Course Description

Course with 03609xxx

03609111   Basic Digital Modelling and Applications   3(2-3-6)

Principles of engineering drawing. Principles of computer-aided design, computer-aided manufacturing and computer-aided engineering. Basic 3D part modeling, assemblies and drawings. Machining theory. Automated CNC machining. Additive manufacturing technology. Basic structural analysis with software. CAD/CAM/CAE integration.

03609161   Digital Manufacturing System Engineering Exploration   1(0-3-2)

Introduction to digital technologies in manufacturing processes. Basic smart factory components. SCADA. Internet of things system. RFID and GPS tracking systems. ERP system. Automatic storage and retrieval systems. AGV and smart conveyor system. Industrial robot arm. Machine vision. Coordinate measuring machine. Career planning. Ethics. Industry site visits.

03609221   Production and Project Management   3(3-0-6)

Introduction to production planning and control. Forecasting. Aggregate production planning. Capacity planning. Master plan schedule. Job scheduling. Just-in-time, lean manufacturing and toyota production system. Fundamental of project management process and framework. Management of time, cost, quality, human resources, risk management. Procurement. Project life cycle management. Applications of PERT and CPM for project management. Project planning and control.

03609223   Digital Work Analysis and Design   3(3-0-6)
Prerequisite: 03602221
Productivity and work study. Method study. Work measurement. Ergonomics. Anthropometry. Work posture. Workstation and workspace design. Digital technologies in work analysis and design.

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.

03609271   Fundamentals of Computation for Digital Manufacturing System Engineering   3(3-0-6)
Prerequisite: 01417168

        First order and second order ordinary differential equations. Laplace transforms and the applications. Basic linear algebra; matrices and determinants, vector spaces, linear transform, eigenvalues and eigenvectors. Matrix decomposition, principal component analysis and singular value decomposition.

03609299   Digital Manufacturing System Engineering Project I   1(0-3-2)

        Interesting projects in various disciplines of digital manufacturing system engineering. Applying digital technologies for improving a small-scale manufacturing process.

03609322   Virtual Factory   3(2-2-5)
Prerequisite: 03602221

        Virtual factory overview and concepts. Probability and statistic for simulation. Layout planning simulation. Material flow simulation. Process simulation. Manufacturing data analytics. Virtual reality and Augmented reality analysis and validation. Manufacturing execution system.

03609324   Preventive and Predictive Maintenance   3(3-0-6)

        Concepts of preventative and predictive maintenance. Preventive and predictive maintenance techniques. Preventative and Predictive maintenance systems and Technology. Root cause analysis. Machine failure. Machine reliability. Maintenance schedule and plan. Condition-based maintenance techniques. Machine condition monitoring techniques. Reliability, productivity and cost analysis techniques. Overall equipment and effectiveness. Computerized maintenance management system.

03609332   Cyber Physical System and Cyber Security   3(3-0-6)

Prerequisite: 03609231

Introduction to cyber-physical systems and cyber security. Overview of cyber-physical systems. Fundamental of networking security. Control systems. Industrial networks. Introduction to industrial control systems. Ladder logic. Industrial network design and architecture. Industrial network protocols. Smart grid. Hacking. Securing industrial control systems. Privacy in cyber-physical systems and cyber security.

03609341   Digital Technology Applied in Manufacturing   3(2-2-5)

Introduction to computer integrated manufacturing. Flexible manufacturing systems. Digital technology in manufacturing System. Lean automation in manufacturing system. Just in time system. Quality control and automated inspection. Application of digital technology for material handling and storage system. Computer network for manufacturing. Manufacturing productivity and implementation.

03609344   Production Control System   3(3-0-6)

Prerequisite: 03601208

Introduction to production control systems. Principles of SCADA and industrial network security. SCADA architecture. Fundamentals of SCADA communication. System components; MTU and RTU Devices. SCADA visualization. Design and implementation of SCADA system. Basic concepts of DCS. DCS Classification. DCS hardware and software. DCS accessories.

