Vision:

Build high quality professionals in the interdisciplinary and diverse areas of robotics and automation to meet techno-societal needs.

Mission:

1. To maintain an academic ambience conducive to the development of intellectually capable and committed professionals.

2. To promote interdisciplinary and industry oriented research.

3. To nurture the culture of start-up and entrepreneurship.

Program Educational Objectives (PEO's):

PEO1: Design and develop robotics and automation systems.

PEO2: Apply the knowledge in multidisciplinary and diverse areas of robotics and automation research.

PEO3: Build successful careers as per the need of Indian and multinational industries/companies.

ProgramOutcomes:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature and analyze complex engineering problems researching substantiated conclusions using first principals of mathematics, natural science, and engineering sciences.

PO3: Design / development of solutions: Design solution for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge andresearch methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitation.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9: Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, as such, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principals and apply these to one's own work, as member and leader in team, to manage projects and in multidisciplinary environment.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

1. Identify the needs, analyze, design and develop simple robotic systems and program for diverse applications
2. Integrate robotics and automation systems and provide cost effective automation solutions.

Course Outcomes:

S.E. Robotics & Automation Engineering (Pune University, 2019 Pattern)   Sem-I

Subject 1 : Engineering Mathematics III (207007)

At the end of this course, students will be able to

1) Solve higher order linear differential equations and its applications to model and analyze mass spring systems.
2) Apply Integral transform techniques such as Laplace transform and Fourier transform to solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications.
3) Apply Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to Reliability engineering and probability theory in testing and quality control.
4) Perform Vector differentiation and integration, analyze the vector fields and apply to fluid flow problems.
5) Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.

Subject 2 : Industrial Electronics and Electrical Technology (211501)

At the end of this course, students will be able to

1. Develop the capability to identify and select suitable DC motor / induction motor /
2. Identify special purpose motor and its speed control method for given industrial application.
3. Program Arduino IDE using conditional statements
4. Interfacing sensors with Arduino IDE
5. Analyze Microcontrollers and embedded systems terminologies and sensors

Subject 3 : Strength of Materials (211082)

At the end of this course, students will be able to

1. Understand the concepts of stress and strain at a point as well as the stress-strain relationship for homogeneous, isotropic materials.
2. Understand the analysis and design the members subjected to tension, compression, torsion, bending and combined stresses using fundamental concepts of stress, strain and elastic behavior of materials.
3. Understand the procedure of determining the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading.
4. Understand analysis of slender, long columns and determine and illustrate principal stresses, maximum shearing stress and stresses acting on a structural member.

Subject 4: Manufacturing Technology (211502)

At the end of this course, students will be able to
1. Describe and classify metal casting processes
2. Classify and analyze various forming processes
3. Understand special casting and forming processes
 4. Classify and describe different types of welding and joining processes
5. Understand various non-conventional machining process.
6. Understand various applications of robots in manufacturing

Subject 5: Material Science and Engineering Metallurgy (211503)

At the end of this course, students will be able to

1. Define the mechanical properties of materials and conduct destructive and non-destructive tests to evaluate and test the properties of materials
2. Draw and explain equilibrium diagrams for various alloy systems
3. Work with Iron-Iron carbide equilibrium diagram and apply this knowledge for classification of steels from microstructure observations
 4. Select proper Heat Treatment, Surface Hardening technique & Isothermal Treatments for the steels considering properties and service requirements
 5. Distinguish different Alloy Steels and Cast Irons based on chemical compositions and microstructures
6. Familiarize with different types of non-ferrous alloys and Composites with their need scope and applications

S.E. Robotics & Automation Engineering (Pune University, 2019 Pattern) Sem-II

Subject 1: Industrial Engineering and Management (211508)

At the end of this course, students will be able to

1. Describe Principles and Types of Management
 2. Interpret Theories of Motivations and leadership
3. Develop Entrepreneurship skills
4. Apply various Tools and techniques of Industrial Engineering for Productivity improvement
 5. Apply Method study and examine the recorded facts and propose new method
6. Apply Work Measurement techniques to determine standard time
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Subject 2: Control System Engineering (211509)

After successful completion of the course students should be able to
1. Model a physical system and express its internal dynamics and input-output relationships by means of block diagrams, mathematical model and transfer functions.
 2. Understand and explain the relationships between the parameters of a control system and its stability, accuracy, transient behavior.
3. Identify the parameters that the system is sensitive to. Determine the stability of a system and parameter ranges for a desired degree of stability.
4. Plot the Bode, Nyquist, Root Locus diagrams for a given control system and identify the parameters and carry out the stability analysis.
5. Determine the frequency response of a control system and use it to evaluate or adjust the relative stability.
 6. Design a P, PD, PI, or PID controller based on the transient and steady state response criteria.

Subject: 3 Design of Machine Elements (211510)

Course Outcomes: On successful completion of the course students should be able to-

1. Understand the basic principles and process of machine design

2. Understand the theories of failures and Factor of safety to design mechanical component.
3. Analyze the stress and strain on mechanical components such as shaft, power screws, mechanical springs, gears, and bearings.
4. Understand, identify and quantify failure modes for mechanical parts such as shaft, power screws, mechanical springs, gears, and bearings.
5. Demonstrate knowledge on basic machine elements used in design of machine elements to withstand the loads and deformations for a given practical application.

