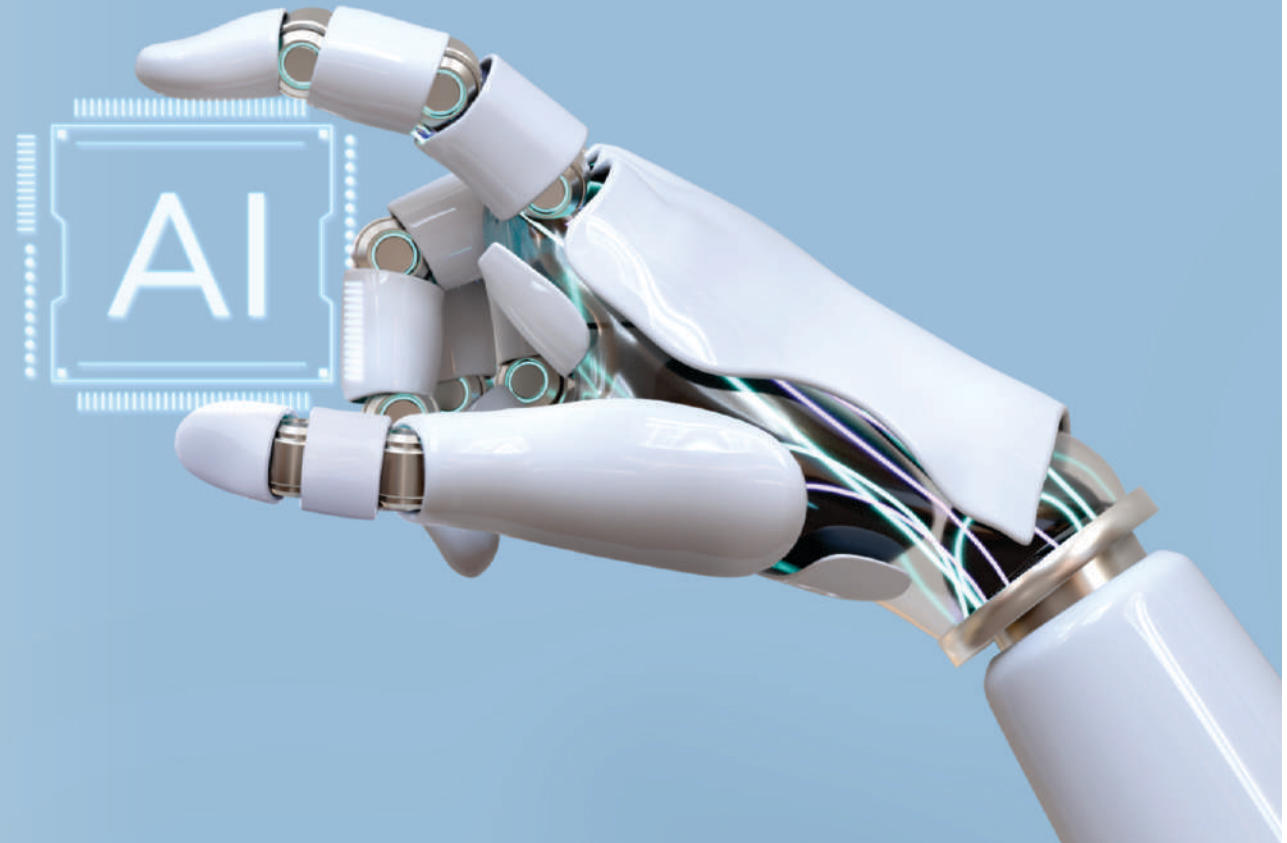


NATIONAL CURRICULUM OF PAKISTAN 2026

# ARTIFICIAL INTELLIGENCE AND ROBOTICS

GRADE I–XII



**NATIONAL CURRICULUM COUNCIL WING**  
*Ministry of Federal Education &  
Professional Training, Islamabad  
Government of Pakistan.*

# MESSAGE FROM FEDERAL SECRETARY MOFE&PT



MR. NADEEM MAHBUB  
Federal Secretary  
Ministry of Federal Education and Professional Training

With a firm resolve to strengthen quality education and promote holistic student development, we are pleased to present the Artificial Intelligence & Robotics Curriculum for Grades I–XII. This curriculum aims to acquaint students with emerging trends in Artificial Intelligence and Robotics and their relevance to everyday life. It provides a clear roadmap for educators, students, and parents, reflecting our shared vision of nurturing critical thinking, creativity, inclusivity, and a lifelong passion for learning.

The curriculum has been carefully developed through extensive stakeholder consultation to ensure a balanced and inclusive approach. It equips learners with the skills, knowledge, and values required to thrive in a rapidly evolving global landscape. Through the integration of technology, innovative pedagogical practices, and co-curricular opportunities, it supports the intellectual, emotional, social, and physical development of students.

We sincerely acknowledge the dedication and contributions of the experts, educators, and administrators involved in this effort. Their collective commitment has resulted in a curriculum that meets academic standards while inspiring learners to achieve their full potential.

We remain committed to continuous improvement and responsiveness to emerging educational needs. Together, let us shape classrooms today to build a stronger Pakistan tomorrow, enabling our youth to stand with confidence and competence in the comity of nations.

May the Almighty guide us in this noble endeavor.

## Acknowledgement

The integration of Artificial Intelligence (AI) and Robotics into the national education system represents a strategic step towards preparing Pakistan's learners for the demands of a rapidly evolving digital and technological landscape. In this context, the National Curriculum Council (NCC) Wing MoFE&PT has finalized the Artificial Intelligence (AI) and Robotics Curriculum, aimed at developing students' skills/competencies in computational thinking, automation, intelligent systems, robotics design, ethical and responsible use of technology, and real-world problem solving through a structured, progressive, and application-oriented learning pathways aligned with national priorities and international best practices.

The National Curriculum Council Wing, places on record its special appreciation for the sustained leadership, technical guidance, and intellectual contribution of Dr. Rehan Tanoli, CEO, Media Tiz Foundation, whose vision and close collaboration with NCC played a pivotal role in the conceptualization, development, and practical orientation of the AI and Robotics Curriculum. The Ministry acknowledges the valuable expert inputs of Prof. Dr. Yasar Ayaz, Chairman/project Director, National Centre of Artificial Intelligence (NCAI), Pakistan, and School of Mechanical & Manufacturing Engineering, NUST, and Ms. Rozina Faheem, Principal, Institute of Art and Design, F-11, whose contributions enriched the curriculum through interdisciplinary perspectives; the curriculum will be disseminated to the relevant stakeholders to support orientation, capacity building, and phased implementation.

Dr. Tabassum Naz Director,  
National Curriculum Council wing  
Ministry of Federal Education and Professional Training  
Government of Pakistan

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# Artificial Intelligence & Robotics

## Grade I –XII

### INTRODUCTION

This curriculum provides a coherent and progressive framework for ICT, Artificial Intelligence, and Robotics from Grade I to Grade XII. It is designed to support the systematic development of digital literacy, computational thinking, and intelligent technology skills, beginning with foundational concepts in the early grades and advancing toward applied programming, data-driven reasoning, and intelligent systems at the secondary level. The curriculum emphasizes continuity, real-world relevance, ethical awareness, and learner readiness for higher education, emerging careers, and responsible participation in a technology-driven society.

### VISION

The curriculum envisions preparing all learners in Pakistan to become confident, responsible, and creative users of digital technologies, including Artificial Intelligence and Robotics. It aims to progressively develop learners' understanding from foundational digital literacy in the early grades to informed, analytical, and innovative application of intelligent systems by the end of higher secondary education enabling them to solve real-world problems, participate ethically in a digital society, and contribute positively to national and global development.

### RATIONALE

Digital technologies and intelligent systems increasingly influence everyday life, education, and the future of work. Early exposure to ICT and age-appropriate AI concepts builds strong foundations in digital literacy, problem solving, and computational thinking, while reducing future learning barriers. A structured and continuous curriculum from primary through higher secondary levels ensures coherent progression from basic technology use to advanced understanding of AI, Machine Learning, and Robotics. This integrated approach supports relevance, innovation, ethical awareness, and readiness for higher education and emerging careers, while positioning technology as a practical tool for learning across disciplines and real-life contexts.

