Course Description
Bachelor of Engineering Program
Robotics and Automation System Engineering (International Program)
Academic Year 2024-present

Curriculum-Specific Courses

03607131 Computer Programming for Robotic Applications 3(2-3-6)

Function. Reusable modules and their use in multi-module software system. Fundamental of object oriented programming. Event-driven programming. Graphical user interface. Data representation. Basic database system.

03607151 Robotics Exploration 3(3-0-6)

Introduction to state of the art of robotic technologies. Basic robot component; mechanism, sensors, low level control system, and actuators. Basic programming. Learning by examples and hand-on experiments. Simple robot applications.

03607161 Computer-Aided Design for Robotic Applications 3(2-3-6)

Principles of computer-aided design. Basic 3D part solid modeling. Robot component modeling. Assembly modeling. Orthographic projection and drawing. Dimensioning and tolerancing. Assembly drawing and bill of materials. Freehand sketches. 3D Printing technologies. Rapid prototyping from 3D parts.

03607231 Microcontroller for Robotics and Automation System 3(3-0-6)

Introduction to microcontroller. Microcontroller architecture. Peripherals. Interface techniques. Memories. Input-output interfaces. Microcontroller programming. Interrupt. Microcontroller applications in robotics and automation systems engineering.

03607232 Introduction to Electrical System for Automation System 3(3-0-6)
Prerequisite: 03601211

Electrical devices. Semiconductor devices. Transformers. Electrical machines. Battery and energy sources. Basic electrical system installation. Wiring diagram. Basic power electronics and converters. Direct current motor and alternating current motor drives. Electrical safety in engineering works.

03607251 Computer-Aided Engineering and Manufacturing for Robotic Applications 3(3-0-6)

Three-dimensional robot modelling. Finite-element model in robot structural analysis. Evaluation of stress concentration, deformation, and safety of factors. Simulation and animation of robot motions. Creation of new material property. Fundamentals of CNC operations. CNC programming. Computer-aided process planning.

03607261 Engineering Measurements and Mechatronics 3(3-0-6)

Measurement of engineering quantity in electrical signal. Sensor characteristics. Measurement errors. System dynamic behavior. Dynamic response of measurement systems. Measurement of motion, strain, forces, and torques. Dynamic behavior of mechanical, electrical, and mechatronics systems. Actuators and electrical signal for control.

03607299 Engineering Project for Robotics and Automation System I 1(0-3-2)

Projects of practical interest in various fields of robotics and automation system engineering. Design and development of a basic robot or automation system.

03607311 Robot Structure and Machinery Design 3(3-0-6)

Fundamental of robot structure and machinery design. Industrial robot arm design. Motor selection. Design of simple mechanical elements of robot and machinery; screw fasteners, keys and pins, shafts, and power screws. Transmission design. Gears. Couplings. Bearings. Belts. Computer aided engineering. Robot structure and machinery design project.

03607312 Fundamentals of Robotics 3(3-0-6)

Principles of robotics. Representing position and orientation. Homogeneous transformation. Manipulator kinematics. Inverse kinematics. Jacobian. Trajectory generation. Manipulator dynamics. Using software for mathematical calculation and simulation of robot operations.

03607331 Machine Vision and Applications in Automation System 3(3-0-6)

Fundamental of digital image. Intensity transformation and spatial filtering. Color image processing. Edge and corner detection. Feature extraction. Image segmentation. Using of computer vision library. Image formation and camera model. Imaging with one camera. Camera calibration. Stereo imaging. Object recognition and tracking. Robot vision.

03607332 Artificial Intelligence for Robot and Machinery 3(3-0-6)

Introduction to artificial intelligence for robot and machinery. Mathematics for artificial intelligence. Knowledge representation and logic. Fuzzy logic. Agent. Search strategies. Planning. Genetic algorithm.

Decision tree. Bayesian learning. Artificial neural networks. Reinforcement learning. Applications of artificial intelligence for robot and machinery.

03607341 Control Engineering for Robotics 3(3-0-6)

Prerequisite: 01417267

Mathematical models of basic robotic systems. Closed-loop and open-loop control systems. Transfer function. Time-domain and frequency-domain analysis and design of control systems. Bode plots. System stability. PID and modified PID controller. Pole placement. Quadratic optimal regulator. State observers. Applications of various controllers for robotic systems.

03607342 Industrial Control and SCADA 3(2-3-6)

Introduction to industrial control. Analog signal conditioning. Digital signal conditioning. Sensors and transducers. Analog controllers. Digital controllers. Sequence control. Programmable logic controllers (PLC). PLC programming. PLC interfaces. Human-machine interface. PLC applications in automation systems. SCADA Systems.

03607351 Industrial Robot and Applications in Manufacturing Processes 3(2-3-6)

Overview of industrial robots. Mechanism of manipulators in industries. Actuators and sensors. Control system and components. Communication in industrial robot systems. Industrial robot operations and programming with teach pendant. Task modeling and simulation. Design and simulation of industrial robot systems for applications in manufacturing processes.

03607361 Industrial Automation System Design 3(2-3-6)

Electrical machines. Pneumatic and electrical pneumatic systems. Hydraulic and electrical hydraulic systems. Programming of programmable logic control for electrical machines, electrical pneumatic and electrical hydraulic systems. Applications and design of automation system in industry.

03607395 Study Abroad 1-6

Learning and self development from courses taken in oversea university. Credit equivalence according to Kasetsart University regulation.

03607396 Body of Knowledge from Overseas Studies 1-15

Knowledge in robotics and automation system engineering at the bachelor's degree level taken in overseas universities or institutes. Credit equivalence according to Kasetsart University regulation.