03609351   Database Design and Data Mining   3(3-0-6)

Data models. Relational models. ER modeling. Database management systems. Structured query language. Association rule. Tools for data mining. Classification, clustering, and pattern mining approaches. Techniques in machine learning.

03609352 Industrial Data Analysis and Visualization 3(3-0-6)

  Prerequisite: 03609351

   Introduction to industrial data. Statistical data analysis. Learning from data. Forecasting. Regression. Pattern classification. Anomaly detection. Recommendation systems. Types of data visualization. Visualizing time series. Interactive data visualization.

03609353 Industrial Measurement and Quality Management 3(2-3-6)

   Introduction to industrial measurement technology. Specification on the drawing. Guaging. Coordinate measurement. Surface metrology. Form and position measurement. Laser measuring technology. Industrial sensors. Measuring uncertainty and traceability. Quality management methods and systems.

03609399 Digital Manufacturing System Engineering Project II 2(0-6-3)

   Interesting projects in various disciplines of digital manufacturing system engineering. Applying digital technologies for improving full-scale manufacturing processes.

03609426 Industrial System Analysis and Design 3(3-0-6)

   Introduction to manufacturing system. Concept of integrated production line design. Design and development of digital factory. Human machine interface design. Manufacturing execution system. Lean automation system. Integration of digital technology and automation system for smart factory.

03609433 Digital Reality in Industry 3(3-0-6)

   Introduction to digital reality; virtual reality, augmented reality, mixed reality, immersive technologies, 360 degree video. Hardware and software for digital reality. Applications of digital reality in industry.

03609451   Enterprise Information System   3(3-0-6)

       Introduction to enterprise information systems. Systems architecture of enterprise information systems. Business functions analysis. Enterprise Information System analysis and planning. Enterprise resource planning modules. Enterprise information systems integration. Enterprise Information System design and implementation. Project monitoring and control; system testing, enterprise system risks and controls, people and technology management, success and failure factors. Automatic identification and data capture systems and technology.

03609461   Smart Logistics and Transportations   3(3-0-6)

       Intelligent transport systems and logistics; data integration, logistics, multimodal transport, on-demand transport services. Transport information broker. Digital technologies in logistics and transportations; digitally-enabled ride, electric and autonomous vehicles.

03609462   Smart Warehouse   3(3-0-6)

       Introduction to smart warehouse. Automated picking tools. Automatic guided vehicles. Automated inventory control platforms. Warehouse management systems. IoT in warehouse. Collaborative robots. Automated storage and retrieval systems.

03609496   Selected Topics in Digital Manufacturing System Engineering   1-3

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

03609498   Special Problems   1-3

       Study and research in digital manufacturing system engineering at the bachelor's degree level and compile into written reports.

Course with extracurricular codes

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

　　　　Limits and continuity of functions. Derivatives and applications. Different integration and applications. Polar coordinates. Improper integrals, sequences an 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.

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 Corequisite: 01420111, 01420117

　　　　Laboratory for General Physics I or Basic Physics I.

03600390　Cooperative Education Preparation　3(3-0-6)

　　　　Principles. Concepts and processes of cooperative education. Related rules and regulations. Basic knowledge and techniques in job application. Basic knowledge and techniques in working. Communication and human relations. Personality development. Quality management system in workplace. Presentations techniques. Report writing.

03600490　Co-operative Education　6

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

03601101 Introduction to Industrial Electronics Engineering 3(3-0-6)

Base number systems and codes. Basic logic gate and logic circuit design. Analog and digital conversion principles. Semiconductor devices. Industrial control. Input and output devices for industrial control. Power electronics basics and converters. Driving direct current motor and alternating current motor. Programmable logic controller (PLC) and interfaces. Basic applications of PLC in automation systems.

03601102 Introduction to Industrial Electrical Engineering 3(3-0-6)

Direct current and alternating current circuit analysis. Three phase systems. Basic electrical and electronic equipment. Basic electrical machine. Electrical measuring instruments. Basic electrical system installation in buildings and factories. Safety in electrical engineering.

