AI & Robotics Lab | Curriculum 2027-28 : Annual Plan

Grade 1

Module No.	Module Name	Topics	Tools/Software	Capstone Project
		Building with Design		
Module 1	3D Pen	• Understand the safe usage of 3D pen to create accurate 2d geometric shapes,transform 2D letters and Emojis into free standing 3D forms using layering.They will apply these skills to design creative 3D models that integrate art and design thinking.	• 3D Pen	3D Nametag for Friendship Day: A 3D-pen printed personalized nametag for Friendship Day.
Module 2	Electronics	• Understand basic components of electronics, build simple circuits to blink and power LED's, apply conductors and insulators in paper circuits, and Play-Doh models, and combine them effectively to show the concepts of open and closed circuits using E-greeting cards.	• Electronics Kit	E greeting cards using LEDs: A paper circuit greeting card lit up with LEDs.
Module 3	Robotics	• Understand the components of Robotics kit, apply motors and sensors to add motion and logic to circuits.They will understand enegy conversion from one form to another. They will verify the same by making a movable toy car.	• Robotics Kit	Simple Toy car: A basic motor-drive n toy car built with the robotics kit
Module 4	Robotics	• Understand the working and application of different sensors like light, moisture and obstacle sensors to create practical automation projects.	• Robotics Kit	Automatic morning alarm:A basic motor-drive n toy car built with the robotics kit
Module 5	Coding	• Understand Blockbased coding, to build interactive stories and games by working with Sprites, Events,Motion,Sensing and control blocks and by creating variables to manage scores.	• Scratch	Pingpong game: A Scratch-coded paddle/ping pong game.

Grade 2

Module No.	Module Name	Topics	Tools/Software	Capstone Project
		Building with Technology		
Module 1	3D Pen	• Understand the basics of using a 3D pen. Students learn how to turn 2D shaped into 3D, using the added dimension of height. They explore shapes like triangles and curves which objects a 3D appearance.	• 3D Pen	Park tour: A 3D-pen model/story project exploring a park theme.
Module 2	Electronics	• Understand basic electronics concepts and components, explore conductors /insulators and static energy, and build open/closed circuits to power simple devices like LEDs	• Electronics Kit	Light up Play-Dough creatures: Playdough creatures wired with simple LED
Module 3	Robotics	• Understanding the concepts of robotics, Understand simple mechanical concepts like wheels, gears, and levers. Learn how these components help robots move and function.	• Robotics Kit	Spin the Wheel Game:A circuit/coding-based spinning wheel game
Module 4	Robotics	• Understand the concept of sensor modules, design and build light-controlled machines, to understand sensor-based automation, implement obstacle detection principles to create Obstacle detection Robot	• Robotics Kit	Obstacle detection Robot: A robot that uses a sensor to detect and avoid obstacles.
Module 5	Coding	• Understanding block based programming language, Event blocks, Looks block, Control statements, loops, • sequencing and instructions	• Scratch, M-block	Maze Game in Scratch: A Scratch-coded maze navigation game.

Grade 3

Module No.	Module Name	Topics	Tools/Software	Capstone Project
		AI which responds to Simulation		
Module 1	Computer Vision	• Understand how AI analyzes and transforms images using computer vision techniques • Learn how AI-powered safety systems use motion detection to identify intruders • Understand light sensing and ON/OFF automation concept • Understand that AI can recognize objects in images • Recognize visual expressions and match emotions • AI fails because of bad or missing data — humans must check AI output before acting on it	• Scratch • Scratch • Cretile Kit • Teachable Machine • Scratch • Scratch	AI Security Guard:A Scratch-coded AI project using motion detection & light sensing to spot intruders.
Module 2	NLP – Natural Language Processing	• Learn how AI recognizes voice commands and converts spoken words into text • Build a voice-controlled Scratch project using microphone input • Create a security system — connecting a sensor to a buzzer • Build a simple rule-based chatbot with Q&A logic • Learn how to Create a story generator that uses AI concepts to combine words into a simple story.	• Scratch • Cretile Kit (Obstacle Sensor + Buzzer + Battery) • ML for Kids • mBlock • Scratch	Talking Buddy: Build an app that speaks a selected phrase aloud when the user presses a button.
Module 3	Machine Learning	• Build a circuit that thinks — wiring a NOT gate to flip a sensor signal • Understand text classification by labelling food categories • Learn visual recognition through interactive games • Identify basic WitBlox AI components and their purpose • Simulate simple prediction by responding to player patterns • The same AI can be helpful or harmful depending on how it is built	• Teachable Machine (text) + Scratch • Teachable Machine (pose) • ML for Kids (text) • Witblox • mBlock/Scratch + ML • Scratch	AI Recycling Sorter:An AI-vision project that identifies and sorts recyclable waste items.
Module 4	Robotics	• Design and drive a wheeled robot — assembling motors and wheels to understand motion • Understand basics of motor-driven flight models and robotic systems • Understand how light and dark can control robot movement • Learn how motors and mechanical linkages create controlled movement • Explore automation, motion control, and design engineering	• Cretile Kit • Witblox AI Kit • Witblox AI Kit • Cretile Kit • Witblox AI Kit	My First Rover: Build and program a basic robot to understand movement, direction, and motor control.