### AIMS

By the end of Grade XII, learners will be able to:

- Use digital tools confidently to create, communicate, analyze information, and solve problems across academic and real-life contexts.

- Apply computational thinking and programming skills, progressing from block-based environments to text-based languages, to design logical and efficient solutions.
- Understand core concepts of Artificial Intelligence, Machine Learning, and Robotics, including how intelligent systems sense, learn, decide, and act.
- Analyze and evaluate real-world applications of AI and Robotics across multiple sectors and contexts.
- Demonstrate ethical awareness, responsible digital citizenship, and informed decision-making related to data privacy, safety, bias, and technology use.
- Identify academic pathways, skill sets, and career opportunities related to ICT, AI, Robotics, and emerging technologies.

## PEDAGOGY AND LEARNING APPROACH

The curriculum adopts a progressive, learner-centered pedagogy that supports the continuous development of digital literacy, computational thinking, and intelligent technology skills from primary through higher secondary education. Learning begins with exploratory, activity-based experiences that encourage curiosity and foundational understanding, and gradually advances toward structured application, analytical thinking, and independent inquiry.

Teaching and learning emphasize hands-on engagement through projects, simulations, programming, and problem-solving tasks that connect concepts to real-world contexts. Instruction evolves from guided discovery and creation in the early grades to text-based programming, data-driven analysis, and system-level understanding in the secondary grades. Collaborative learning, reflection, documentation, and presentation of work are integral components throughout the curriculum.

Ethical awareness, digital safety, inclusivity, and responsible use of technology are embedded across all grade levels and learning activities. Assessment-informed pedagogy, supported by continuous formative feedback and appropriate summative evaluation, guides instructional decisions and supports learner progression. This approach prepares students for higher education, emerging careers, and responsible participation in a technology-driven society.

## PROGRESSION GRID (Grade I– V)

<b>Domain A: ICT Fundamentals</b>				
Grade I	Grade II	Grade III	Grade IV	Grade V
<p><b>Standard:</b> Student will understand the foundation in technology through application of fundamental concepts of computer systems, digital technologies, data handling, sequencing and use of AI to analyze patterns using real world examples.</p>				
<p><b>Benchmark:</b> Students will be able to identify core computer components and their functions, recognize the role of technology in daily life.</p>			<p><b>Benchmark:</b> Students will be able to analyze the use of latest devices.</p>	
<b>Student Learning Outcomes</b>				
<p>[SLO: AI-01-A-01]: Recognize and name basic ICT devices (e.g., input, processing and output) and their functions.</p>	<p>[SLO: AI-02-A-01]: Recognize and name ICT devices (e.g., storage, and communication) and their functions.</p>	<p>[SLO: AI-03-A-01]: Use of basic peripheral computer devices like keyboard, mouse, display screen, printer etc.</p>	<p>[SLO: AI-04-A-01]: Use of peripheral computer devices like scanner, camera, flash disk etc.</p>	<p>[SLO: AI-05-A-01]: Recognize and name smart devices and their functions in daily life.</p>
<p>[SLO: AI-01-A-02]: Learn how to turn on and off a computer, open and close programs.</p>	<p>[SLO: AI-02-A-02]: Navigate simple software interfaces, such as educational games and learning applications.</p>		<p>[SLO: AI-04-A-02]: Demonstrate basic troubleshooting skills for common ICT devices.</p>	

Domain B: Applied Digital Skills				
Grade I	Grade II	Grade III	Grade IV	Grade V
<b>Standard:</b> Students will use digital tools to create multimedia content, develop foundational keyboarding skills, organize and represent data digitally.				
<b>Benchmark:</b> Students will be able to utilize digital tools proficiently to create projects; demonstrate structured keyboarding skills.			<b>Benchmark:</b> Students will be able to analyze and organize data and convey information clearly by presenting findings through visual representations using digital tools.	
Student Learning Outcomes				
<b>[SLO: AI-01-B-01]:</b> Begin developing typing skills using age-appropriate typing programs to familiarize students with the keyboard layout and basic typing techniques.	<b>[SLO: AI -02-B-01]:</b> Introduce proper finger placement and basic typing exercises.	<b>[SLO: AI -03-B-01]:</b> Improve typing speed and accuracy, with a focus on proper finger placement and touch-typing techniques. Regular practice using typing programs can help solidify these skills.	<b>[SLO: AI -04-B-01]:</b> Use search engines and other online resources to find information (voice, OCR etc.) for class projects. Emphasize the importance of evaluating the credibility of sources and citing information correctly. Conduct advanced online research, critically evaluate the credibility of sources, and properly cite information.	<b>[SLO: AI -05-B-01]:</b> Use of spreadsheet that includes understanding of basic functions and tools. Understand basic terminologies like data, information, and data analysis concepts, such as organizing data in spreadsheets, creating graphs and charts. Interpret and analyze data using simple data collection projects.

<p>[SLO: AI -01-B-02]: Use drawing tools to create any multimedia content like Canva.</p>	<p>[SLO: AI -02-B-02]: Use common software applications, such as any text editor and educational games.</p>	<p>[SLO: AI -03-B-02]: Use common software such as word processors like MS-Word, Google Docs. This includes understanding more complex functions like saving and retrieving files.</p>	<p>[SLO: AI -04-B-02]: Use of multimedia tools to create digital content. Students can learn to combine text, images, and sound to create simple presentations or digital stories, fostering creativity and communication skills.</p>	<p>[SLO: AI -05-B-02]: Use of collaborative digital projects like group presentations, digital storytelling, or simple research projects (including animations/ simple videos that integrate text, images, audio, and effects).</p>
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Domain C: Problem Solving and Programming Fundamentals				
Grade I	Grade II	Grade III	Grade IV	Grade V
<p><b>Standard:</b> Students will apply computational thinking and block-based programming to design animations, stories, and interactive projects by using visual, motion, sound, and logic blocks; debugging their work; and understanding how block-based concepts connect to text-based coding.</p>				
<p><b>Benchmark I:</b> Students will be able to understand sequences, apply logical reasoning to solve programming challenges, develop functional projects using block-based platforms and evaluate the operation of real-world smart systems.</p> <p><b>Benchmark II:</b> Students will be able to design and code simple animations, stories, and interactive projects using block-based tools by combining visual, motion, and sound blocks; applying loops, events, and conditions and presenting their creative digital creations to others.</p>			<p><b>Benchmark I:</b> Students will be able to define problems, break them into sub-problems, and apply logic blocks such as loops, conditionals, variables, and events to create and present interactive projects based on real life. while understanding how these concepts relate to basic text-based code.</p> <p><b>Benchmark II:</b> Students will be able to design interactive digital projects such as games, quizzes, or smart system models using multiple logic blocks, evaluate their work for creativity and usability, and use different coding platforms to view and manage their projects in both block-based and text-mode environments.</p>	
<p><b>Student learning outcomes</b></p>				

[SLO: AI -01-C-01]: Identify, define, and analyze a problem.	[SLO: AI -02-C-01]: Use visual programming tools like Scratch/ Code.org/ Blockly or any other to solve basic programming logic, sequencing, and problem-solving in an interactive and playful manner.	[SLO: AI -03-C-01]: Create an interesting story using visual, motion and sound blocks.	[SLO: AI -04-C-01]: Create simple programs that incorporate variables conditionals, loops, and events in block-based coding platforms (e.g. Scratch etc.,). Perform problem solving and logical thinking through coding activities.	[SLO: AI -05-C-01]: Design interactive projects such as games or quizzes that respond to player actions.
[SLO: AI -01-C-02]: Solve simple daily life problems.	[SLO: AI -02-C-02]: Combine visual, motion, and sound blocks to create an interactive experience (e.g. ScratchJr, Blockly etc.).	[SLO: AI -03-C-02]: Use block-based coding to build scenes and script dialogue in small projects.	[SLO: AI -04-C-02]: Apply multiple logic blocks to control interactive projects.	[SLO: AI -05-C-02]: Recognize that block-based coding can be translated into text-based code such as Python.
		[SLO: AI -03-C-03]: Apply loops, events, and conditions in story creation (e.g. ScratchJr, Blockly etc.).		[SLO: AI -05-C-03]: Use of text-based coding environments such as Python to create simple programs emphasizing problem-solving and logical thinking.
		[SLO: AI -03-C-04]: Debug and improve own work		[SLO: AI -05-C-04]: Use different platforms to view code in both block and text modes (e.g. Microbit, MakeCode, Edublocks etc)

