AI-Robot Development Kit Course Outline

	Categories	Course Resources and Practice Cases
1	Python programming	(1) Number types, conversions, and operations (2) Basic usage of Python operators, built-in functions, sequences (3) Program selection structure experiment (4) Program loop structure experiment (5) List experiments (6) Ensemble experiments (7) Function experiments (8) String experiments (9) The regular expression experiment (10) Visualize the data (11) Data processing in Python (12) Python file operations (13) Python multi-processing (14) Python multi-threading (15) The difference between Python processes and threads (16) Object-oriented Python understanding (17) Using Python classes and instantiating them (18) Using Python to instantiate objects (19) Inheritance with Python classes (20) Serial communication with Python (21) Socket TCP communication based on Python (22) Python based Socket UDP communication (23) Modbus communication with Python (24) PyQt5 environment setup (25) Use of PyQt5 (26) Use of Qt Designer and PyUIC
2	Machine learning	(1) AdaBoost movie dataset data classification (2) Verification of double coin toss model based on EM inference (3) Classification of unknown data based on K-means algorithm (4) Movie genre recognition based on K-nearest neighbor algorithm (5) Dynamic pedestrian detection based on HOG and support vector machine (6) Decision tree-based diagnosis of breast cancer (7) Naive Bayes-based spam filtering (8) Face recognition based on random forest

		(9) Housing price prediction based on linear regression
3	Deep learning	(1) Linear regression modeling and application: house price prediction experiment (2) Model construction and application of neural network: clothing classification experiment (3) Neural network regularization: clothing classification optimization experiment (4) Neural network parameter optimization: nonlinear function minima finding experiment (5) Model construction and testing experiments based on neural networks (6) Optimization model design based on residual network (7) Neural network optimizer - handwritten digit recognition (8) Text classification - JD shopping classification (9) Design based on LeNet handwritten digit body recognition system (10) Automatic arrangement design of songs based on RNN (11) Image target detection based on YOLOV5
4	Digital image processing	(1) Algebraic operations between images (2) Coding and decoding of image operations (3) Geometric affine transformation of the image (4) Image airspace filtering (5) Frequency-domain filtering of images (6) Morphology-based detection of rice grains (7) Image cutout based on Canny algorithm (8) Image contour segmentation based on watersheds (9) Based on Hu rectangular shape matching (10) Smooth filtering and morphological processing
5	Machine vision	(1) Visual system cognition (2) Pixel size measurement (3) Object positioning and angle measurement (4) Edge length measurement 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) Detection of product surface defects based on morphological treatment (10) Camera checkerboard calibration (11) Vision-based license plate recognition (12) License plate recognition based on OpenCV (13) Electronic product identification based on template matching

		(14) Vision-based barcode recognition (15) Vision-based QR code recognition (16) Vision-based object shape and color recognition (17) Visual-based fruit recognition (18) Image-based NanoDet object detection model practice
6	Depth vision	(1) Face detection and ranging (2) Face detection and gimbals following (3) Face detection and recognition (4) Mask testing (5) Dynamic pedestrian detection
7	Embedded Systems and applications	(1) Intelligent sensing system cognition (2) The construction of the Arduino programming environment (3) OLED display experiment (4) Human radar detection experiment (5) Illuminance detection experiment (6) Heart rate detector experiment (7) Ultrasonic rangefinder experiment (8) Intelligent traffic light control experiment (9) Fan speed control experiment (10) Gyroscope-based attitude somatosensory gimbals control (11) Bluetooth-based intelligent security system design
8	Speech Processing and Sensor Control	(1) Cognition of speech processing module (2) LED light control (3) Lamp ring control based on SPI (4) Sound source localization (5) Voice control lighting (6) Voice control to play music (7) Speech recognition and response (8) Voice-controlled robotic arm visual grabbing (9) Voice-based intelligent sensor control (10) Object classification of robotic arm based on vision and speech
9	Vision-based Robotics Applications	(1)Robotic arm cognition and basic operation (2)Robotic arm teaching and motion control (3)Calibration of robotic arm and vision system (4)Vision-based object classification of robotic arms (5)Vision-based robotic arm object palletizing (6)Vision-based numerical sequencing of robotic arms (7)Object classification of robotic arms based on vision and speech (8)Vision-based robotic arm fruit sorting