Grade 4

Module No.	Module Name	Topics	Tools/Software	Capstone Project
		AI to Recognize and Classify		
Module 1	Computer Vision	• Train AI to classify facial emotions from webcam input • Use body pose/gesture to control game elements • Understand security automation and trigger-response systems • Trigger visual effects based on recognized poses or objects • Learn how WitBlox AI Vision identifies and classifies objects to automate sorting • Understand data privacy — every app permission teaches AI more about you	• Teachable Machine • Teachable Machine + Scratch • Cretile Kit • Scratch + Extensions • Witblox AI Kit • Scratch	AI Traffic Cop: An AI-vision project simulating traffic direction and control.
Module 2	NLP – Natural Language Processing	• Build a voice-driven quiz using speech recognition and scoring • Train a text model to generate creative story responses • Build a structured conversation flow with branching answers • Explore how AI processes and translates between languages • Train a text classifier to organise and tag information topics	• Scratch (Text to Speech Extension) • ML for Kids (text) • Witblox • Scratch + API • ML for Kids (text)	Hand Sign Spotter : Build an AI-powered app that recognizes hand signs using image classification
Module 3	Machine Learning	• Understand how Machine Learning uses datasets and pattern recognition • Train a pose model to recognise hand signs and gestures • Understand how text input drives recommendation outputs • Train an audio model to classify different sound environments • Build a project where a trained model drives game decisions • AI-generated content is designed to look real — critical reading is essential	• Teachable Machine (text) + Scratch • Teachable Machine (pose) • ML for Kids (text) • Witblox • mBlock/Scratch + ML • Scratch	AI School Fair Stall:An interactive AI-powered stall/demo built for a school fair using teachable machine
Module 4	Robotics	• Trigger a servo lid using IR proximity — intro to actuator control • Understand how rotational motion creates force and drives swinging mechanisms • Explore linkage and hinge-based mechanisms to assemble a functional lamp • Observe motor direction control using switches • Build a mini see-saw using WitBricks and test different balancing situations • Questioning what you read online protects you and everyone you share with	• Cretile Kit • Witblox Kit • Witblox Kit • Cretile Kit • Witblox Kit • Scratch	Object Pusher : Use AI Vision to detect and classify objects for interactive applications.

