Pimpri Chinchwad Education Trust's

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune

DEPARTMENT OF MECHANICAL ENGINEERING

Curriculum Structure and Syllabus
of
Honor in Automation and Robotics
(Approved by BoS Mechanical Engineering)
(Course 2020)

Effective from Academic Year 2023-24

Institute Vision

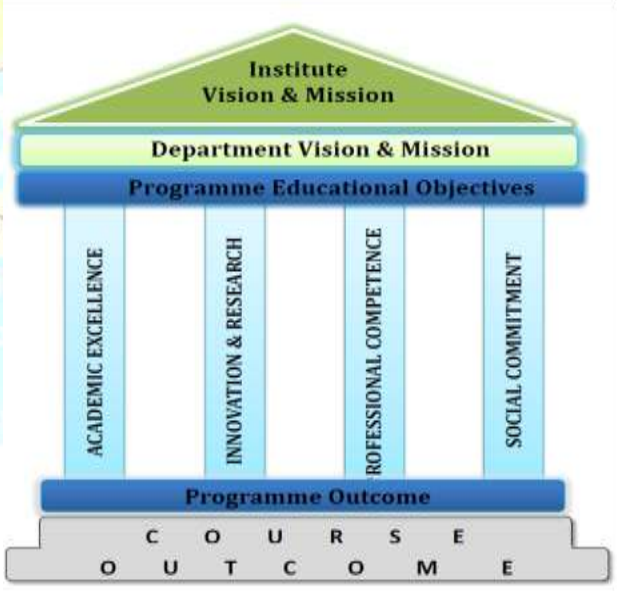
To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute.
2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education.
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations.

Quality Policy

We at PCCOE are committed to impart Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders. We shall strive for academic excellence, professional competence and social commitment in fine blend with innovation and research. We shall achieve this by establishing and strengthening state-of-the-art Engineering and Management Institute through continual improvement in effective implementation of Quality Management System.



.

Preface

Looking at Global Scenario to enhance the employability skills and impart deep knowledge in emerging/ multidisciplinary areas, an additional avenue is provided to passionate learners through the Minors and Honors Degree Scheme in academic structure.

For Honors degree program, student has to earn additional 20 credits in emerging area of one's own domain.

Objectives of Honors Degree

- To enable students to pursue allied academic interest in contemporary areas.
- To provide effective yet flexible options for students to achieve basic to intermediate level competence in the contemporary area.
- To enhance the employability skills with different combinations of competencies and flavors.
- To provide an academic mechanism for fulfilling demand of specialized areas from industries for higher order skill jobs.
- To provide a strong foundation to students aiming to pursue research/ higher studies in the Contemporary field of study.

Preface of Honor in Automation and Robotics

Automation and Robotics can be considered as the most advanced automatic systems and robotics, as a technique and scientific discipline, can be considered as the evolution of automation with interdisciplinary integration with other technological fields. The two parts are essential in an automatic system and are integrated in the sense that their design and operation must be considered as a unique goal in order to obtain and operate an automatic system with the best performances.

Automatic systems are often designed with the aim of having the possibility of an easy updating of their structure and operation with the purpose of being adjusted more quickly to the mutable demands of production and design of products. These very flexible systems are denominated as 'flexible automatic systems'

Robotics is interdisciplinary engineering and is considered a high-end professional career. Robotics deals with designing and building the manipulator structure and its control.

Job opportunities are available for Robotics engineers in manufacturing plants, laboratories, medical fields, mining, automation sector, life sciences, aerospace engineering, agricultural engineering, etc. Also, there is a demand for robotic engineers in gaming, nuclear science, exploration of the sea, etc. There are good opportunities in higher education to pursue a career in the field of Robotics, such as M. Tech in Robotics, M. Tech in Automation and Robotics, M. Tech in Intelligent Systems and Robotics, M. Tech in Mechatronics, etc.

Course Objectives:

The course aims to:

- To provide an interdisciplinary environment and bring together the students groups involved in robotics, control engineering, industrial automation and other upcoming technologies.
- To facilitate extra curriculum activities in the area of Robotics and Automation.
- Demonstrate strong professional skills to work effectively in multi-disciplinary areas with a growth mindset.
- Creation of knowledge pool of students with high-end technical skills ready for research, Industry and higher studies.