03601206 Introduction to Industrial Electronics Engineering Laboratory 1(0-3-2)
Prerequisite: 03601101

Laboratory experiments on topics covered in Introduction to Industrial Electronics Engineering.

03601207 Introduction to Industrial Electrical Engineering Laboratory 1(0-3-2)
Prerequisite: 03601102

Laboratory experiments on topics covered in Introduction to Industrial Electrical Engineering.

03601208 Automation System in Manufacturing 3(3-0-6)
Prerequisite: 03601101

Fundamental elements for automation in manufacturing process. Industrial controllers. Analog and digital signal conditioning. Process and motion control. Industrial sensors and actuators Sequential control and programmable logic controllers. PLC interfaces. PLC programming. Human-machine Interface. Overview of Industrial robots. Robot programming and simulation software. Robot programming hardware.

03601304   Automation System in Manufacturing Laboratory   1(0-3-2)
            Prerequisite: 03601208

            Laboratory experiments on topics covered in Automation System in
Manufacturing.

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.

03602221   Applied Probability and Statistics for Engineers   3(3-0-6)
            Prerequisite: 01417168

            Descriptive statistics in basic engineering. Probability. Random
variables. Discrete probability distributions. Continuous probability distributions.
Joint probability distributions. Sampling distributions. Statistical inference for
one and two populations. Engineering applications.

03602401   Financial and Economic Analysis   3(3-0-6)

            Profitability analysis: cost estimation, financial estimation, rate of return
estimation, and financial evaluation. Resource-ability analysis: value-added,
effects of income taxes and inflation, and economic rate of return.

03602417   Innovative Product Design and Manufacturing   3(3-0-6)

            Introduction to ages of industry. Product design processes. Creative and
innovative thinking. Conceptual design. Feasibility analysis. System-level design.
Detail design. Design for manufacturing and assembly. Additive manufacturing.
Product evaluation and improvement. Product life cycle management. Startup
entrepreneurship. Patents.

03602442   Energy Management   3(3-0-6)

Energy conservation in industrial plants. Audit and analysis of energy consumptions of lighting. Air-conditioned. Heat energy. Air compression and electrical systems. Materials and products balance chart. Techniques for energy conservation. Economy engineering applications in energy management. Energy measuring devices and technology. Modern techniques and technology in energy conservation.

03602473   Strategies for Managing Supply Chains   3(3-0-6)

Supply chain strategy and corporate strategy interface. Porter's value chain. Logistics costs. Supply chain performance. Matching supply and demand. Bullwhip effect. Collaborative planning forecasting and replenishment. Sales and operations planning. Supply chain strategy design. Lean concepts in supply chain. Agile concepts in supply chain. Responsive supply chain. Hybrid supply chain. Managing risk in supply chain. Era of network competition. Creating sustainable supply chain.

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

Computer concepts. Computer components. Hardware and software interaction. EDP concepts. Program design and development methodology. High-level language programming.

03603102   Basic Computer Architecture and Embedded System   3(3-0-6)

Basics of computer architecture. Computer arithmetic. Memory system organization and architecture. Interface and communication. Assembly language. Device subsystems. Processor design and organization of CPU. Performance and enhancements. Distributed system models. Embedded systems technologies, architecture, and design. Embedded systems peripherals. Digital and analog inputs/outputs. Interrupts, timer, and watchdog. Storage. Sensors and transducers. Wired communications. State machines. Wireless sensors networks and smart systems. Model-based programming.

03603103   Basic Digital Circuit Design   3(3-0-6)

Basic digital system design. Boolean algebra. Digital design techniques. Logic gates. Logic minimization. Standard combinational circuits, sequential circuits. Flip-flops. Synchronous and asynchronous sequential circuits. PLA, ROM, and RAM. Arithmetic circuits. Computer-aided logic design.

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.