## Domain D: Introduction to AI & Robotics

Grade I	Grade II	Grade III	Grade IV	Grade V
<p><b>Standard:</b> Build knowledge of AI, robotics and smart systems and leverage creative problem-solving to design technology-driven solutions for real-world problems.</p>				
<p><b>Benchmark I:</b> Students will be able to differentiate robots from non-programmable toys, understand that robots follow programmed instructions, and use directional logic, loops, and simple path-following commands to control physical or virtual robots.</p> <p><b>Benchmark II:</b> Students will be able to recognize how AI learns patterns from data, interact with basic AI models, understand how sensors help machines make decisions, identify AI-powered devices in daily life, and simulate simple AI-based activities such as sorting, recognition, or voice response.</p>			<p><b>Benchmark I:</b> Students will be able to recognize how smart systems and AI use sensors, automation, and data to make decisions, explore real-world applications, test basic AI models with real inputs, simulate smart devices using block-based coding or virtual hardware, and reflect on AI accuracy, benefits, and limitations.</p> <p><b>Benchmark II:</b> Students will be able to apply coding, AI logic, and data understanding to design and integrate sensors, logic, or training models in meaningful projects, proposing creative smart solutions to real-world problems using AI or simulated systems.</p>	
<h3>Student Learning Outcomes</h3>				
[SLO: AI -01-D-01]: Understand basic concepts, simple examples and uses of Artificial Intelligence (AI) in everyday life.	[SLO: AI -02-D-01]: Understand relationship between AI and Robotics.	[SLO: AI -03-D-01]: Recognize that AI learns patterns from data, introducing them to the basics of machine learning.	[SLO: AI -04-D-01]: Recognize that smart systems use sensors and automation to make decisions.	[SLO: AI -05-D-01]: Explain that AI uses data to learn patterns, for introducing machine learning concepts.
[SLO: AI -01-D-02]: Differentiate between robots and non-programmable toys.	[SLO: AI -02-D-02]: Use of AI tools to solve simple problems or puzzles.	[SLO: AI -03-D-02]: Test a basic AI model using visual tools e.g. Teachable Machine or any other available)	[SLO: AI -04-D-02]: Simulate smart systems using block-based logic.	[SLO: AI -05-D-02]: Test a basic AI model using real images or sounds (e.g. Machine Learning for kids, cognates etc.)
[SLO: AI -01-D-03]: Understand that robots follow instructions to perform actions.	[SLO: AI -02-D-03]: Apply directional logic to move a robot physically or virtually.	[SLO: AI -03-D-03]: Differentiate between rule-based coding and learning-based AI behavior.	[SLO: AI -04-D-03]: Prepare simplified hardware project or simulate one (e.g.	[SLO: AI -05-D-03]: Reflect on AI accuracy Keeping in view importance of good training data.

			TinkerCad, Proteus, Fritzing).	
[SLO: AI -01-D-04]: Understand that AI enables some machines to see, hear, and recognize objects.	[SLO: AI -02-D-04]: know that machines use sensors to make decisions.	[SLO: AI -03-D-04]: Recognize common AI-powered devices in daily life.	[SLO AI -04-D-04]: Explore real-world applications of AI in homes, cities, and education.	[SLO: AI -05-D-04]: Recognize that sensors provide input and actuators provide output in smart systems.
	[SLO: AI -02-D-05]: Simulate an AI-based activity (e.g., sorting or reacting to voice).		[SLO: AI -04-D-05]: Use AI models that classify, predict, or react to input data.	[SLO: AI -05-D-05]: Simulate simple smart device behavior using block coding or virtual hardware (e.g. TinkerCad, Proteus, Fritzing).
	[SLO: AI -02-D-06]: Interact with a simple AI model to understand the concept of recognition (Voice, images etc.).		[SLO: AI -04-D-06]: Discuss benefits and limitations of AI in decision-making.	[SLO: AI -05-D-06]: Explain that real-world systems automate decisions using inputs.
			[SLO: AI -04-D-07]: Apply coding, AI logic, and data understanding to create a meaningful tech solution.	[SLO: AI -05-D-07]: Propose a creative smart solution to a real-world problem using AI or code.
				[SLO: AI -05-D-08]: Integrate sensors, logic, or training models in a simulated or coded system.



Domain E: Digital Safety				
Grade I	Grade II	Grade III	Grade IV	Grade V
<b>Standard:</b> Develop responsible digital citizenship by understanding online safety, protecting data privacy, and practicing the ethical use of technology.				
<b>Benchmark I:</b> Students will be able to demonstrate safe and responsible online behavior by recognizing safe and unsafe interactions, practicing respectful digital communication, understanding basic privacy concepts, and protecting their personal information in digital environments.			<b>Benchmark II:</b> Students will be able to apply ethical reasoning when designing or using smart systems and demonstrate responsible and appropriate use of AI-powered tools in digital research.	
Student Learning Outcomes				
<b>[SLO: AI -01-E-01]:</b> Understand basic concepts of e-safety, such as not sharing personal information online, recognizing trusted websites, and asking for help from a trusted adult when needed.	<b>[SLO: AI -02-E-01]:</b> Recognize respectful online communication and responsible digital interaction.	<b>[SLO: AI -03-E-01]:</b> Recognize and avoid online scams, understand privacy settings (password, firewall etc.) and concepts of cyberbullying.	<b>[SLO: AI -04-E-01]:</b> Understand principles of safe and responsible internet use. Recognize appropriate online behavior and concept of a digital footprint.	<b>[SLO: AI -05-E-01]:</b> Encourage students to think critically about their digital footprint and online interactions.
<b>[SLO: AI -01-E-02]:</b> Acknowledge safe and unsafe online behavior through interactive experiences.	<b>[SLO: AI -02-E-02]:</b> Demonstrate knowledge of personal information and understand the importance of Privacy.	<b>[SLO: AI -03-E-02]:</b> Understand digital citizenship, online ethical behavior, use of copyright.	<b>[SLO: AI -04-E-02]:</b> Apply ethical reasoning when designing or using smart systems to ensure responsible digital behavior.	<b>[SLO: AI -05-E-02]:</b> Use AI-powered tools appropriate use in digital research (e.g., ChatGPT, DeepSeek). Encourage students to think critically about their digital footprint and online interactions.

## PROGRESSION GRID (Grade VI–XII)

Domain A: Fundamentals of AI & Robotics						
GRADE VI	GRADE VII	GRADE VIII	GRADE IX	GRADE X	GRADE XI	GRADE XII
<p><b>Standard:</b> Students will understand the fundamental concepts of Artificial Intelligence, Machine learning, and Robotics, including system components, algorithms, and data processing; differentiate between AI and ML; analyze AI-driven decision-making and autonomous robotic applications across industries; and explore real-world applications, ethical considerations, and societal impact.</p>						
<p><b>Benchmark I:</b> Students will be able to correctly explain AI and robotics concepts, differentiate AI from ML, analyze AI decision-making, apply algorithms, and describe real-world applications</p>			<p><b>Benchmark II:</b> Students will be able to recognize the importance of data in powering AI systems, explain how the Three Laws of Robotics guide ethical robot behavior and recognize how sensors, kinematics, and machine learning enhance robotics capabilities.</p> <p><b>Benchmark III:</b> Students will be able to analyze the AI learning process through the Sense-Think-Act model, evaluate the role of AI in enabling autonomous robotics, analyze AI-driven robotics applications across industries, apply AI to understand environments</p>			
Students Learning Outcomes						
[SLO: AI -06-A-01]: Describe the basic concepts of AI & Robotics.	[SLO: AI -07-A-01]: Explain role and components of AI systems.	[SLO: AI -08-A-01]: Differentiate between AI and Machine Learning.	[SLO: AI -09-A-01]: Evaluate the role of AI in enabling autonomous robotics.		[SLO: AI -11-A-01]: Analyze the ways AI transforms industries and modern systems.	
[SLO: AI -06-A-02]: Discuss real-world applications of AI & Robotics.	[SLO: AI -07-A-02]: Explore data collection and processing in AI.	[SLO: AI -08-A-02]: Explain ML concepts and their working principles.	[SLO: AI -09-A-02]: Analyze the AI learning process through the Sense-Think-Act model.		[SLO: AI -11-A-02]: Explain the importance of data in powering AI systems.	