03607399 Engineering Project for Robotics and Automation System II 2(0-6-4)

Projects of practical interest in various fields of robotics and automation system engineering. Design and development of components of a robot or an automation system related to mechanical structures, control systems, vision systems, or related fields.

03607421 Tools Design for Robotics 3(3-0-6)

Prehension technology. Prehension strategy and procedure. Active pair mating. Design of impactive gripper. Contigutive prehension. Astrictive prehension. Vacuum suction. Magnetoadhesion. Tool exchange and reconfigurability. Separation of materials. Instrumentation and control.

03607422 Smart Embedded System in Robotics 3(3-0-6)

Cyberphysical and embedded systems technologies for robots. Concepts and architectures of embedded systems. Software organization and architectures for embedded systems. Embedded systems design flow. Time and clocks. Real world Input/Output (IO) and subsystem integration. Wired/wireless network and smart sensor systems in robots. Analysis tools, debugging tools and techniques. Real-time operating systems. Fuzzy logic systems. Hardware/Software co-design. Design for robustness and fault recovery in robotics.

03607451 Introduction to Autonomous Mobile Robots 3(3-0-6)

Introduction to mobile robot. Locomotion. Mobile robot kinematics. Perception. Mobile robot localization. Planning and navigation.

03607492 Work-Integrated Education 9

Work-integrated learning in industrial sector. On the job training as a temporary employee under systematically supervision through collaboration between academic and industrial personnel in the same organization continuously from the cooperative education semester.

03607496 Selected Topics in Robotics and Automation System Engineering 3(3-0-6)

Selected topics in robotics and automation system engineering at the bachelor's degree level. Topics are subject to change each semester.

03607498 Special Problems 1-3

Study and research in robotics and automation system engineering at the bachelor's degree level and compiled into written reports.

03607499 Engineering Project for Robotics and Automation System III 3(0-9-6)

Projects of practical interest in various fields of robotics and automation system engineering. Design and development of a robot or an automation system related to mechanical structures, control systems, vision systems, measurement systems, intelligent systems or related fields.

Curriculum-Related Courses

01417167 Engineering Mathematics I 3(3-0-6)

Limits and continuity of functions, derivatives and applications, differentials, integration and applications, polar coordinates, improper integrals, sequences and series, mathematical induction.

01417168 Engineering Mathematics II 3(3-0-6)

Prerequisite: 01417167

Vector and solid analytic geometry, calculus of multivariables functions, calculus of vector-valued functions.

01417267 Engineering Mathematics III 3(3-0-6)

Prerequisite: 01417168

First order linear differential equations. Linear differential equations with constant coefficients. Laplace transforms and inverse transforms. Power series solutions. System of linear differential equations.

01420111 General Physics I 3(3-0-6)

Mechanics. Harmonic motion. Waves. Fluid mechanics. Thermodynamics.

01420113 Laboratory in Physics I 1(0-3-2)

Prerequisite or in the same semester: 01420111 or 01420117 Laboratory for General Physics I or Basic Physics I.

03600490 Co-operative Education 6

On the job training as a temporary employee according to the assigned project including report and presentation.

03601211 Electric Circuit Analysis I 3(3-0-6)

Definitions. Basic concept and units. Circuit elements. Node and mesh analysis. Circuit theorems. Resistance, inductance and capacitance. First and second order circuits. Phasor diagram. Sinusoidal signal. Alternating current power circuits. Three-phase systems.

03601213 Electric Circuit Laboratory 1(0-3-2)

Prerequisite: 03601211

Laboratory experiments on topics covered in Electric Circuit Analysis I (03601211)

03601434 Computer Aided Electronic System Development 3(3-0-6)

Engineering design process. Electronic system development. Computer aided development and life cycle of electronic system. Printed circuit board, surface-mount and rapid prototyping technologies. Technical documentation. Electronic system design related software. Schematic, library and component management. Electrical rule check and netlist. Circuit analysis and simulation. Board level design. Design recommendations for systems with special requirements.

03602201 Introduction to Materials and Manufacturing Processes 3(3-0-6)

Relationship between structures, properties, manufacturing processes and applications of engineering materials. Metals. Polymers. Ceramics. Composites. Mechanical properties and material degradation. Fundamental of manufacturing processes foundry, forming, welding, powder metallurgy, hot and cold forming, cutting, turning, shaping, drilling, milling, and surface finishing.

03602251 Engineering Economy 3(3-0-6)

Economic analysis for engineering decisions under certainty, uncertainty and risk situations. Time value of money. Investment analysis and incremental investment analysis. Break-even analysis. Government project analysis. Effects of inflation and income taxes.

03603101 Introduction to Computer Programming 3(2-3-6)

Computer concepts, Computer component, Hardware and software interaction, EPD concepts, Program design and development methodology, High-level language programming.

03604223 Basic Principles of Engineering Mechanics 3(3-0-6)

Prerequisite: 01417167

Force systems and resultant. Equilibrium. Dry friction. Application of equilibrium equations to structures and machines. Fluid statics. Kinematics and kinetics of particles and rigid bodies. Newton's laws of motion. Principles of work and energy. Impulse and momentum.

03604281 Workshop Practice 1(0-3-2)

Practice in work-piece measuring. Gas and arc welding. Metal sheet works. Lathe works. Safety in workshop.

03609231 Industrial Data Communication and Internet of Things 3(3-0-6)

Basic of data communication. Network protocols. TCP/IP network. Sensors and network devices. Wireless sensor networks. IoT applications.