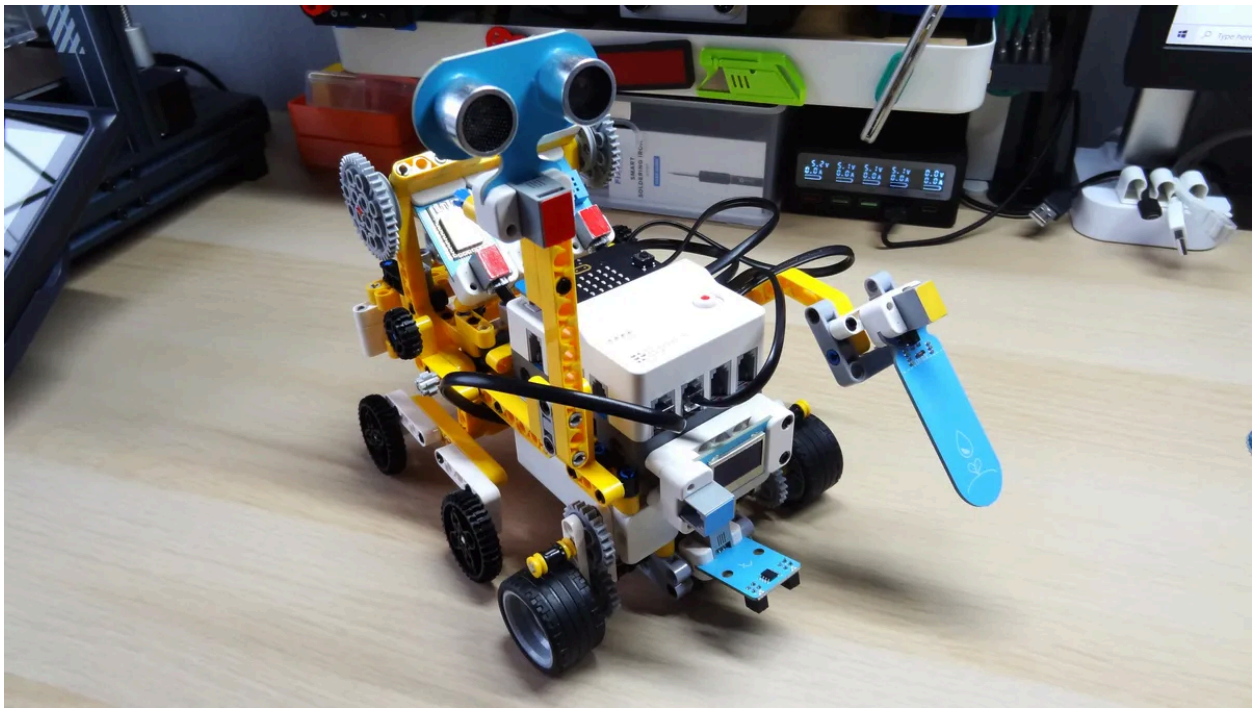
# MAST Summer Camp 2025

## TYPA (TAS) Summer Program - Detailed Course Overview

Join us this Summer for a journey through cutting-edge technology with our hands-on engineering programs. Whether building smart farms, environmental monitors, or autonomous robots, students develop real-world STEM skills through immersive, project-based learning. Each course combines creative problem-solving, technical skills, and innovation to prepare young minds for the technology-driven future.

## Grades 1-2: "Exploring Our World & Beyond"



Students will combine engineering skills, scientific inquiry, and design thinking skills to explore the problems that scientists and engineers all around the world are trying to solve! We will use a range of maker tools, microcontrollers, sensors, mechanical building blocks, and child-friendly coding applications to explore 3 central themes.

## Course 1: Surviving in Space

Students will build inventions that demonstrate how mankind can get to space, explore terrain, and survive with no infrastructure.

**Sample Projects:**

1. **Mini Rocket Launcher**: Students design and build a small air-pressure rocket using recycled materials, learning about propulsion, aerodynamics, and the physics of space travel.
2. **Space Garden Challenge**: Create a self-contained growing chamber that demonstrates how astronauts might grow food in space, exploring plant needs, light requirements, and water conservation.
3. **Astronaut Protection Suit**: Design wearable technology that monitors "astronaut vitals" using simple sensors, while creating protective gear to shield from simulated space hazards.

## Course 2: Ocean and Climate

Students will build prototypes of devices that marine biologists and climatologists use to explore our most precious planetary systems.

**Sample Projects:**

1. **Ocean Explorer ROV**: Construct a simple mechanical underwater exploration vehicle that can be controlled to "collect samples" from a simulated ocean environment.
2. **Wildlife Tracking Beacons**: Create and decorate animal trackers with LED indicators that demonstrate how scientists monitor migration patterns and animal behavior.
3. **Arctic Research Station**: Build a model research station with working temperature sensors, designing structures that can withstand simulated extreme weather conditions.

## Course 3: Smart Cities & Health

We will explore cities of the future with connected roads and environments - and how our habits and health can improve with connected devices.

