UNITREE

宇树科技

Unitree Robotics

具身智能课程总体建设方案

Embodied Intelligence Curriculum Development Plan

宇树科技股份有限公司

Unitree Robotics Co., Ltd.

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Visit the Unitree website for product terms and policies.
Comply with local laws and regulations.

请勿危险改造或使用机器人。

Do not modify or operate robots in unsafe ways.



课程总览
Curriculum Overview

03 基础入门
Foundation

具身智能工程导论
Introduction to Embodied Intelligence Engineering

机器人平台认知与基础操控
Robot Platform Fundamentals and Basic Operation

四足机器人运动与仿真基础
Quadruped Locomotion and Simulation Fundamentals

07 进阶开发
Development

四足机器人开发与实践
Quadruped Robot Development and Practice

人形机器人开发与实践
Humanoid Robot Development and Practice

机器人学基础与 ROS2 实践
Robotics Fundamentals and ROS2 Practice

机器人自主导航
Autonomous Robot Navigation

具身智能方法与应用（强化学习）
Embodied Intelligence Methods and Applications (Reinforcement Learning)

具身智能系统安全与运维—四足
Embodied System Safety and Maintenance: Quadrupeds

具身智能系统安全与运维—人形
Embodied System Safety and Maintenance: Humanoids

06 项目实战
Projects

机器人认知与工程实践
Robot Cognition and Engineering Practice

机器人操作与抓取
Robot Manipulation and Grasping

多机器人协同与系统集成
Multi-Robot Coordination and System Integration

行业场景综合设计
Integrated Design for Industry Applications

四足机器人实训台课程
Quadruped Robot Training Platform Course

人形机器人实训台课程
Humanoid Robot Training Platform Course

三层能力递进：建立硬件自信 → 补齐工具链与二次开发 → 项目制交付与行业综合设计
Three stages: hardware confidence, development toolchains, then project delivery and industry application design

具身智能课程路径图谱

Embodied Intelligence Learning Pathways

四足机器人课程路径

Quadruped Learning Path

四足机器人运动与仿真基础
Quadruped Locomotion and Simulation Fundamentals

四足机器人开发与实践
Quadruped Robot Development and Practice

四足机器人实训台课程
Quadruped Robot Training Platform Course

具身智能系统安全与运维—四足
Embodied System Safety and Maintenance: Quadrupeds

具身智能方法与应用
Embodied Intelligence Methods and Applications

机器人自主导航
Autonomous Robot Navigation

行业场景综合设计
Integrated Design for Industry Applications

四足岗位能力出口
Quadruped Career Skills
运控 / 导航 / 巡检 / 系统集成
Motion / Navigation / Inspection / Integration

共享基础课程

Shared Foundation Courses

具身智能工程导论
Introduction to Embodied Intelligence Engineering

机器人平台认知与基础操控
Robot Platform Fundamentals and Basic Operation

机器人学基础与 ROS2 实践
Robotics Fundamentals and ROS2 Practice

双路径共同能力

Capabilities Shared by Both Paths

需求建模
Requirements Modeling
可观测设计
Observability Design
测试与验收
Testing and Acceptance
工程交付与复盘
Engineering Delivery and Review

岗位能力导向：开发、算法、运维、数采、集成、项目交付
Career focus: development, algorithms, maintenance, data collection, integration and project delivery

人形机器人课程路径

Humanoid Learning Path

人形机器人开发与实践
Humanoid Robot Development and Practice

具身智能系统安全与运维—人形
Embodied System Safety and Maintenance: Humanoids

机器人认知与工程实践
Robot Cognition and Engineering Practice

人形机器人实训台课程
Humanoid Robot Training Platform Course

机器人操作与抓取
Robot Manipulation and Grasping

多机器人协同与系统集成
Multi-Robot Coordination and System Integration

人形岗位能力出口
Humanoid Career Skills
开发 / 数采 / 工程交付 / 协同
Development / Data / Delivery / Coordination