Grade 4

Module No.	Module Name	Topics	Tools/Software	Capstone Project
		AI to Recognize and Classify		
Module 1	Computer Vision	• Train AI to recognise classmates — understand classification accuracy • Build a multi-class model that sorts recyclable vs non-recyclable waste • Learn how AI Vision and gesture recognition detect and classify hand movements in real time • Train a pose model to identify sign language letters and display translation • Learn how AI uses computer vision to recognize and classify human emotions	• Teachable Machine • Teachable Machine • Witblox AI Kit • Teachable Machine + mBlock • Witblox AI Kit • Scratch	Plant Doctor-cretile: A Cretile-kit project using sensors/AI to diagnose plant health.
Module 2	NLP – Natural Language Processing	• Train text model to match story recommendations to student preferences • Use a moisture sensor to monitor soil conditions and alert users when plants need water • Classify spoken entries by mood and display emotion tags in Scratch • Build a chatbot with text + voice that answers local community questions • Generate branching game narration using a trained text classifier	• ML for Kids (text) • Cretile • ML for Kids (speech) • ML for Kids + mBlock • Scratch + ML for Kids	Personalised Reading App : Create an app that recommends and organizes reading content based on user preferences.
Module 3	Machine Learning	• Compare clean vs dirty datasets — see how data quality affects accuracy • Train two image models with different data and observe and explain bias • Build an AI system that predicts emotional states and triggers mood-based music • Build a mBlock recommendation interface backed by a trained model • Students choose a topic, collect data, train a model and present findings	• ML for Kids • Teachable Machine • Witblox AI Kit • mBlock + ML • Witblox AI Kit	Student Innovation Challenge Using Cretile Kit: An open-ended innovation challenge where students design their own project with the Cretile kit.
Module 4	Robotics	• Learn how wings create lift and engines produce thrust — build a model aeroplane robot • Understand how ultrasonic sensors detect obstacles for autonomous navigation in assistive devices • Understand how Light & Moisture Sensors collect environmental data to automate a cooling system • Understand how racing cars are designed for speed and stability • Build a line-following robot that avoids obstacles and delivers objects between two stops • AI used in healthcare must always have a human checking its decisions	• Witblox Kit • Witblox Kit • Cretile Kit • Witblox Kit • Witblox Kit • Scratch	Obstacle-Avoiding Wheelchair :Develop a smart wheelchair app that demonstrates how sensors help navigate safely around obstacles.

Grade 6

Module No.	Module Name	Topics	Tools/Software	Capstone Project
		AI to automate everyday routines		
Module 1	Computer Vision	• Understand image pixels, RGB channels and image representation • Detect objects using AI • Use face detection to create an automated visitor monitoring system • Measure distance, trigger an alert when an object is within range • Build a face-recognition attendance logger for classroom use • Write biased and balanced datasets; run classifiers and compare outputs	• Python • Webcam + Python + RPi Pico + Obstacle Sensor + Motor Driver • Webcam + Pico + Buzzer/Switch • Pico + Ultrasonic Sensor + Buzzer • Python • Activity	Auto Attendance Tracker- a computer vision program to detect students and help mark their attendance using webcam
Module 2	NLP – Natural Language Processing	• Learn tokenization, word frequency and text processing • Convert speech into simple actions • Map numeric sensor readings to pre-written natural language phrases • Build a physical Morse code messenger applying text encoding, dictionary mapping, and time-based tokenization • Count and rank inputs by frequency — physical parallel to word-frequency analysis • Analyse what data apps collect; build a privacy-aware input validator in Python	• Python • Python • Pico + LDR + Switch • Pico + Push Button + Switch • Pico + Touch Sensor x4 • Activity	Touch Typing Tally- a NLP program to detect who's the fastest finger
Module 3	Machine Learning	• Classify how close you are to the screen • Compare models using accuracy and confusion matrices • Create a labelled audio dataset; understand amplitude feature extraction and nearest-centroid classification • Use design-thinking to pitch an ethical AI solution for a school problem	• "• Pico + Ultrasonic Sensor + Python + sklearn • • Pico + Touch Sensor + Push Buttons + Python • • Push button, mic • • Activity"	• Classify Sounds - classify sounds of different actions using ML code
Module 4	Robotics	• Understand how PWM is used to control motor speed in robotic systems • Understand how sensors and servo motors automate a railroad barrier system • Analog sensing, light intensity, automation • Digital inputs, event-based programming • Using IoT sensors to create home automation	• Witblox Ai Kit • Witblox AI Kit • Raspberry Pi 3, LDR, LED • Raspberry Pi 3, Touch Sensor, Buzzer • RPi 3, LDR, PIR Sensor, Touch Sensor, LEDs, Buzzer	Smart Room Automation System- use sensors to simulate home devices automation