**Sample Projects:**

1. **Smart Traffic Light System**: Program a working traffic light system that responds to "traffic" movement, learning the basics of automation and flow control.
2. **Personal Health Monitor**: Create a wearable device with pulse sensors and simple displays that tracks activity and demonstrates how technology can monitor health.
3. **Smart Home Model**: Build a model home with working lights, temperature sensors, and automatic features that respond to environmental changes.

# Grades 3-5: "Life on Earth, Powered by Science"

Dive into the future of technology as students explore three cutting-edge fields transforming our world. Using microcontrollers, sensors, robotics, and coding tools, students will tackle real environmental and technological challenges through hands-on projects.

## Course 1: AgriTech Innovators

Explore cutting-edge farming technology as we build automated irrigation systems, smart greenhouses, and soil monitoring devices.

**Sample Projects:**

1. **Automated Irrigation System**: Build a working model that uses soil moisture sensors to trigger water delivery only when plants need it, learning about conservation and automation.
2. **Smart Mini-Greenhouse**: Create a controlled environment with temperature and humidity sensors that automatically adjusts growing conditions and records data over time.
3. **Plant Health Monitor**: Design and build a device that measures light levels, soil quality, and moisture, displaying results through a simple dashboard that helps make plant care decisions.

## Course 2: EcoTech Explorers

Design and construct environmental monitoring tools and renewable energy solutions to understand how technology helps combat climate change.

**Sample Projects:**

1. **Weather Station Network**: Build multiple interconnected weather stations that measure temperature, humidity, and wind, then analyze the collected data to understand microclimates.
2. **Solar-Powered Device Charger**: Create a working solar panel setup that demonstrates energy harvesting, storage, and usage while powering small electronics.
3. **Water Quality Testing Device**: Design an electronic water testing system that can measure clarity, pH, and contaminants, learning about both electronics and environmental monitoring.

## Course 3: IoT Inventors

Create smart devices that collect and analyze real-world data while learning programming and electronics fundamentals.

**Sample Projects:**

1. **Connected Room Monitor**: Build a device that measures room occupancy, noise levels, and air quality, then displays results through a simple dashboard.
2. **Data Collection Network**: Create multiple sensor nodes that communicate with each other to build a more complete picture of an environment, learning about networks and data visualization.

3. **Smart Security System**: Design and program a security system with motion detection, alarm features, and notifications that can be controlled remotely.

## Grades 6-8: "Future Machines"

Students explore advanced mechanical and electrical engineering concepts using the Nezha Arduino kit. Through hands-on projects, they'll learn programming, electronics, and mechanical design while building autonomous robots and smart devices.

## Course 1: Mechanical Foundations

Explore the core principles of mechanical engineering by building gear-driven robots and motorized machines.

**Sample Projects:**

1. **Multi-Gear Transmission Vehicle**: Design and build a vehicle with multiple gear ratios that can be shifted to overcome different terrains and obstacles.
2. **Mechanical Arm Manipulator**: Create a robotic arm with multiple joints and precise control mechanisms, learning about leverage, torque, and mechanical advantage.
3. **Automated Assembly Line**: Build a working model of an assembly line with multiple stations that demonstrates principles of industrial automation and mechanical timing.

## Course 2: Electronics & Control

Master Arduino programming and electronic fundamentals through hands-on projects using sensors, motors, and microcontrollers.

**Sample Projects:**

1. **Light-Following Robot**: Program a vehicle that can detect and follow a light source, incorporating multiple sensors and motor control algorithms.
2. **Electronic Music Instrument**: Create a programmable electronic instrument that uses different sensors to alter pitch, tempo, and sound quality.
3. **Smart Home Control Center**: Design a central hub that monitors multiple environmental factors and controls connected devices based on programmed parameters.

## Course 3: Advanced Automation

Take robotics to the next level by creating autonomous machines that can sense and interact with their environment.

**Sample Projects:**

1. **Maze-Solving Robot**: Build and program a robot that can navigate through an unknown maze, mapping its path and finding the most efficient route.
2. **Environmental Response System**: Create a system that monitors multiple environmental factors and takes different automated actions based on changing conditions.
3. **Object Recognition Robot**: Design a machine that can identify different objects by their shape, size, or color and then sort or manipulate them accordingly.

## Program Schedule:

- Each level offers 3 weeks of curriculum which repeats after 3 weeks
- Courses are suitable for rising grades (grade in Fall 2025)

| | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 |
|---|---|---|---|---|---|---|
| **Grades 1-2** | Space | Ocean | Cities | Space | Ocean | Cities |
| **Grades 3-5** | AgriTech | EcoTech | IoT | AgriTech | EcoTech | IoT |
| **Grades 6-8** | Mechanics | Electronics | Automation | Mechanics | Electronics | Automation |

## What to Expect

Throughout each week-long course, your child will:

- Work with age-appropriate technology and tools
- Develop critical thinking and problem-solving skills
- Learn fundamental STEAM concepts through hands-on projects
- Build confidence in their technical abilities
- Collaborate with peers on engineering challenges

All materials are provided, and no prior experience is necessary. Our expert instructors create a supportive environment where every student can thrive, regardless of their starting skill level.

*Note: While we've outlined sample projects above, our instructors may adapt activities based on student interests and abilities to provide the best possible learning experience.*