具身智能工程导论

Introduction to Embodied Intelligence Engineering

课程信息

Course Information

48

总学时

Total hours

4

总学分

Total credits

配套硬件平台

Hardware Platform

Go2 Edu标准版

Go2 Edu U1



课程目标

Learning Objectives

中文 / Chinese

1. 了解具身智能机器人的定义、发展历程及核心特性，理解其与传统机器人计算的差异，明晰大模型技术对具身智能机器人的影响机制。

2. 了解具身智能机器人感知（视觉、激光雷达、语音）、控制与决策（双足/四足机器人控制）、交互与学习（数据采集、标注、训练）的核心模块功能及技术逻辑。

3. 具备对具身智能机器人典型实例的分析能力，能完成基础感知模块的实例演练，为后续深入学习具身智能系统搭建理论与实践基础。

英文 / English

1. Understand the definition, history and core characteristics of embodied intelligent robots, how they differ from traditional robot computing, and how large AI models influence embodied intelligence.

2. Understand the functions and technical logic of perception (vision, LiDAR and speech), control and decision-making (biped and quadruped control), and interaction and learning (data collection, annotation and training).

3. Analyze representative embodied robotics examples and complete basic perception exercises, building a theoretical and practical foundation for further study of embodied intelligent systems.

机器人平台认知与基础操控

Robot Platform Fundamentals and Basic Operation

课程信息

Course Information

48

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

Go2 Edu标准版

Go2 Edu U1



课程目标

Learning Objectives

中文 / Chinese

1. 掌握机器人平台核心硬件（电源模块、主控单元等）的识别与功能认知，理解机器人系统软件架构，建立对机器人平台的整体认知

2. 熟悉机器人操作的安全规范，能独立完成遥控器/APP与机器人的连接调试，具备操作前准备、常见异常状态判断与初步处置能力。

3. 能够熟练完成机器人基本动作（行走、转向等）与姿态控制，能通过参数面板进行基础参数调整。

英文 / English

1. Identify core hardware such as power modules and main controllers, understand the system software architecture, and develop an overall understanding of the robot platform.

2. Follow safe operating procedures, independently connect and configure a remote controller or app, prepare the robot for operation, and recognize and initially respond to common abnormal states.

3. Perform basic movements such as walking and turning, control robot posture, and adjust basic settings through the parameter panel.

四足机器人运动与仿真基础

Quadruped Locomotion and Simulation Fundamentals

课程信息

Course Information

32

建议学时

Recommended hours

2

建议学分

Recommended credits

配套硬件平台

Hardware Platform

Go2 Edu标准版

Go2 Edu U1



课程目标

Learning Objectives

中文 / Chinese

1. 让学生初步掌握四足机器人运动学与基本步态知识。

2. 掌握在仿真环境中搭建 Go2模型并进行简单动作与行走实验的方法。

3. 理解仿真参数对实机行为的影响，为后续“仿真到实机”迁移打基础。

英文 / English

1. Develop a basic understanding of quadruped robot kinematics and fundamental gaits.

2. Build a Go2 model in a simulation environment and conduct simple motion and walking experiments.

3. Understand how simulation parameters affect physical robot behavior, laying the foundation for simulation-to-real transfer.

四足机器人开发与实践

Quadruped Robot Development and Practice

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

Go2 Edu标准版

Go2 Edu U1



课程目标

Learning Objectives

中文 / Chinese

1. 掌握四足机器人的软硬件架构、开发环境使用方法，理解关节电机控制、刚体运动学等核心理论，明确四足机器人“感知-规划-控制”的系统逻辑。

2. 具备四足机器人基础操控、底层/高层运动控制调试、避障数据获取、激光雷达导航等实操能力，能独立完成简单步态规划、ROS仿真导航及实机部署等核心任务。

3. 能够综合运用所学技术，完成四足机器人多功能集成开发、功能实现与调试优化。

英文 / English

1. Understand quadruped hardware and software architectures and use the development environment. Learn joint motor control and rigid-body kinematics, and understand the perception, planning and control pipeline.

2. Operate the robot, debug low- and high-level motion control, acquire obstacle data and use LiDAR navigation. Independently perform basic gait planning, ROS navigation simulation and deployment on a physical robot.

