

# Supporting Courses

## 1. Python Programming

1. Numerical types, conversion, and operations
2. Python operators, built-in functions, and basic sequence operations
3. Program selection structure experiment
4. Program loop structure experiment
5. List operations experiment
6. Set operations experiment
7. Function operations experiment
8. String operations experiment
9. Regular expressions experiment
10. Data visualization
11. Data processing in Python
12. Python file operations
13. Python multiprocessing
14. Python multithreading
15. Differences between processes and threads in Python
16. Understanding Object-Oriented Programming in Python
17. Using classes and instantiating objects in Python
18. Using instantiated objects in Python
19. Using inheritance in Python classes
20. Serial communication using Python
21. Socket TCP communication using Python
22. Socket UDP communication using Python
23. Modbus communication using Python
24. Setting up the PyQt5 environment
25. Using PyQt5
26. Using Qt Designer and PyUIC

## 2. Machine Learning

1. Predicting Boston housing prices using Linear Regression
2. Movie genre classification using K-Nearest Neighbors (K-NN)
3. Clustering unknown data using K-Means algorithm
4. Breast cancer diagnosis using Decision Trees
5. Classifying movie datasets with AdaBoost
6. Verifying a double coin tossing model using EM inference
7. Spam email filtering with Naive Bayes
8. Facial recognition system design with Random Forest

9. Dynamic pedestrian detection using Support Vector Machines (SVM)
10. Lane detection system design using Deep Learning
11. Traffic sign recognition system using CNN and SVM
12. Traffic sign recognition system using HOG and SVM

### 3. Deep Learning

1. Linear Regression Modeling and Application - House Price Prediction
2. Building and Applying Neural Networks - Clothing Classification Experiment
3. Regularization in Neural Networks - Clothing Classification Optimization
4. Neural Network Parameter Optimization - Non-linear Function Minimization Experiment
5. Building and Testing Neural Network Models
6. Optimizing Models Using Residual Networks
7. Optimizers in Neural Networks - Handwritten Digit Recognition
8. Text Classification - JD Shopping Classification
9. Handwritten Digit Recognition System Design using LeNet
10. Automatic Song Composition Design using RNN
11. Image Data Labeling with Deep Learning
12. Object Detection Model Training using YOLOv5
13. Defect Detection with YOLOv5

### 4. Digital Image Processing

1. Algebraic operations between images
2. Image operations - Encoding and Decoding
3. Geometric affine transformations in images
4. Spatial domain filtering of images
5. Frequency domain filtering of images
6. Grain detection based on morphology
7. Image segmentation using the Canny algorithm
8. Image contour segmentation using Watershed
9. Shape matching using Hu moments

### 5. Machine Vision

1. Visual system understanding
2. Pixel size measurement
3. Object location and angle measurement
4. Edge length and area detection
5. Object color and shape recognition
6. Barcode and QR code recognition



7. OCR character segmentation and training
8. OCR character recognition
9. Surface defect detection using morphological processing
10. Camera calibration using checkerboard patterns
11. License plate recognition using OpenCV
12. Electronic product recognition using template matching
13. License plate recognition using machine vision
14. Barcode recognition using machine vision
15. QR code recognition using machine vision
16. Object shape and color recognition using machine vision
17. Fruit recognition using machine vision
18. NanoDet target detection model practice based on vision
19. Defect detection in workpieces using machine vision
20. Document recognition using machine vision

## 6. Deep Vision

1. Face detection and distance measurement
2. Face detection and PTZ (Pan-Tilt-Zoom) tracking
3. Face detection and recognition
4. Mask detection
5. Dynamic pedestrian detection

## 7. Embedded Systems and Applications

1. Introduction to intelligent sensor systems
2. Setting up the Arduino programming environment
3. OLED display experiment
4. Human radar detection experiment
5. Light intensity detection experiment
6. Heart rate monitor experiment
7. Ultrasonic distance measurement experiment
8. Smart traffic light control experiment
9. Fan speed control experiment
10. Gyroscope-based posture sensing and gimbal control
11. Bluetooth-based smart security system design

## 8. Speech Processing and Sensor Control

1. Introduction to speech processing modules
2. LED light control



3. LED ring control using SPI
4. Sound source localization
5. Voice-controlled lighting
6. Voice-controlled music playback
7. Speech recognition and response
8. Voice-controlled robotic arm visual object grabbing
9. Smart sensor control based on voice
10. Visual and voice-based robotic arm object classification

## 9. Vision-Based Robotics Applications

1. Robotic arm understanding and basic operation
2. Robotic arm teaching and motion control
3. Camera calibration with visual systems for robotic arms
4. Vision-based robotic arm object classification
5. Vision-based robotic arm palletizing
6. Vision-based robotic arm sorting of objects
7. Vision-based robotic arm fruit classification