[SLO: AI -06-A-03]: Analyze and discuss the evolution and significance of AI & Robotics.	[SLO: AI -07-A-03]: Apply algorithms to solve problems.	[SLO: AI -08-A-03]: Analyze different types of ML models.	[SLO: AI -09-A-03]: Apply AI to understand environments.		[SLO: AI -11-A-03]: Recognize the role of Machine Learning in enhancing robotics capabilities.	
	[SLO: AI -07-A-04]: Analyze AI-driven decision-making processes.		[SLO: AI -09-A-04]: Analyze AI-driven robotics applications across industries.		[SLO: AI -11-A-04]: Recognize that different robotics applications are enhanced by sensors and kinematics.	
					[SLO: AI -11-A-05]: Evaluate the application of the Three Laws of Robotics in guiding robotic behavior.	

## Domain B: Practical Applications of AI & Robotics

GRADE VI	GRADE VII	GRADE VIII	GRADE IX	GRADE X	GRADE XI	GRADE XII
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**Standard:**  
 Students will analyze how Artificial Intelligence and Robotics enhance efficiency and daily life by examining robot components, sensors, controllers, locomotion, and power systems; evaluating control methods and AI learning algorithms; and exploring smart home technologies and their real-world applications.

**Benchmark I:**  
 Students will be able to analyze how AI and robotics enhance processes and efficiency in various sectors, identify the roles of robots in everyday tasks, recognize key components such as sensors, motors, and controllers, and evaluate how sensors and power sources support robot functionality and mobility.

**Benchmark II:**  
 Students will be able to explain how AI enables intelligent robot operation, analyze how sensors support navigation and interaction, differentiate types of robot locomotion, and evaluate various control methods for autonomous robots.

**Benchmark III:**  
 Students will be able to discuss the role of AI and automation in smart home environments, evaluate the impact of devices on daily living, explain how AI learning algorithms enhance smart home technologies, assess smart home security solutions, and predict future trends in smart home innovations.

### Students Learning Outcomes

[SLO: AI -06-B-01]: Analyze the ways AI and Robotics improve processes and efficiency in various sectors.	[SLO: AI -07-B-01]: Identify examples of robots assisting with everyday tasks.	[SLO: AI -08-B-01]: Explain the role of AI in enabling robots to operate intelligently.	[SLO: AI -09-B-01]: Discuss the role of AI and automation in smart home environments.			
	[SLO: AI -07-B-02]: Acknowledge components of robots such as	[SLO: AI -08-B-02]: Discuss that sensors assist robots with	[SLO: AI -09-B-02]: Discuss usage of devices and their			

	sensors, motors, and controllers.	navigation and interaction.	impact on daily living.			
	[SLO: AI -07-B-03]: Recognize that sensors enable robots to perceive their surroundings.	[SLO: AI -08-B-03]: Differentiate between various types of robotic locomotion.	[SLO: AI -09-B-03]: Explain how AI learning algorithms improve, smart home technologies.			
	[SLO: AI -07-B-04]: Evaluate the ways power sources support robot mobility and function.	[SLO: AI -08-B-04]: Evaluate different control methods for autonomous robots.	[SLO: AI -09-B-04]: Evaluate smart home security technologies.			
			[SLO: AI -09-B-05]: Predict future trends in smart home innovations based on emerging			

## Domain C: Programming & Logical Thinking

GRADE VI	GRADE VII	GRADE VIII	GRADE IX	GRADE X	GRADE XI	GRADE XII
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**Standard:**

Students will understand and apply core Python programming concepts including syntax, control structures, data collections, functions, modules, loops, and object-oriented programming to develop efficient and structured programs, process and visualize data, and implement basic machine learning models using Python libraries for real-world applications.

**Benchmark I:**

Students will be able to write and execute basic Python programs by applying core syntax, control structures, conditional statements, loops, and data collections (lists, dictionaries, tuples, arrays), as well as perform simple string manipulations to solve basic programming tasks.

**Benchmark II:**

Students will be able to write Python programs that correctly apply functions, modules, and fundamental programming concepts, perform basic mathematical operations on arrays, and load, clean, and visualize datasets using Python libraries (matplotlib, etc).

**Benchmark III:**

Students will be able to apply core Python programming concepts—including variables, control structures, operators, and object-oriented programming—to develop structured applications, and will correctly implement and evaluate classical and basic machine learning models using Python libraries.

### Students Learning Outcomes

[SLO: AI -06-C-01]: Understand the basic syntax and structure of Python programs.	[SLO: AI -07-C-01]: Apply conditional statements to control program flow and implement decision-making in Python programs.	[SLO: AI -08-C-01]: Use lists to store and manipulate collections of data (e.g. Dictionary, Tuple, Arrays etc.).	[SLO: AI -09-C-01]: Apply functions and modules in Python to create reusable, efficient code.	[SLO: AI -10-C-01]: Load, clean, and visualize datasets using Python libraries (e.g. Pandas, Matplotlib, Seaborn etc).	[SLO: AI -11-C-01]: Apply core programming concepts including variables, control structures, and operators in Python.	[SLO: AI -12-C-01]: Evaluate classical machine learning models like linear regression and decision trees using Python libraries (e.g. scikit-learn, SciPy etc.)
[SLO: AI -06-C-02]: Write simple Python programs to perform basic computational tasks.	[SLO: AI -07-C-02]: Apply loops to control program flow and perform repetitive tasks in Python programs.	[SLO: AI -08-C-02]: Perform basic string manipulations for text processing.	[SLO: AI -09-C-02]: Use fundamental Python programming concepts to build meaningful programs.	[SLO: AI -10-C-02]: Use fundamental Python programming and perform basic mathematical operations on these arrays (e.g. NumPy)	[SLO: AI -11-C-02]: Use Object-Oriented Programming concepts to develop structured Python applications.	[SLO: AI -12-C-02]: Implement basic machine learning models for Python libraries (e.g. TensorFlow, PyTorch).

## Domain D: Machine Learning & AI Algorithms

GRADE VI	GRADE VII	GRADE VIII	GRADE IX	GRADE X	GRADE XI	-GRADE XII
<p><b>Standard:</b> Students will understand core AI and Machine Learning concepts, differentiate between AI, ML, and Deep Learning, apply data preprocessing and ML models (regression, classification, clustering, neural networks, NLP), and implement Python-based solutions to analyze data and develop intelligent systems to solve real-world problems.</p>						
<p><b>Benchmark I:</b> Students will be able to recognize real-life applications of AI and Machine Learning, explain how AI learns from data to solve problems, and explore basic ML concepts such as classification and sorting through simple tasks.</p> <p><b>Benchmark II:</b> Students will be able to differentiate AI from Machine Learning, explain how ML algorithms learn from data, and discuss various types of Machine Learning models.</p>			<p><b>Benchmark III:</b> Students will be able to collect, clean, and preprocess data for AI analysis, perform exploratory data analysis to identify patterns, differentiate between supervised and unsupervised learning, and apply regression, classification, and clustering models to analyze and categorize data.</p> <p><b>Benchmark IV:</b> Students will be able to analyze ML vs. Deep Learning, neural networks, and computer vision, evaluate ML models, and understand the role and applications of Data Science, NLP, LLMs, and Agentic AI, applying Python for data analysis.</p>			
<h3 style="color: red;">Students Learning Outcomes</h3>						
<p>[SLO: AI -06-D-01]: Recognize real-life examples of AI and Machine Learning.</p>	<p>[SLO: AI-07-D-01]: Explain how AI learns from data to solve problems.</p>	<p>[SLO: AI-08-D-01]: Differentiate between AI and Machine Learning.</p>	<p>[SLO: AI-09-D-01]: Collect, clean and preprocess data to prepare it for AI analysis.</p>	<p>[SLO: AI-10-D-01]: Differentiate between supervised and unsupervised learning.</p>	<p>[SLO: AI-11-D-01]: Analyze differences between Machine Learning vs. Deep Learning.</p>	<p>[SLO: AI-12-D-01]: Analyze differences between computer vision and human vision (e.g. Open CV etc).</p>
<p>[SLO: AI -06-D-02]: Explore the way AI learns from</p>	<p>[SLO: AI-07-D-02]: Explore basic ML concepts like</p>	<p>[SLO: AI-08-D-02]: Acknowledge the ways Machine Learning</p>	<p>[SLO: AI-09-D-02]: Explain the significance of Exploratory Data</p>	<p>[SLO: AI-10-D-02]: Apply regression models to predict</p>	<p>[SLO: AI-11-D-02]: Explain neural networks and their</p>	<p>[SLO: AI-12-D-02]: Analyze the role of Data Science in AI and Robotics.</p>