3. Apply the techniques learned to integrate multiple quadruped functions, implement features, and debug and optimize the system.

人形机器人开发与实践

Humanoid Robot Development and Practice

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

G1 Edu 进阶版

G1 Edu - U2



课程目标

Learning Objectives

中文 / Chinese

1. 理解人形机器人的特性与系统框架，掌握仿真环境搭建、模型加载方法。

2. 具备人形机器人行走控制能力，能独立完成激光雷达/深度相机数据获取、目标识别、定位系统搭建及路径规划算法的仿真与实机应用。

3. 能够基于人形机器人的感知、定位、规划等核心模块，完成综合实践项目的场景构建、功能集成与调试优化，具备复杂任务的系统设计与落地能力。

英文 / English

1. Understand humanoid robot characteristics and system architecture, and learn to configure simulation environments and load robot models.

2. Control humanoid walking, independently acquire LiDAR and depth-camera data, recognize targets, build localization systems, and apply path planning algorithms in simulation and on physical robots.

3. Build scenarios, integrate functions, and debug and optimize practical projects using perception, localization and planning modules. Develop the system design and implementation skills needed for complex tasks.

机器人学基础与 ROS2 实践

Robotics Fundamentals and ROS2 Practice

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

G1 Edu 进阶版

G1 Edu - U2



课程目标

Learning Objectives

中文 / Chinese

1. 掌握机器人位姿描述、运动学基础及简单动力学概念。

2. 掌握ROS2基础架构与常用开发工具，具备在仿真环境中搭建和调试人形机器人系统的能力。

3. 能将仿真环境中的控制策略迁移到实际人形机器人上进行验证。

英文 / English

1. Understand robot pose representation, fundamental kinematics and basic dynamics.

2. Use ROS2 architecture and common development tools to build and debug humanoid robot systems in simulation.

3. Transfer control strategies from simulation to a physical humanoid robot and validate their performance.

具身智能系统安全与运维—四足

Embodied System Safety and Maintenance: Quadrupeds

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

Go2 Edu标准版
四足机器人实训平台

Go2 Edu Standard
Quadruped training platform



课程目标

Learning Objectives

中文 / Chinese

1. 掌握机器人系统功能安全、电气安全、网络安全的核心概念，能准确识别机械危险，熟悉基础安全操作规范。

2. 理解ROS2/机器人系统日志记录与备份机制，掌握监控指标的查看方法，具备异常日志初步识别与数据备份能力。

3. 具备机器人系统结构化诊断思维，能遵循运维手册规范处理典型故障，具备机器人日常运维与故障排查的实操能力，保障系统稳定运行。

英文 / English

1. Understand functional, electrical and cybersecurity concepts for robot systems, identify mechanical hazards accurately, and follow basic safe operating procedures.

2. Understand ROS2 and robot system logging and backup mechanisms, inspect monitoring indicators, identify abnormal logs at a basic level, and back up data.

3. Use a structured diagnostic approach and maintenance manuals to resolve typical faults. Develop practical skills in routine maintenance and troubleshooting to support stable robot operation.

具身智能系统安全与运维—人形

Embodied System Safety and Maintenance: Humanoids

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

R1 专业版G
人形机器人实验台

R1 Edu G humanoid robot
Humanoid training platform



课程目标

Learning Objectives

中文 / Chinese

1. 掌握人形机器人系统安全与运维的核心技术体系，具备独立完成相关开发任务的能力。

2. 培养学生掌握人形机器人系统安全运维与故障诊断能力，能判断基础模块的软硬件故障，有效应对异常情况及进行日志管理。

英文 / English

1. Understand the core technical framework for humanoid robot system safety and maintenance, and independently complete related development tasks.

2. Develop skills in humanoid system safety, maintenance and fault diagnosis. Identify hardware and software faults in basic modules, respond effectively to abnormal conditions, and manage logs.