Grade 7

Module No.	Module Name	Topics	Tools/Software	Capstone Project
		AI that assists with Real Decisions		
Module 1	Computer Vision	• Track selected objects in live video • Build an automated control loop that reads soil moisture to trigger a water pump • Count and classify vehicles from a video feed using frame differencing • Measure and classify parking distance data • Use Python to compare image metadata; discuss societal impact of synthetic media	• Python + OpenCV + Webcam • Moisture Sensor + Pump + Pico • Python + OpenCV + Background Sub • Ultrasonic Sensor + Pico + Servo + Webcam • Activity	Smart Parking Assistant – a computer vision program to count and classify vehicles and measure distance
Module 2	NLP – Natural Language Processing	• Extract specific keywords from text data using NLP to trigger physical movements • Analyze text inputs for distress keywords to automatically trigger physical alarm systems • Convert sensor data into natural language reports • Build a basic input-response dialogue loop; understand how chatbots prompt, receive and store user input	• Python (NLTK) + Pico + Motor Driver • Python + Pico + Buzzer + LED • DHT22 + NLP + TTS • Pico + PIR Sensor + Switch	Intruder Interview Logger – an NLP program that scans text/speech input for distress or trigger keywords and automatically logs the "interview" while setting off an alarm system.
Module 3	Machine Learning	• Recommend projects based on student interests • Build a session dataset and apply a threshold classifier • Extract timing features from event streams and cluster them • Detect environmental conditions and suggest fixes • Analyse real AI diagnostic tools; debate accuracy vs privacy tradeoffs	• Python + sklearn • Obstacle Sensor, Motion Sensor, Switch • Push Button, Sound Sensor • Pico + Sound Sensor + LDR + Temp Sensor • Activity	Recommendation Engine – a machine learning program that uses student interest data to recommend projects, similar to how apps suggest content based on your preferences.
Module 4	Robotics	• "• Learn how to measure distance with sound waves and implement gesture-based controls • • Read analog sensor values, control high-power motors via relay, and create an automated feedback loop • • Connect sensor data to physical output and data logging • • Implement event counting and timing windows; understand noise and false triggers"	• Raspberry Pi 3, Ultrasonic Sensor, Jumper Wires, Breadboard • Raspberry Pi 3, Water Level Sensor, DC Water Pump, Relay Module, Tubing, Power Supply • RPi 3, DHT-22, Motor Driver, Push Button • RPi 3, PIR Sensor, Motor Driver, Push Button • RPi 3, Sound Sensor, Motor Driver, Push Button	Clap-Controlled Drone – a sound sensor to detect claps and translate them into drone commands

Grade 8

Module No.	Module Name	Topics	Tools/Software	Capstone Project
		AI to Turn Data into Predictions		
Module 1	Computer Vision	• Build a prototype smart access system • Flag unusual activity in video feed and log timestamped alert images • Convert gestures into speech • Classify objects and trigger sorting actions • Apply ethics-by-design to a real AI product idea; present to a panel with ethical safeguards	• Webcam + OpenCV • OpenCV + Background Sub + RPi + Buzzer • MediaPipe + Python + TTS • Webcam + Pico + Motor Driver • Activity	Smart Recycling Assistant – a computer vision program that classifies objects (like recyclables)
Module 2	NLP – Natural Language Processing	• "• Build intelligent multi-turn conversations • • Design a domain-specific chatbot • • Classify text sentiment; 'stressed/hot' (negative) activates a cooling water pump via Pico • • Apply ethics-by-design to a real AI product idea"	• Python + LLM APIs • Python + NLP • Python (TextBlob) + Pico + Pump • Activity	Mood Detector – an NLP program that analyses text sentiment (like stress levels)
Module 3	Machine Learning	• Design and collect a structured labelled dataset for a real problem • Train classification and regression models on sensor data • Classify soil conditions as Dry, Normal, or Wet • Compare models using accuracy and confusion matrices • Create a labelled audio dataset; understand amplitude feature extraction and nearest-centroid classification • Analyze and propose reskilling solutions	• Python + CSV • Matplotlib + Sensor Data • Pico + Ultrasonic Sensor + Python + sklearn • Pico + Touch Sensor + Push Buttons + Python • Push button, mic • Activity	Classify Sounds – a machine learning program that trains on labelled audio data to classify different sounds using amplitude features.
Module 4	Robotics	• Apply basic object classification models and coordinate servo movements for robotic manipulation • Interface with I2C and digital sensors to log vibration and environmental data • Program obstacle avoidance algorithms, integrate live video streaming, and control DC motors • Read environmental sensor data to trigger automated fluid pumping • Apply computer vision (OpenCV) to categorize objects and coordinate sensor inputs with timed motor control	Raspberry Pi 3, Camera Module, Servo Motors, Power Supply Raspberry Pi 3, mic, DHT-22 Raspberry Pi 3, Motor Driver, PIR Sensor, Webcam, Ultrasonic Sensor, DC Motors + Rover Chassis Raspberry Pi 3, Moisture Sensor, DHT-22, LDR, Motor Driver, Pump Raspberry Pi 3, Webcam, Obstacle Sensor, Motor Driver, DC Motor	Product Sorting Conveyor – a robotics project that combines object classification with servo-controlled movement to sort products

