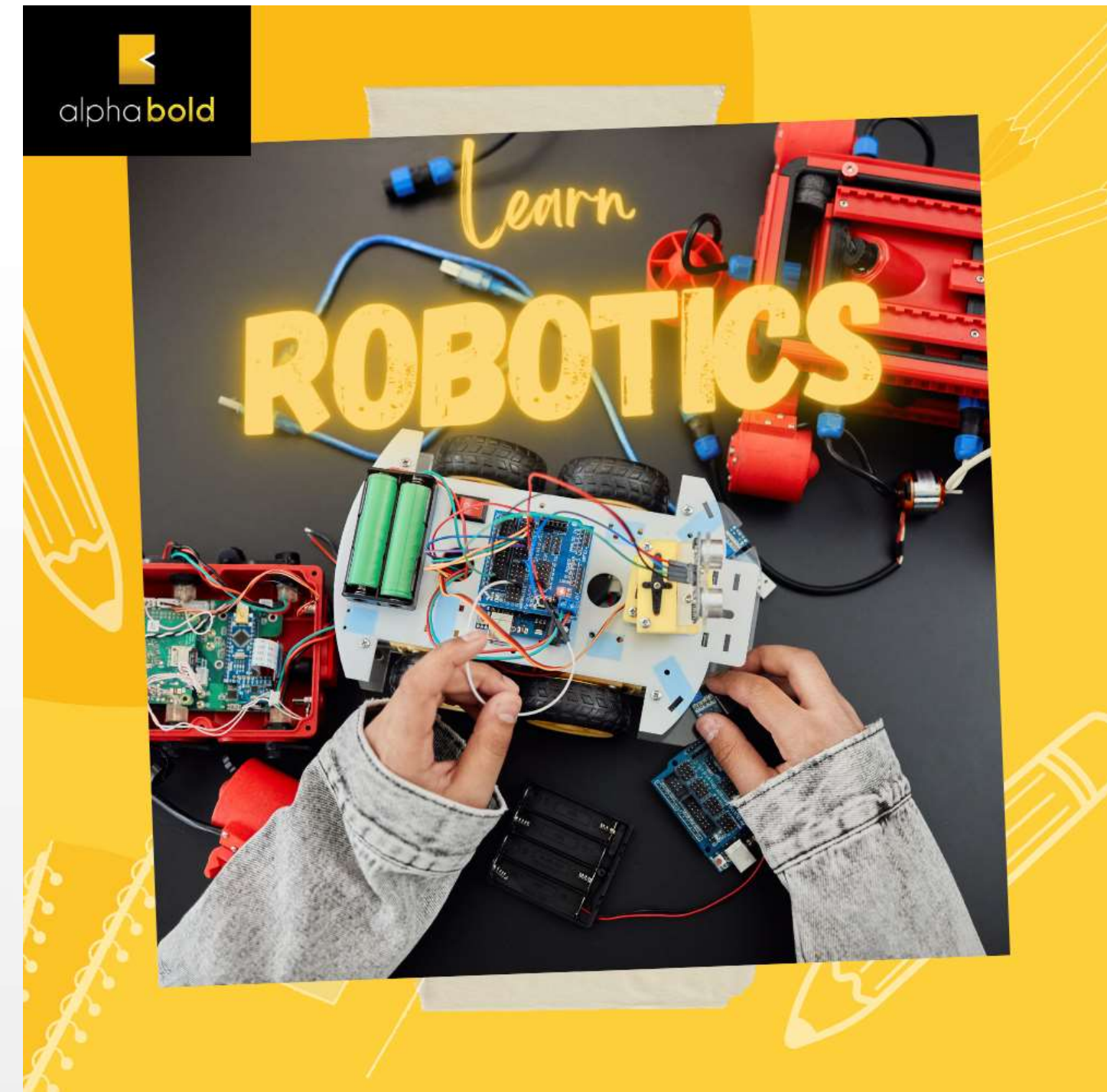
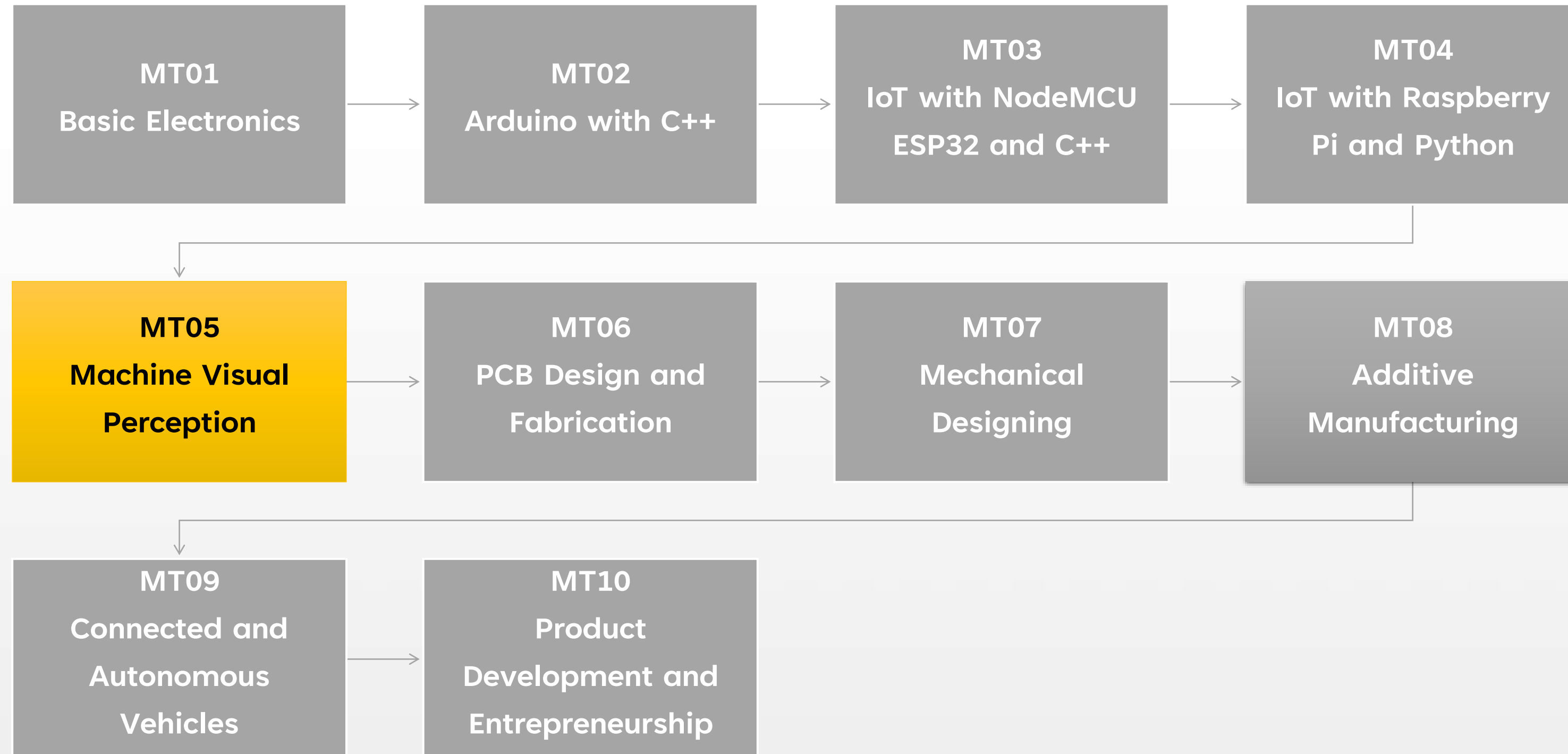