具身智能方法与应用（强化学习）

Embodied Intelligence Methods and Applications (Reinforcement Learning)

课程信息

Course Information

48

建议学时

Recommended hours

3

建议学分

Recommended credits

配套硬件平台

Hardware Platform

Go2 Edu标准版

Go2 Edu U1



课程目标

Learning Objectives

中文 / Chinese

1. 概念理解：理解强化学习在四足机器人中的基本要素，能用工程语言描述任务。

2. 奖励函数能力：能针对“鲁棒地形行走/速度跟踪”类目标，设计并迭代奖励函数，并能解释其效果。

3. 工具链使用：能熟练使用强化学习及仿真工具链。

4. Sim2Real 落地：能将训练得到的策略部署到四足机器人实训台，在安全边界内完成基本任务，并产出评估结果。

英文 / English

1. Concepts: Understand the basic elements of reinforcement learning for quadruped robots and describe tasks in engineering terms.

2. Reward design: Design and refine reward functions for robust terrain walking or velocity tracking, and explain their effects.

3. Toolchains: Use reinforcement learning and simulation toolchains proficiently.

4. Sim2Real deployment: Deploy trained policies on a quadruped training platform, complete basic tasks within safety limits, and produce evaluation results.

机器人认知与工程实践

Robot Cognition and Engineering Practice

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

G1 Edu 进阶版

G1 Edu - U2



课程目标

Learning Objectives

中文 / Chinese

1. 本课程以宇树 G1 人形机器人为载体，通过“展厅导览”这一可控、可验收的室内应用场景，训练学生将具身智能系统落到工程交付层面：把需求转化为可执行的任务模型；把“感知—决策—执行”闭环落实为可观测、可诊断、可迭代的工程系统；并以测试用例与指标体系完成验收与复盘。

2. 课程以工程化认知与闭环交付为主线，强调系统设计逻辑、异常处理与可靠性、数据与指标驱动的迭代优化。

英文 / English

1. Use the Unitree G1 humanoid in a controlled, testable indoor exhibition-guide scenario to develop engineering delivery skills. Convert requirements into executable task models, implement the perception, decision and execution loop as an observable, diagnosable and iterative system, and complete acceptance testing and reviews using test cases and performance metrics.

2. Follow an engineering approach to robot cognition and complete delivery, with emphasis on system design logic, exception handling and reliability, and iterative improvement driven by data and metrics.

机器人自主导航

Autonomous Robot Navigation

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

A2 Pro / As2 Edu 标准版

A2 Pro / As2edu-U1



课程目标

Learning Objectives

中文 / Chinese

1. 掌握移动机器人定位与建图（SLAM）的基本原理与常用算法。

2. 掌握全局与局部路径规划、避障与导航策略的理论与工程实现方法。

3. 能在真实场景中使用四足机器人实现室内外自主导航任务

英文 / English

1. Understand the fundamental principles and common algorithms of simultaneous localization and mapping (SLAM) for mobile robots.

2. Understand the theory and engineering implementation of global and local path planning, obstacle avoidance and navigation strategies.

3. Implement indoor and outdoor autonomous navigation tasks with a quadruped robot in real environments.

机器人操作与抓取

Robot Manipulation and Grasping

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

G1-D 旗舰版A

G1D-U6



课程目标

Learning Objectives

中文 / Chinese

1. 平台闭环熟练度：能熟练完成采集任务创建

2. 模板化采集能力：会用“任务模板 + 标签体系 + 场景配置模板 + 质检清单 + 交付包”组织采集工作，实现多人并行、质量可控、结果可复现

3. 工业 Demo 落地能力：通过两阶段项目形成岗位能力闭环

4. 协作与追溯能力：能按照角色分工开展数据生产，保证职责边界清晰、审核机制熟悉、交付证据链完整

英文 / English

1. Platform workflow: Create data collection tasks proficiently.

2. Template-based collection: Organize data collection with task templates, a labeling system, scene configuration templates, quality checklists and delivery packages. Support parallel work, controlled quality and reproducible results.

3. Industrial demo implementation: Develop a complete set of job skills through a project in two phases.

4. Collaboration and traceability: Produce data through defined roles, maintain clear responsibilities, understand review procedures, and preserve a complete chain of delivery evidence.