Course Outcomes:

At the successful completion of this Minor program, students will be able to:

- Explore opportunities and career in Robotics and Automation.
- Identify the right industrial automation for a given application.
- Apply the knowledge of various controllers in the projects and Industry.
- Identify recent developments in Robotics and Automation

INDEX

LIST OF ABBREVIATIONS IN CURRICULUM STRUCTURE

Sr. No.	Abbreviation	Type of Course
1.	L	Lecture
2.	P	Practical
3.	T	Tutorial
4.	H	Hours
5.	CR	Credits
6.	IE1	Internal Evaluation 1
7.	IE2	Internal Evaluation 2
8.	ETE	End Term Evaluation
9.	TW	Term Work
10.	OR	Oral
11.	PR	Practical
12.	PROJ	Project

CREDIT DISTRIBUTION: SEMESTER WISE						
1 Lecture hour = 1 Credit 2 Lab Hours = 1 Credit 1 Tutorial Hour = 1 Credit						
Sr. No	**Course Title**	**Credits/Semester**				
		5	**6**	**7**	**8**	Total
1.	Automation	**4**	**0**	**0**	**0**	**4**
2.	Robotics: Kinematics and Programming	**0**	**4**	**0**	**0**	**4**
3.	Robotics: Kinematics and Programming Lab	**0**	**1**	**0**	**0**	**1**
4.	Control System	**0**	**0**	**3**	**0**	**3**
5.	Control System Lab	**0**	**0**	**1**	**0**	**1**
6.	Seminar	**0**	**0**	**2**	**0**	**2**
7.	Integrated Project	**0**	**0**	**0**	**5**	**5**
	Total	**4**	**5**	**6**	**5**	**20**

Curriculum structure

AUTOMATION AND ROBOTICS

Honor in Mechanical Engineering

Curriculum structure

AUTOMATION AND ROBOTICS

Honor in Mechanical Engineering

Semester	Course Code	Course Name	Teaching Scheme					Evaluation Scheme						
			L	P	T	H	CR	IE	MTE	ETE	TW	PR	OR	Total
V	HME5977	Automation	4	-	-	4	4	20	30	50	-	-	-	100
VI	HME6977	Robotics: Kinematics and Programming	3	-	1	4	4	20	30	50	-	-	-	100
VI	HME6978	Robotics: Kinematics and Programming Lab	-	2	-	2	1	-	-	-	25	-	25	50
VII	HME7975	Control System	3	-	-	3	3	20	30	50	-	-	-	100
VII	HME7976	Control System Lab	-	2	-	2	1	-	-	-	25	-	25	50
VII	HME7977	Seminar/Mini-Project/MOOC/Industrial Training	-	4	-	4	2	-	-	-	25	-	25	50
VIII	HME8979	Integrated Project	-	10	-	10	5	50	-	-	50	-	50	150
			10	18	1	29	**20**	130	90	150	125	-	125	**600**

Abbreviations are: L-Lecture, P-Practical, T-Tutorial, H- Hours, IE- Internal Evaluation, MTE- Mid Term Evaluation, ETE- End Term Evaluation, TW –term work, PR-Practical, OR - Oral

Course Syllabus

AUTOMATION AND ROBOTICS

Semester - V

Program:	Honor in Automation and Robotics					Semester: V		
Course:	Automation					Code: HME5977		
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	IE	MTE	ETE	TW	Total
4	-	4	4	20	30	50	-	100

Prior knowledge of:

a. Manufacturing practices,
b. Mechatronics……..are essential

Course Objectives:

Students are expected to study,

1. The need for Automation
2. Automated Material handling and assembly systems
3. Types of drives and Sensors used in Automation

Course Outcomes:

The students will be able to,

1. UNDERSTAND the basic concepts of Automation.
2. SELECT the appropriate Automated Material handling and assembly system.
3. IDENTIFY and EVALUATE appropriate Drive and sensor for Applications