data in basic tasks.	classification and sorting	algorithms learn from data.	Analysis in understanding data patterns. (e.g. seaborn, matplotlib).	continuous outcomes.	biological inspiration.	
-	-	[SLO: AI-08-D-03]: Discuss types of Machine Learning models.	-	[SLO: AI-10-D-03]: Apply classification models to categorize data.	[SLO: AI-11-D-03]: Differentiate between types of neural networks.	[SLO: AI-12-D-03]: Apply data analysis through Python (e.g. Pandas, Numpy, Matplotlib, seaborn etc).
-	-	-	-	[SLO: AI-10-D-04]: Use clustering models to group similar data (e.g. scikit-learn etc).	[SLO: AI-11-D-04]: Evaluate an ML model for real-world problems.	[SLO: AI-12-D-04]: Explain NLP, LLMs, and Agentic AI.
-	-	-	-	-	-	[SLO: AI-12-D-05]: Acknowledge applications of NLP, LLMs, and Agentic AI.
-	-	-	-	-	-	[SLO: AI-12-D-06]: Analyze the role of Agentic AI in intelligent systems.
-	-	-	-	-	-	[SLO: AI-12-D-07]: Design and develop a chatbot using machine learning models (e.g. nltk etc.).

## Domain E: Robotic Components & Advanced Robotics

GRADE VI	GRADE VII	GRADE VIII	GRADE IX	GRADE X	GRADE XI	GRADE XII
<p><b>Standard:</b> Students will understand the components, sensors, and control systems of robots, analyze their roles in daily life, extreme environments, and specialized applications, explain the Laws of Robotics and ethical considerations, evaluate AI and machine learning in enhancing robot intelligence, and apply knowledge of locomotion, kinematics, and autonomy to assess real-world and mission-driven robotic systems.</p>						
<p><b>Benchmark I:</b> Students will be able to identify and explain the basic parts of robots, including sensors and motors, describe their role in daily tasks and interactions, and analyze how sensors and power sources guide robot movement and functionality.</p> <p><b>Benchmark II:</b> Students will be able to explain how AI enhances robot intelligence, including the use of senses for navigation, analyze different types of robot locomotion, and discuss control methods such as autonomous operation.</p>			<p><b>Benchmark III:</b> Students will be able to explain the Laws of Robotics and ethical considerations, analyze challenges and modern adaptations, and evaluate robot components, including sensors, joints, and kinematics, for their role in movement and functionality.</p> <p><b>Benchmark IV:</b> Students will be able to analyze autonomous and collaborative robots, their components and functionality in extreme environments, and evaluate AI and ML applications in enhancing robotic intelligence and real-world tasks.</p>			
<b>Students Learning Outcomes</b>						
<p>[SLO: AI-06-E-01]: Understand basic parts of robots used in daily life.</p>	<p>[SLO: AI-07-E-01]: Discuss robots' role in assisting daily tasks.</p>	<p>[SLO: AI-08-E-01]: Discuss the role of AI in making robots smarter.</p>	<p>[SLO: AI-09-E-01]: Explain the Laws of Robotics and their purpose.</p>	<p>[SLO: AI-10-E-01]: Analyze the role of kinematics, joints, and sensors.</p>	<p>[SLO: AI-11-E-01]: Analyze autonomous robotics using advanced algorithms.</p>	<p>[SLO: AI-12-E-01]: Explain the components of robots for extreme environments.</p>
<p>[SLO: AI-06-E-02]: Explain how sensors help robots interact with their environment.</p>	<p>[SLO: AI-07-E-02]: Explain the key components like sensors and motors.</p>	<p>[SLO: AI-08-E-02]: Explain AI use of senses for navigation.</p>	<p>[SLO: AI-09-E-02]: Explain the Three Laws of Robotics with examples.</p>	<p>[SLO: AI-10-E-02]: Discuss types of robotic joints and their functions.</p>	<p>[SLO: AI-11-E-02]: Explain collaborative robotics and swarm robotics.</p>	<p>[SLO: AI-12-E-02]: Discuss robot movement in harsh conditions.</p>

	[SLO: AI-07-E-03]: Explain the role of sensors in guiding robot interaction.	[SLO: AI-08-E-03]: Discuss the types of robot locomotion.	[SLO: I09-E-03]: Discuss challenges in applying robotics laws.	[SLO: AI-10-E-03]: Illustrate sensor use in robotic movement.	[SLO: AI-11-E-03]: Discuss mission driven robots and their impact.	[SLO: AI-12-E-03]: Analyze the ability of robots to explore inaccessible areas.
-	[SLO: AI-07-E-04]: Explain robot movement and power sources.	[SLO: AI-08-E-04]: Discuss robot control methods like autonomy.	[SLO: AI-09-E-04]: Discuss adaptations of laws in modern robots.	[SLO: AI-10-E-04]: Understand real-world robots using their components.	[SLO: AI-11-E-04]: Recognize computer vision and robotic arms applications.	[SLO: AI-12-E-04]: Illustrate AI-driven autonomy in robotic systems
-	-	-	[SLO: AI-09-E-05]: Recognize ethical considerations in robot programming.	[SLO: AI-10-E-05]: Explore emerging trends such as soft robotics	[SLO: AI-11-E-05]: Analyze bio-inspired and healthcare robotics.	[SLO: AI-12-E-05]: Evaluate robots' role in disaster response.
-	-	-	-	-	-	[SLO: AI-12-E-06]: Evaluate ML's role in improving robotic intelligence.

## Domain F: Ethics, Laws & Careers in AI & Robotics

GRADE VI	GRADE VII	GRADE VIII	GRADE IX	GRADE X	GRADE XI	GRADE XII
<p><b>Standard:</b> Students will understand the importance of ethics and ethical guidelines in AI and Robotics, analyze ethical challenges such as bias, privacy, and safety, and explore career pathways aligned with industry needs and ethical responsibilities.</p>						
			<p><b>Benchmark:</b> Students will be able to understand ethical guidelines governing AI and Robotics, evaluate legal responsibilities in technology deployment, investigate ethical challenges in real-world scenarios and explore diverse career opportunities within the AI and Robotics fields.</p>			
Students Learning Outcomes						
-	-	-	[SLO: AI-10-F-01]: Explain the importance of ethical practices in AI and Robotics.	-	[SLO: AI-12-F-01]: Analyze real-world ethical dilemmas and propose solutions.	[SLO: AI-10-F-01]: Explain the importance of ethical practices in AI and Robotics.
-	-	-	[SLO: AI-10-F-02]: Explain the need for ethical guidelines in AI and Robotics.	-	[SLO: AI-12-F-02]: Explore specific career/ pathways in AI & Robotics.	[SLO: AI-10-F-02]: Explain the need for ethical guidelines in AI and Robotics.
-	-	-	[SLO: AI-10-F-03]: Discuss ethical challenges such as bias, privacy, and safety.	-	[SLO: AI-12-F-03]: Identify required skills related to industry demands and ethical considerations.	[SLO: AI-10-F-03]: Discuss ethical challenges such as bias, privacy, and safety.
-	-	-	[SLO: AI-10-F-04]: Identify specific job roles that use AI and robotics technologies.	-	-	[SLO: AI-10-F-04]: Identify specific job roles that use AI and robotics technologies.