Grade 9

Module No.	Module Name	Topics	Tools/Software	Capstone Project
		Combining AI, Vision & Language and Robotics into one System		
Module 1	Computer Vision	• Train a colour-histogram classifier to detect smoke and trigger buzzer alarm • Detect, track and analyze multiple objects simultaneously; understand object IDs and tracking pipelines • Recognize human actions and postures; develop AI systems for workplace safety monitoring • Build a vision-based inspection system that identifies defects and generates inspection reports • Map iris position to screen coordinates; translate gaze vectors into cursor movement and blinks into clicks • Estimate position using visual markers and develop navigation logic for autonomous systems • Analyze trade-offs between public safety, privacy and civil liberties	• Python + OpenCV + Background Subtraction + Pico + Buzzer • Python + OpenCV + YOLO • OpenCV + MediaPipe + Webcam • OpenCV + Raspberry Pi 3 + Webcam • Python + MediaPipe Face Mesh + PyAutoGUI • OpenCV + ArUco Markers + Raspberry Pi 3 • Case Studies + Debate Framework	Spatial AI & Mapping – a computer vision program that uses visual markers (ArUco) and object tracking to help a robot understand its position and navigate autonomously.
Module 2	NLP – Natural Language Processing	• Detect language of user input, translate, generate reply and translate back — enabling a bot to handle 10+ languages • Transcribe spoken commands, parse intent using regex token matching, and route to physical relays controlling LEDs • Combine vision and language models to answer questions about images and live camera feeds • Evaluate ethical challenges in self-driving vehicles, drones and autonomous robots	• Python (LangDetect + deep_translator + NLTK) + Flask web UI • Python (SpeechRecognition + pyttsx3) + Pico + Relay Module + LEDs • Webcam + LLM + OCR • Robotics Simulation + Scenarios	Multimodal Language AI – an NLP program that combines vision and language models, letting a bot answer questions about images/live camera feeds and communicate across 10+ languages.
Module 3	Machine Learning	• Collect/clean health-metrics CSV, train a Decision Tree classifier, visualise the tree, report accuracy and discuss overfitting vs pruning • Train and deploy a model that predicts room occupancy patterns from sensor data • Predict watering requirements using environmental conditions instead of fixed thresholds • Investigate deepfakes and develop methods for media verification	• Python + Pandas + scikit-learn (Decision Tree) + Matplotlib • Pico + PIR + Motion Sensor + Python • Pico + Moisture + DHT22 + Pump • Open-Source AI Tools	Predictive Agriculture – a machine learning program that predicts watering needs and room/environmental conditions using sensor data instead of fixed thresholds.
Module 4	Robotics	• Apply basic object classification models and coordinate servo movements for robotic manipulation • Interface with I2C and digital sensors to log vibration and environmental data • Design predictive logic systems by logging time-series environmental data to automate actions based on user habits • Implement hand-gesture recognition using computer vision libraries to create a biometric authentication state-machine • Program obstacle avoidance algorithms, integrate live video streaming, and control DC motors • Read environmental sensor data to trigger automated fluid pumping • Apply computer vision (OpenCV) to categorize objects and coordinate sensor inputs with timed motor control • Implement sensor fusion with weighted averaging and noise filtering; connect to how warehouse robots fuse multiple inputs for robust tracking	• Raspberry Pi 3, Camera Module, Servo Motors, Power Supply • Raspberry Pi 3, mic, DHT-22 • Raspberry Pi 3, Motor Driver, PIR Sensor, Webcam, Ultrasonic Sensor, DC Motors + Rover Chassis • Raspberry Pi 3, Moisture Sensor, DHT-22, LDR, Motor Driver, Pump • Raspberry Pi 3, Webcam, Obstacle Sensor, Motor Driver, DC Motor	Human-Following Trolley – a robotics project that uses sensor fusion (combining multiple sensor inputs like ultrasonic, PIR, and camera) to let a trolley detect and follow a person automatically.