Machine Visual Perception (MVP)

Computer Vision with Python





Course Unit Details

Overview

This course unit delves into the world of Machine Visual Perception, equipping you with the foundational skills and tools to understand and manipulate images and videos using OpenCV, a popular computer vision library. You'll explore various image processing techniques, delve into object detection and tracking, and gain hands-on experience building basic computer vision applications.

Aims

- Introduce the fundamental concepts of computer vision and OpenCV.
- Develop a strong understanding of image representation and manipulation techniques.
- Equip you with the ability to analyze and enhance visual content.
- Explore object detection, tracking, and pose estimation using OpenCV.
- Build practical skills for implementing basic computer vision applications.

Learning Outcomes

- By the end of this course unit, you will be able to:
 - Define computer vision and its applications in various fields.
 - Understand functionalities of OpenCV for computer vision tasks.
 - Load, display, and manipulate images using OpenCV functions.
 - Perform basic image processing tasks like annotation, enhancement, and filtering.
 - Access and control camera input for real-time video processing.
 - Implement techniques for edge detection and feature extraction within images.
 - Create panoramic images and improve image quality using HDR techniques.
 - Track objects within video frames and leverage OpenCV for this purpose.
 - Develop applications for face detection and object recognition using OpenCV.
 - Utilize Openpose for basic pose estimation tasks based on image or video data.

Syllabus

Introduction of Computer Vision and OpenCV

1. Getting Started with Images
2. Basic Image Manipulation
3. Image Annotation
4. Image Enhancement
5. Accessing the Camera
6. Video Writing
7. Image Filtering Edge Detection
8. Image Features and Alignment
9. Panorama
10. HDR
11. Object Tracking
12. Face Detection
13. Object Detection
14. Pose Estimation using Openpose

Course Unit Requirements

Desired

Prerequisite Course Units

- MT03, MT04

Background Knowledge

- Familiarity with robotics concepts such as integrating microcontrollers with sensors and motors
- Understanding of programming concepts such as function calls, conditional statements, loops and recursion

Prior Programming Skills

- Intermediate Python (Preferably)
- Intermediate C++

Software and Packages Required

- OS: Ubuntu/ Raspberry Pi OS
- Latest Python Release
- Library: Open CV

Hardware Required

- Electronic Components:
 - Microcontroller: Raspberry Pi
 - Necessary Sensors and Motors
- Computing device with internet connectivity

Recommended

Machine Learning

Basic Physics (Newtonian Mechanics)

Calculus and linear algebra

- Single variable calculus and differential equations
- Matrix operations – transformations and rotations

Basic Statistics and probability

- Probability distribution
- Sampling, Mean, variance

Unix / Linux command line/ shell basics

- File commands: ls, cd, pwd, mkdir, rm, cp, mv, touch, cdhmod, tar
- Process management: ps, top, kill pid
- SSH user@host..., grep, locate, echo
- Installation: ./configure, make, make install
- Ports

Thank you for learning with alpha **bold**



alpha**bold**