## DIGITAL LEARNING -COMPETENCIES, SAFETY, AND IMPLEMENTATION

**Overview:** This curriculum develops learners’ digital competencies progressively from Grades 1–XII, integrating computational thinking, AI literacy, digital project design, and responsible technology use. Learning is guided by ethical, inclusive, and real-world principles to prepare students for lifelong learning and future-ready skills.

**Expected Competencies:** By the end of Grade XII, learners will be able to:

- **Digital Literacy:** Evaluate, integrate, and operate devices, software, and platforms in diverse contexts; troubleshoot technical issues and optimize workflows.
- **Project Design and Data Analysis:** Design and present multimedia projects and data-driven solutions; analyze complex datasets using spreadsheets, databases, and visualization tools.
- **Computational Thinking and Programming:** Decompose complex problems, design efficient algorithms with nested loops, recursion, and conditional logic; develop, test, and debug modular programs using block-based and text-based languages.
- **Artificial Intelligence:** Explain, implement, and evaluate AI and machine learning models; interpret predictions, assess limitations, and identify biases.
- **Digital Citizenship and Ethics:** Demonstrate responsible and ethical use of technology; protect data and privacy; critically assess societal, legal, and ethical implications of digital solutions.
- **Innovation and Problem Solving:** Integrate technology, data, and computational thinking to create solutions for complex, real-world challenges.

### Progression by Grade Bands

- **Grades 1–V:** Basic device operation, simple multimedia projects, introductory computational thinking, safe online behaviour, and awareness of AI concepts.
- **Grades VI–VIII:** Expanded device use, intermediate multimedia and spreadsheet projects, guided programming, AI exploration, and ethical online practices.
- **Grades IX–X:** Independent operation of advanced tools, complex projects, modular programming, AI evaluation, and advanced digital citizenship.
- **Grades XI –XII:** Mastery of interdisciplinary digital projects, advanced AI applications, sophisticated computational thinking, ethical decision-making, and innovation in real-world problem solving.

### Safety, Ethics, and Equity

- Digital safety, privacy, ethics, and equity are embedded across all grades.
- Early grades focus on protecting personal information, identifying trusted adults, and practicing responsible online behaviour.
- Higher grades emphasize critical evaluation of digital content, understanding AI limitations, recognizing misinformation, and exploring fairness, bias, inclusivity, and ethical technology use.

## Teacher Support and Resources

- Provide grade-wise lesson sequences, activity guides, and recommendations for low-cost, accessible hardware and software.
- Offer professional development covering device operation, block-based and text-based programming, simple AI demos, classroom management for digital projects, and online safety facilitation.
- Encourage offline, low-bandwidth, and locally available resources where internet access is limited.
- Share assessment tools, exemplar work, and strategies for differentiated instruction.
- Foster collaborative teacher communities for sharing best practices, troubleshooting, and continuous professional growth.

## Implementation Guidance

- **Time Allocation:** 2–3 periods per week for Grades VI–VIII; at least 2 theory and 2 lab periods per week for Grades IX–XII, with flexibility for hands-on projects.
- **Progressive Learning:** Begin with awareness and exploration (Grades VI–VIII), structured application (Grades IX–X), and advanced project- and data-driven learning (Grades XI–XII).
- **Cross-Curricular Integration:** Connect technology learning to other subjects, such as science, mathematics, and language arts, to enhance relevance and application.
- **Project-Based Learning:** Gradually increase hands-on and applied projects, enabling learners to solve real-world problems using AI, programming, and robotics.

## Guiding Principles

- **Progression and Coherence:** Learning sequenced from exploration to innovation.
- **Learner-Centered:** Encourages active participation, inquiry, collaboration, and critical thinking.
- **Conceptual Understanding with Application:** Builds strong foundations for real-world use.
- **Inclusive and Age-Appropriate Design:** Ensures equity, accessibility, and participation for all learners.
- **Ethical and Responsible Use:** Digital safety, privacy, and ethical AI embedded throughout.
- **Real-World Relevance and Future Readiness:** Prepares learners for higher education, careers, and lifelong learning in a technology-driven world.

## ASSESSMENT AND EVIDENCE OF LEARNING

Assessment is a continuous and integral process for evaluating learners' understanding, skills, application, and ethical awareness in ICT, Artificial Intelligence, and Robotics. It supports learning through formative feedback and measures achievement of curriculum outcomes through summative evaluation.

In **Grades I –V**, assessment emphasizes observation, hands-on activities, simple projects, portfolios, and teacher feedback to document development of digital literacy, computational thinking, creativity, and safe technology use.

In **Grades VI –VIII**, assessment combines formative and structured approaches, including quizzes, practical assignments, simulations, group projects, and reflections, with equal emphasis on conceptual understanding, problem solving, and responsible use of technology.

In **Grades IX–XII**, assessment focuses on depth of understanding, application, and analysis through written examinations, practical programming tasks, laboratory work, data analysis, and project-based learning. Learners demonstrate competence through text-based programming, AI and machine learning applications, robotics tasks, case studies, and ethical analyses addressing issues such as data privacy, bias, safety, and societal impact.

## DOMAIN-WISE WEIGHTAGES AND TIME DISTRIBUTION

The following tables present the weightages and time allocation for specified domains across all grades. They serve as a guide to ensure effective planning, teaching, and assessment.

- **For Teachers and Education Planners:** The information helps in developing assessment and evaluation strategies, planning lessons, and scheduling both theory and practical sessions.
- **For Textbook Writers:** These tables guide the allocation of content, ensuring that each topic receives appropriate emphasis according to its weightage.
- **Teaching Schedules:** Theory and practical periods are integral to classroom management and curriculum delivery. While the suggested time may be adjusted based on local circumstances, it is advisable not to deviate significantly from the recommended allocation. For example, 3 periods per week over 10 months results in approximately 120 periods per year ( $3 \times 4 \times 10 = 120$ ).

This integrated approach ensures coherence between domain weightages, instructional time, and theory-practical balance, supporting effective learning and curriculum implementation.

Item	Formula Used
Domain Total Periods	$(\text{Weightage} \div 100) \times 120$
Theory Periods	Allocated as per conceptual requirement

Practical Periods	Remaining periods emphasizing skill development
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### Grade I-V: Domain-wise Weightage and Time Distribution (120 Periods)

Domain	Domain Title	Suggested Weightage	Total Periods	Theory (40%)	Practical (60%)	Rationale
A	ICT Fundamentals	15%	18	7	11	Concept-heavy fundamentals require more theory
B	Applied Digital Skills	20%	24	9	15	Tool-based skills need extensive hands-on practice
C	Problem Solving & Programming Fundamentals	25%	30	12	18	Programming demands continuous lab practice
D	Introduction to AI & Robotics	25%	30	12	18	Balanced mix of AI concepts and activities
E	Digital Safety	15%	18	7	11	Awareness with application through activities
TOTAL		100%	120	47	73	40% Theory: 60% Practical

### Grades VI–VIII: Domain-wise Weightage and Time Distribution (120 Periods)

Domain	Domain Title	Suggested Weightage	Total Periods	Theory (40%)	Practical (60%)	Rationale
A	Fundamentals of AI & Robotics	20%	24	10	14	Introduces basic AI and robotics concepts, components, and foundational understanding.
B	Practical Applications of AI & Robotics	20%	24	9	15	Hands-on exploration of AI applications and simple robotics projects.
C	Programming & Logical Thinking	25%	30	12	18	Develops computational thinking, problem-solving, and introductory coding skills.