Subject 4: Metrology and Quality Assurance (211511)

Course Outcomes: After learning this subject, the student will be able to:

1. Describe and work with various linear and angular measuring devices
2. Design limit gauges and work with special measuring devices for gear, screw thread and surface finish measurements
3. Distinguish various comparators and use profile projector
4. Use various control charts and various quality assurance tools
5. Get knowledge of various quality standards and their implementations in industries.
6. Implement TQM and TPM concepts in practice

Subject 5: Computer Graphics for Robotics (211512)

Course Outcomes: After learning this subject, the student will be able to:

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Use of geometric transformations on graphics objects and their application in robot kinematics analysis.
3. Demonstrate the application of Bezier curves and interpolation in robot path planning
4. Apply concept of analytic geometry and geometric algebra for modelling in robotic physics

Subject 6: Project Based Learning (211099)

1. Project based learning will increase their capacity and learning through shared cognition.
2. Students able to draw on lessons from several disciplines and apply them in practical way.
3. Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

T.E. Robotics & Automation Engineering (Pune University, 2019 Pattern) Sem-I

Subject 1: Embedded System in Robotics(311501(A))

Course Outcomes: After successful completion of this course, the student will be able to

1. Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
2. Get familiarized with programming environment to develop embedded solutions.
3. Program ARM microcontroller to perform various tasks.
4. Understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices

Subject 2: Hydraulics and Pneumatics(311502(A))

Course Outcomes: Students will be able to

1. Exemplify the basic principles of Industrial fluid power.
2. Select and specify various components for hydraulic and pneumatic systems.
3. Execute PLC program for electro-hydraulic circuit applications
4. Organize hydraulic and pneumatic circuits for given application
5. Evaluate the hydraulic and pneumatic systems based on various evaluation criteria

Subject 3: Robot Kinematics and Dynamics(311503(A))

Student will be able to:

1. Select the type of mechanism for the robotic applications
2. Perform kinematic analysis, synthesis of mechanisms.
3. Perform forward and inverse kinematics of robots
4. Apply design procedure for mechanical grippers depending upon their types and mechanism
5. Design of robot manipulators based on dynamic analysis

Subject 4: Sensor Technology(311504(A))

Course Outcomes: After successful completion of this course, the student will be able to

1. Choose sensor for a particular application
2. Check the performance of the sensor under test.
3. Design signal conditioning circuitry for a sensor
4. Analyze the specifications of various types of sensors
5. Understand the principals of advance sensors

Subject 5: Elective 1-Industrial Robotics and Material handling Systems (311505(A)-III)

Course Outcomes: Students will be able to

1. Understand about material handling system
2. Understand storage and data capturing system
3. Describe the basic concepts, parts of robots and types of robots.
4. Select the robots according to its usage.
5. Describe various applications of robots, justification and implementation of robot

Subject 6 : Seminar (311506)

At the end of this course, students will be able to

1. Acquire Knowledge and skill for proper Literature review and it's analysis of specific Process.

2. Able to perform small experimentation to investigate chemical engineering data on working models.

3. Acquire innovative problem solving skills and conceptualization of creative ideas.

4. Understand report writing skills with the help of research papers, Journals and Reference books.

5. Acquire presentation and communication skills.

T.E. Robotics & Automation Engineering (Pune University, 2019 Pattern) Sem-II

Subject 1: Robot Programming (311508(A))

Course outcomes: Student will be able to:

1. Explain robot programming methods
2. Understand the components of robot programming
3. Develop simple programs to simulate robot movements
4. Develop robot programs for specific application
5. Describe the safety rules in robot handling

Subject 2: Artificial Intelligence for Robotics (311509(A))

Course outcomes: Student will be able to:

1. Select appropriate artificial intelligence method/algorithm to handle various issues in robotics
2. Demonstrate various algorithms used in artificial intelligence
3. Apply artificial intelligence algorithms to robotics problems
4. Compare the performance of AI algorithms
5. Build solution methodology to solve complex problems in flexible automation

Subject 3: Flexible Manufacturing Systems(311510(A))

Course outcomes: Students should be able to:
1. Understand FMS and its applications.
2. Implement GT.
3. Perform CNC programming
4. Apply the concept of computer integrated manufacturing in FMS scenario

5. Understand basics of Tool Management System.

Subject 4: Elective 2-Micro-electro-mechanical Systems(311511(A)-I)

Course outcomes: Students should be able to:

1. Understand the operation of micro devices, micro systems and their applications
2. Design the micro devices, micro systems using the MEMS fabrication process.
3. Gain a knowledge of basic approaches for various sensor design
4. Gain a knowledge of basic approaches for various actuator design

Subject 5: Internship (311513)

At the end of this course, students will be able to
1. Get practical exposure of actual processes/operations in the chemical industry.
2. Apply theoretical knowledge gained from Chemical Engineering courses to actual Problems in the Chemical industry.
3. Acquire innovative problem solving skills and conceptualization of creative ideas.
4. Acquire presentation, communication and report writing skills.
5. Get acquainted with management skill, organizational structure and improve teamwork Qualities.