to invoke functions and check their return values for correctness • Read through code and dry run by hand to find bugs	Summative for Theory and Practical Based Assessment	K/U/A	
D: Data and Analysis	**[SLO CS-11-D-01]**	Students will be able to relate the role and importance of model building with their real-world applications Students will know how statistical modeling can find relationships between real world events and can be used to make recommendations based on statistical findings.	Summative for Theory and Practical Based Assessment	K/U/A	**25**

		They will know use cases for modeling, when they can be used, which models fit which use cases and basic statistical techniques such as linear regression and multiple linear regression. Students will know: • The linear relationship between variables (using correlation coefficients and build the y = mx + c using slope and intercept) • The structure of linear models, K-means, Smoothing Students will be able to: • Use the information from one variable to make predictions about another variable (fitting a line to understand the relationship between wo variables and use the correlation coefficient to access the linear association) • Identify the slope and intercept for the linear relationship • Build their first statistical model (Microsoft Excel Python, Weka, or Microsoft Excel) • (Advanced) Interpret the results of the model including statistical significance and beta values • (Advanced) Draw conclusions from the model output to inform real world policies			
	[SLO CS-11-D-02]	Students will understand and explain experimental design in data science Students will understand • The importance of experimentation in data science as a tool to differentiate between correlation and causation • Measures used in experimentation • Real work experimentation examples Student will know… • Data collection methods, including traditional methods of designed experiments and observational studies and surveys • Statistics as a process for making inferences about population parameters based on a random sample from that population	Summative for Theory and Practical	K/U/A	

		Students will be able to • Differentiate between correlation and causation • Compare and contrast population vs. sample • Compare and contrast parameter vs. statistic • How to do their own experiments through in-class activities • Apply a real-world business problem where experimentation is used.(e.g. Facebook, YouTube, on line retail) • Explain situations where one measure of central tendency or spread may be more appropriate than others • (Advanced) Identify reports that use special data structures (census, survey, observational study, and randomized experiment) • (Advanced) Use RStudio/python to re-randomize data • (Advanced) Compute measures of central tendency and spread in RStudio/python			
	[SLO CS-11-D-02]	Students will understand and explain experimental design in data science Students will understand • The importance of experimentation in data science as a tool to differentiate between correlation and causation • Measures used in experimentation • Real work experimentation examples Student will know… • Data collection methods, including traditional methods of designed experiments and observational studies and surveys • Statistics as a process for making inferences about population parameters based on a random sample from that population Students will be able to • Differentiate between correlation and causation • Compare and contrast population vs. sample • Compare and contrast parameter vs. statistic • How to do their own experiments through in-class activities	Summative for Theory and Practical Based Assessment	K/U/A	

		• Apply a real-world business problem where experimentation is used.(e.g. Facebook, YouTube, on line retail) • Explain situations where one measure of central tendency or spread may be more appropriate than others • (Advanced) Identify reports that use special data structures (census, survey, observational study, and randomized experiment) • (Advanced) Use RStudio/python to re-randomize data • (Advanced) Compute measures of central tendency and spread in RStudio/python			
	[SLO CS-11-D-03]	Students will analyze pre-existing data sets to create summary statistics and data visuals (such as bar charts, pie charts, line graphs, etc.) Students will understand • Definitions and analysis of data and data products (charts, graphs, statistics) • How to construct multiple views of data • How to use analyze data through computational tools such as Excel, Google Sheets, R, or Python Students will • Apply their knowledge of visualization techniques (such as measures of center and spread, boxplots, bar plots , histograms, scatterplots) to data • Read plots (identify the name of the plot, interpret the axes, look for trends, identify confounding factors) • Use visualization to tell stories with data • (Advanced) Create basic plots in RStudio • (Advanced) Create frequency tables in RStudio • (Advanced) Critically read reports from media sources to evaluate their claims and communicate their evaluations in written or verbal form using different types of media	Summative for Theory and Practical Based Assessment	K/U/A	

		Students will be able to… • Collect, clean, and manipulate data using tools such as Excel, Google Sheets, R, or Python • Analyze data using statistical techniques and create visualizations to communicate their findings • Understand the connection of databases to machine learning • (Advanced) Understand how evidence was collected, what the perspective or bias of the creator might be and look behind the scenes to the process used to create the product. Even the way data are represented embeds within it decisions on the part of the data creator			
E: Applications of Computer Science	**[SLO CS-11-E-01]**	Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain Students will understand… • Advancement in technologies like smaller size, higher processing power, longer battery power, AI techniques, cloud computing, and connectivity have enabled IoT applications • Network connectivity, Processing power, and Cryptography are technologies that enable blockchains Students will be able to… • Analyze technologies that have enabled IoT and blockchain applications	Summative for Theory	K/U	**15**
	[SLO CS-11-E-02]	Students should be able to evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs Students will understand… • That there are different stakeholders that have vested interest in the outcomes of an AI algorithm • These different stakeholders might have conflicting requirements for these algorithms Students will be able to…	Summative for Theory	K/U	

		• Explore some of the stakeholders and describe their interest in AI algorithms • Assess policies that can help protect different stakeholders' interests • Evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs			
F: Impacts of Computing	**[SLO CS-11-F-01]**	Understand and apply safe & responsible use of information sources, identifying sources of reliable information compared to unreliable information and its sources Students will understand… • Safe & responsible use of information sources • Human bias is everywhere including data collection and information sharing Students will know… • The difference between data source verification tasks that should be completed by humans and those that are ideally completed by computing devices Students will be able to… • Identify sources of reliable and unreliable information • Address issues of bias in the designs of their computing applications • Conduct data searches to obtain reliable information	Summative for Theory	k/u	**15**
	[SLO CS-11-F-02]	Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity Students will understand… • The uses of assistive technologies for people with disabilities and the elderly • The impact of the digital divide on connectivity and how accessibility to information affects the lives of different people Students will know…	Summative for Theory	k/u	

		• The different technological innovations we are using to improve communication between people such as Wi-Fi networks, Bluetooth etc. Students will be able to… • Discuss the impact of computing technology on business and commerce • Collaborate on strategies to provide equity and equal access to information • (Advanced) Distinguish between impact of tasks that are ideally completed by humans and those that are ideally completed by computing devices			
G: Digital Literacy	**[SLO CS-11-G-01]**	Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations) Students will understand… • Definitions of data collection strategies (e.g. qualitative interviews, surveys, prototypes, simulations) • Best practices on how to present primary & secondary data for a research question • How to design data-collection approach to gather original data Students will know… • How to use appropriate data collection strategies for various types of research questions Students will be able to… • Design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations) • Present data using appropriate digital tools (such as graphs or infographics in worksheets, presentations, reports etc.)	Summative for Theory and Practical Based Assessment		**10**
H:	**[SLO EN-11-H-01]**	Students will create, test, and iterate a prototype for a business idea	Summative for Theory and	K/U/A	**10**

Entrepreneurship in the digital age		Students will understand… • What is prototyping and why is it important • How to design and test a prototype Students will be able to… • Design, build and test the prototype • Derive learnings from prototype testing • Iterate business solution based on prototype test results	Practical Based Assessment		