D	Machine Learning & AI Algorithms	15%	18	7	11	Introduces basic ML concepts and simple AI algorithms.
E	Robotic Components & Advanced Robotics	10%	12	5	7	Hands-on component understanding balanced with theory.
F	Ethics, Laws & Careers in AI & Robotics	10%	12	5	7	Awareness of ethics, privacy, and career opportunities in AI and robotics.
TOTAL		100%	120	48	72	40% Theory: 60% Practical

### Grades IX–X: Domain -wise Weightage and Time Distribution (140 Periods)

Domain	Domain Title	Suggested Weightage	Total Periods	Theory (35%)	Practical (65%)	Rationale
A	Fundamentals of AI & Robotics	10%	14	5	9	Reinforces foundational knowledge with brief theory and applied tasks.
B	Practical Applications of AI & Robotics	15%	21	7	14	Hands-on applications to consolidate skills.
C	Programming & Logical Thinking	25%	35	12	23	Focus on algorithmic thinking and coding practice.
D	Machine Learning & AI Algorithms	25%	35	12	23	Advanced ML topics require balanced theory and practice.
E	Robotic Components & Advanced Robotics	15%	21	8	13	Applied robotics and component integration.
F	Ethics, Laws & Careers in AI & Robotics	10%	14	6	8	Ethical and career awareness through discussion and tasks.
TOTAL		100%	140	50	90	35% Theory: 65% Practical

### Grades XI–XII: Domain-wise Weightage and Time Distribution (154 Periods)

Domain	Domain Title	Suggested Weightage	Total Periods	Theory (40%)	Practical (60%)	Rationale
A	Fundamentals of AI & Robotics	10%	16	6	10	Review and advanced context for AI & robotics foundations.
B	Practical Applications of AI & Robotics	15%	20	8	12	Applied projects, simulations, and real-world AI tasks.
C	Programming & Logical Thinking	25%	40	16	24	Advanced programming, algorithm design, and problem-solving.
D	Machine Learning & AI Algorithms	25%	40	16	24	Deep dive into ML techniques and algorithm implementation.
E	Robotic Components & Advanced Robotics	15%	18	6	12	Advanced robotics, system integration, and design projects.
F	Ethics, Laws & Careers in AI & Robotics	10%	20	8	12	Ethical AI, privacy, laws, and career guidance.
TOTAL		100%	154	60	94	40% Theory: 60% Practical

## THE TEXTBOOK

Revamping the education system requires the active involvement of multiple stakeholders. Schools must fulfill their institutional responsibilities, parents need to actively support their children’s learning, and teachers play a pivotal role in nurturing knowledge and skills. Among the various factors influencing education, print materials, particularly textbooks, remain central to delivering high-quality learning experiences at all levels. While numerous stakeholders contribute to a child’s overall development, the significance of textbooks as comprehensive reservoirs of knowledge cannot be overstated.

Textbook authors, therefore, bear a crucial responsibility in shaping young minds. An effective textbook is one that:

- Features content and presentation that are carefully structured and thoughtfully planned,
- Is authored by qualified and competent subject matter experts, and
- Is engaging, visually appealing, and capable of capturing the interest of both teachers and students.

Such textbooks have the potential to inspire curiosity, facilitate understanding, and enhance the overall teaching and learning experience.

## GUIDELINES FOR TEXTBOOK AUTHORS

Textbooks designed for lower levels generally incorporate a greater number of learning features compared to those intended for higher levels. Nevertheless, the following considerations are essential when developing textbooks:

- The textbook should align with the objectives of the National Curriculum.
- Authors must consistently adhere to established standards and benchmarks.
- The textbook should be visually appealing and capable of sustaining students' interest.
- The title page should be attractive and accurately reflect the content of the textbook.
- Illustrations and images should employ a colour scheme that is realistic and relatable.
- A detailed table of contents should be included to facilitate navigation.
- Text should be clear, concise, and easily comprehensible.
- Content should be well-spaced and organized; breaking material into smaller, labeled sections can enhance readability and comprehension.
- Authors should consider the cognitive and developmental level of the target students.
- The length and scope of the textbook should be reasonable and appropriate for the intended level.
- Information presented must be accurate, current, and reliable.
- Material should be arranged logically progressing from simple to complex, familiar to unfamiliar, and concrete to abstract concepts.
- The textbook must be free from ambiguities, errors, and misleading content.

By adhering to these principles, textbooks can effectively support learning, stimulate curiosity, and provide a reliable foundation for students' educational development.

## TEXTBOOK STYLE AND STRUCTURE

To serve as an effective teaching and learning tool, a textbook must prioritize clarity, coherence, and reader friendly presentation. Content should be organized logically, with a structured flow that gradually builds understanding while engaging young learners.

## SUGGESTED UNIT STRUCTURE

### Unit Opening

- **Unit Overview:** List the main headings or topics covered in the unit.
- **Student Learning Outcomes (SLOs):** Clearly state one SLO per heading; for longer units, select a reasonable number that captures the key learning goals.

- **Introduction:** Provide a short, age-appropriate explanation of what the unit covers and why it is important, connecting content to real-life experiences when possible.

### Unit Body

- **Key Terms:** Highlight key terms using bold and italicize supporting emphasis. Define terms when first introduced and compile them in the glossary.
- **Tips and Hints:** Present as separate call-out boxes or side notes to engage students directly, offer guidance, or highlight critical points.
- **Visuals and Illustrations:** Use age-appropriate images, diagrams, and infographics to explain concepts, making content relatable and visually stimulating.
- **Interactive Elements:** Include simple activities such as drag-and-drop exercises, labelling diagrams, or short reflection questions to enhance engagement.

### Unit Ending

- **Checkpoint Exercises:** Incorporate multiple-choice questions, fill-in-the-blank items, matching exercises, or short-answer questions suitable for the grade level.
- **Lab/Practical Exercises:** Include hands-on activities, especially for subjects like computer science or science, ensuring tasks are simple and guided.
- **Summary:** Provide a concise review of the main concepts, ideally aligned with the SLOs. Use bullet points or visual cues to reinforce understanding. Avoid introducing new content.

### End of Textbook

- **Glossary:** Include only essential terms introduced in the textbook.
- **Bibliography/Suggested Reading:** Provide references for further reading, appropriate to the comprehension level of students.
- **Index:** Include an organized index of key terms for quick reference.

## RECOMMENDATIONS FOR ENHANCING READABILITY AND ENGAGEMENT

- Use simple, clear language with short sentences appropriate to the age group.
- Include colourful, relatable illustrations and infographics that connect to students' daily experiences.
- Maintain consistent layout and formatting across units (headings, subheadings, and highlighted terms).
- Include frequent interactive features such as quizzes, reflection questions, or small projects to reinforce learning.
- Chunk information into small, digestible sections with clear headings and subheadings to avoid overwhelming young learners.
- Integrate storytelling, real-life examples, or scenarios to make abstract concepts tangible and relatable.

## THE TEACHER'S MANUAL

The Teacher's Manual is an essential companion to the textbook, designed to guide teachers in understanding the structure, content, and instructional approach of the textbook. It serves as a professional development tool, helping teachers enhance their teaching practices and facilitate effective student learning. By providing

detailed explanations of key concepts and step-by-step guidance on instructional strategies, the manual ensures that teachers can maximize the educational value of the textbook.

### Key Features of the Teacher’s Manual:

- **Clarity and Usability:** The manual should be easy to understand and practical to use in daily teaching.
- **Support for Instruction:** Provide guidance on teaching the text, extending activities, and deepening student understanding.
- **Sequenced Instructions:** Include step-by-step directions for conducting each activity.
- **Lesson Planning:** Offer detailed lesson plans aligned with unit objectives and Student Learning Outcomes (SLOs).
- **Project Guidance:** Suggest meaningful projects and activities for students to reinforce learning.
- **Teaching -Learning Resources:** List relevant materials, digital resources, and supplementary aids for instruction.
- **Assessment Support:** Establish a test bank with questions different from those in the textbook and suggest interactive quizzes corresponding to each unit.
- **Instructional Strategies:** Present up-to-date and relevant teaching methods, along with the rationale for their use.
- **Implementation Guidance:** Explain how to apply each teaching strategy effectively in the classroom.
- **Strategy Evaluation:** Identify strengths, limitations, and potential challenges associated with each teaching approach.
- **Resource Identification:** Specify the resources required for implementing strategies and extending activities.
- **Professional Development:** Expand teachers’ repertoire of pedagogical knowledge and instructional skills.
- **Assessment Strategies:** Recommend formative and summative assessment methods to monitor and enhance student learning.

By integrating these features, the Teacher’s Manual not only supports instructional planning but also empowers teachers to deliver engaging, effective, and evidence-based learning experiences.

### THE WORKBOOK

Workbooks are designed to complement the textbook by providing writing activities and exercises that reinforce the concepts introduced in each unit. They support the development of students’ conceptual understanding and enable learners to apply knowledge and skills in new and meaningful contexts. Workbooks serve as a bridge between learning and practice, helping students consolidate their understanding while fostering critical thinking and problem-solving abilities.