多机器人协同与系统集成

Multi-Robot Coordination and System Integration

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

G1 Edu U2
G1 头部双自由度模组

G1 Edu U2 + 2dof module



课程目标

Learning Objectives

中文 / Chinese

1. 掌握多机器人系统的基本模型与典型协同策略。

2. 理解系统集成的工程流程与关键技术要点。

3. 能够基于人形机器人G1-Comp和Robocup足球赛场景，完成小规模多机器人协同系统搭建。

英文 / English

1. Understand basic models of multi-robot systems and typical coordination strategies.

2. Understand engineering workflows and key technologies for system integration.

3. Build a small multi-robot coordination system using G1-Comp humanoids in a RoboCup soccer scenario.

行业场景综合设计

Integrated Design for Industry Applications

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

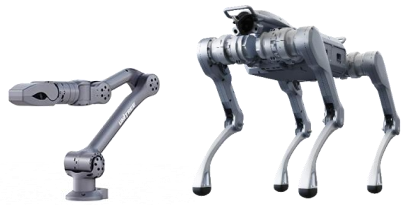
Recommended credits

配套硬件平台

Hardware Platform

A2 Pro 四足机器人
机械臂

A2 Pro + Robot Arm



课程目标

Learning Objectives

中文 / Chinese

本课程聚焦“行业场景→任务链路→系统方案→验证交付”的全流程设计能力。以电厂/电站巡检为蓝本，围绕四足机器人在复杂环境的移动能力与背载机械臂的近距操作能力，训练学生完成从场景抽象、工艺流程拆解、风险评估、任务规划、系统集成到验收评测的综合设计与工程实现。

英文 / English

Develop end-to-end design skills covering industry scenarios, task workflows, system solutions, validation and delivery. Using power plant and substation inspection as a reference, combine quadruped mobility in complex environments with close-range manipulation by a mounted robot arm. Complete scenario abstraction, process decomposition, risk assessment, task planning, system integration, and acceptance testing through integrated design and engineering implementation.

四足机器人实训台课程

Quadruped Robot Training Platform Course

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

Go2 Edu标准版
四足机器人实训平台

Go2 Edu U1
Quadruped training platform



课程目标

Learning Objectives

中文 / Chinese

1. 掌握四足机器人机械结构、电气系统与分布式控制架构的系统认知方法。

2. 掌握永磁同步电机FOC矢量控制原理与混合控制参数的调试方法，具备电机速度/位置/力矩控制与减速比换算能力。

3. 掌握多传感器数据同步技术，能独立完成D435i深度相机（彩色/深度/点云）、IMU（加速度/陀螺仪/磁力计）、激光雷达点云、语音模块的接入、标定与数据解析。

英文 / English

1. Develop a systematic understanding of quadruped mechanical structures, electrical systems and distributed control architectures.

2. Understand field-oriented control (FOC) for permanent magnet synchronous motors and learn to tune hybrid control parameters. Control motor speed, position and torque, and perform gear-ratio conversions.

3. Synchronize multiple sensors and independently connect, calibrate and parse data from a D435i depth camera (color, depth and point clouds), an IMU (acceleration, gyroscope and magnetometer), LiDAR point clouds, and speech modules.

人形机器人实训台课程

Humanoid Robot Training Platform Course

课程信息

Course Information

64

建议学时

Recommended hours

4

建议学分

Recommended credits

配套硬件平台

Hardware Platform

R1 专业版G
人形机器人实验台

R1edu-U7
Humanoid training platform



课程目标

Learning Objectives

中文 / Chinese

1. 掌握人形机器人实验台课程的核心技术体系，具备独立完成相关开发任务的能力。

2. 利用人形机器人实验台的丰富接口和模块，培养学生对人形机器人底层硬件系统的理解和操作能力。

英文 / English

1. Understand the core technical framework of the humanoid robot training platform course, and independently complete related development tasks.

2. Use the platform's interfaces and modules to develop an understanding of humanoid low-level hardware systems and the skills to operate them.



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请勿危险改造或使用机器人。

Do not modify or operate robots in unsafe ways.