### Key Features of an Effective Workbook:

- **Clarity and Accessibility:** Exercises should be easy for students to understand and follow, with clear and explicit instructions.
- **Engaging and Challenging:** Activities should be stimulating, thought-provoking, and encourage creative thinking.
- **Alignment with the Textbook:** Exercises should correspond to the knowledge and skills developed in the textbook.
- **Comprehensive Coverage:** Include multiple exercises and activities for each unit, topic, and subtopic.
- **Variety and Innovation:** Avoid repetition in style or structure; provide diverse types of exercises to maintain interest.
- **Balanced Workload:** Ensure that no single topic or skill is overloaded with activities.
- **Supplementary Activities:** Include exercises that differ from those in the textbook or Teacher’s Manual, offering additional practice.
- **Resource Guidance:** Suggest accessible, affordable, and safe materials or resources to support the proposed activities.

By incorporating these features, the workbook becomes an interactive learning tool that enhances understanding, reinforces skills, and encourages independent learning.

## THE WEB -BASED RESOURCES

The World Wide Web is growing very fast to access an immense volume of rapidly evolving information. It is acting as a driving force since its ease of use makes the internet trivially accessible. Through web-based links like the ones mentioned below the teachers, parents and students can:




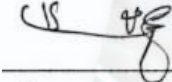
- access various sites around the world,
- access additional information and currency on the topics,
- view three-dimensional figures, graphics, lesson plans, activities and various books of interest.

### List of Websites

Sr#	Resource	Type	Practical Focus	Grades	URL	Best for SLO(s)
1	Code.org – AI for Oceans	Interactive web activity	AI basics, sorting, training data	I–III	<a href="https://code.org/oceans">https://code.org/oceans</a>	[AI-01-D-01] [AI -03-D-01]
2	Code.org Courses (A–C)	Block-based coding	Sequencing, logic, decision making	I–II	<a href="https://code.org/learn">https://code.org/learn</a>	[AI -01-D-03], [AI -02-D-03]
3	Blockly Games	Web-based puzzles	Logic, loops, problem solving	I–III	<a href="https://blockly.games">https://blockly.games</a>	[AI -02-C-01]
4	ScratchJr	Visual programming	Events, motion, simple automation	I–II	<a href="https://www.scratchjr.org">https://www.scratchjr.org</a>	[AI -01-D-02]
5	Scratch (MIT)	Block-based programming	Interactive projects, logic	II–V	<a href="https://scratch.mit.edu">https://scratch.mit.edu</a>	[AI-03-D-03], [AI -04-D-02]
6	Teachable Machine (Google)	Web-based ML tool	Image & sound classification	III–V	<a href="https://teachablemachine.withgoogle.com">https://teachablemachine.withgoogle.com</a>	[AI-03-D-02], [AI -05-D-02]
7	Machine Learning for Kids	Web-based ML platform	Simple ML projects	III–V	<a href="https://machinelearningforkids.co.uk">https://machinelearningforkids.co.uk</a>	[AI -05-D-02]
8	Cognimates	AI + Scratch platform	Voice & image recognition	III–V	<a href="https://cognimates.me">https://cognimates.me</a>	[AI -03-D-02]
9	Google AI Experiments	Interactive demos	Explore AI behavior visually	III–V	<a href="https://experiments.withgoogle.com/collection/ai">https://experiments.withgoogle.com/collection/ai</a>	[AI -04-D-06]
10	BBC Bitesize – Artificial Intelligence	Videos & activities	Introductory AI concepts	I–III	<a href="https://www.bbc.co.uk/bitesize">https://www.bbc.co.uk/bitesize</a>	[AI -01-D-01]
11	Be Internet Awesome (Google)	Interactive safety platform	Digital safety & ethics	I–XII	<a href="https://beinternetawesome.withgoogle.com">https://beinternetawesome.withgoogle.com</a>	[AI -01-E-01]

12	Computer Knowledge (CKnow)	Tutorial website	Basic computer concepts	III–VIII	<a href="http://www.cknow.com/vtu/tor/index.html">http://www.cknow.com/vtu/tor/index.html</a>	[AI -03-A-01]
13	Funbrain	Educational games	Logic & thinking skills	I–V	<a href="https://www.funbrain.com">https://www.funbrain.com</a>	[AI -01-C-02]
14	HowStuffWorks	Educational website	Understanding technology concepts	III–VIII	<a href="https://www.howstuffworks.com">https://www.howstuffworks.com</a>	[AI -03-A-01]
15	Learn the Net	Web tutorials	Internet & email basics	III–VIII	<a href="https://www.learnthenet.com/english/index.html">https://www.learnthenet.com/english/index.html</a>	[AI -02-A-02]
16	PowerPoint in the Classroom	Teaching resource	Presentation skills	III–X	<a href="https://www.actden.com/pp">https://www.actden.com/pp</a>	[AI -04-B-02]
17	Robot Magazine	Educational robotics resource	Robotics awareness	III–XII	<a href="http://www.botmag.com">http://www.botmag.com</a>	[AI -02-D-01]
18	TypingMaster	Typing practice	Keyboarding skills	I–XII	<a href="https://www.typingmaster.com">https://www.typingmaster.com</a>	[AI -01-B-01]
19	TypingTutor	Typing practice	Typing speed & accuracy	I–XII	<a href="https://www.typingtutor.com">https://www.typingtutor.com</a>	[AI -02-B-01]
20	Wikipedia	Online encyclopedia	Research & information literacy	III–XII	<a href="https://en.wikipedia.org">https://en.wikipedia.org</a>	[AI -04-B-01]
21	AI Experiments by Google	Interactive demos	Explore AI models, datasets	VI–XII	<a href="https://experiments.withgoogle.com/ai">https://experiments.withgoogle.com/ai</a>	[AI -04-D-05]
22	MIT App Inventor	Block-based app development	Mobile app creation, logic	VI–XII	<a href="https://appinventor.mit.edu">https://appinventor.mit.edu</a>	[AI -03-D-04]
23	RoboGarden	Game-based coding	Python and block programming	VI–XII	<a href="https://robogarden.ca">https://robogarden.ca</a>	[AI -03-D-05]
24	Scratch Extensions (AI + Sensors)	Block-based AI projects	Image, motion, voice projects	VI–X	<a href="https://scratch.mit.edu">https://scratch.mit.edu</a>	[AI -03-D-06]
25	TensorFlow Playground	Interactive ML	Visualize neural networks and learning	IX–XII	<a href="https://platform.tensorflow.org">https://platform.tensorflow.org</a>	[AI -05-D-03]
26	OpenAI Playground	AI experimentation	Test AI language models	XI–XII	<a href="https://platform.openai.com/playground">https://platform.openai.com/playground</a>	[AI -05-D-04]
27	Arduino Education	Robotics & electronics	Microcontrollers, sensors, motors	IX–XII	<a href="https://www.arduino.cc/education">https://www.arduino.cc/education</a>	[AI -06-D-01]
28	CodeCombat	Interactive programming game	Python, JavaScript coding	VI–XII	<a href="https://codcombat.com">https://codcombat.com</a>	[AI -03-D-07]
29	AI4All Open Learning	AI & social impact	AI projects, real-world problem solving	IX–XII	<a href="https://ai-4-all.org">https://ai-4-all.org</a>	[AI -05-D-05]

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**NOTIFICATION**

No. F.1-2/2025-AI/NCC: In exercise of the powers conferred under the Federal Supervision of Curricula, Textbooks and Maintenance of Standards of Education Act, 1976 Section 3 (2) (a), the Competent Authority i.e. Director, NCC Wing, M/o FE&PT has approved the Curriculum "**Artificial Intelligence & Robotics**" for Grades I- XII. The curriculum will be implemented in all Public and Private Educational Institutions of Islamabad Capital Territory (ICT) and the educational institutions under Federal Government across the country w.e.f academic year 2026-27. This curriculum is available at [ncc.gov.pk](http://ncc.gov.pk)

2. The spirit of this curriculum focuses on familiarizing students with emerging trends in Artificial Intelligence and their applications in daily life.

  
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