Detailed Syllabus

Unit	Description	Duration (H)
1	**Introduction** Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Levels of Automation. **Flexible Manufacturing System:** Types, Advantages, Limitations	10
2	**Types of Automation** Transfer Mechanism, Buffer Storage, Control Functions, and Automation for Machining Operations, Design and Fabrication Considerations. Analysis of Automated Flow Lines: General Terminology and Analysis, Analysis of Transfer Lines Without Storage, Partial Automation, Automated Flow Lines with Storage Buffers, Computer Simulation of Automated Flow Lines	10
3	**Automated material handling** Material handling function, Types of Material Handling Equipment. Automated Guided Vehicle Systems. Automated Storage Systems, Automated Storage/Retrieval Systems. Automated flow lines with storage buffers.	10
4	**Automated Assembly** Automated flow lines and transfer mechanisms, Analysis of transfer lines without storage. Types of Automated Assembly Systems, Part Feeding Devices, Multi-station Assembly Machines, Analysis of a Single Station Assembly Machine.	10
5	**Drives** Working principle of synchronous, Asynchronous & stepper motors. DC and AC motors operation and selection, method of control and application of brushless DC motor, PMSM, stepper motor, A. C servomotor, selection criteria for servo motor and servo amplifier, universal motor. Hydraulic motor and Pneumatic motor.	10
6	**Sensors** Encoders: Absolute and Incremental: - Optical, Magnetic, Capacitive, pneumatic Position Sensors Range Sensors: Range Finders, Laser Range Meters, Touch Sensors, Force and torque sensors. Safety Sensor: Light Curtain, Laser Area Scanner, Safety Switches; Low level & High-level Vision, Sensing & Digitizing, Image Processing & analysis, Segmentation, Edge detection,	10
	Total	60

Text Books:

1. Groover, M. P., (2016), "Automation, Production Systems, and Computer-integrated Manufacturing," Pearson Education, ISBN: 9789332572492
2. Deb, S. R., Deb, S., (2017), "Robotics Technology and Flexible Automation," McGraw Hill Education, ISBN: 9780070077911

Reference books:

1. Sandler, B. Z., (1999), "Robotics: Designing the Mechanisms for Automated Machinery," Academic Press/Prentice Hall, ISBN: 9780137816002
2. Derby, S. J., (2004), "Design of Automatic Machinery," CRC Press, ISBN: 9780824753696
3. Gupta, A. K., Arora, S. K., Westcott, J. R., (2016), "Industrial Automation and Robotics: An Introduction," Mercury Learning & Information, ISBN: 9781938549304
4. Niku, S. B., (2020), "Introduction to Robotics, Analysis, Control, Applications," Wiley, ISBN: 9781119527626
5. Siegwart, R., Nourbakhsh, I. R., Scaramuzza, D., (2011), "Introduction to Autonomous Mobile Robots," The MIT Press, ISBN: 9780262015356

Course Syllabus

AUTOMATION AND ROBOTICS

Semester - VI

Program:	Honor in Automation and Robotics					Semester: VI			
Course:	Robotics: Kinematics and Programming					Code: HME6977			
Teaching Scheme				Evaluation Scheme					
Lecture	Tutorial	Hours	Credit	IE 1	MTE	TW	OR	ETE	Total
3	1	4	4	20	30	-	-	50	100

Prior knowledge of:

a. Theory of Machines,
b. Mechatronics,
c. Basics of Electrical and Electronics Engineering……..are essential

Course Objectives:

Students are expected to study,

1. various types of Robots and the functional elements of Robotics
2. Study the basic Mathematical Modeling of Robot
3. Understand the basics of Robot Programming

Course Outcomes:

After learning the course, the students should be able to:

1. UNDERSTAND the basic concepts of Robotics
2. DEVELOP Mathematical Model for the kinematics of Robot
3. Write a program for the robot

Detailed Syllabus

Unit	Description	Duration (H)
1.	**Introduction** Structure, classification and applications, robot anatomy, dexterity and robot compliance. Positions, orientations and frames of a rigid body, homogeneous transformations.	10
2.	**Manipulator kinematics** Representation of joints and links using Denavit-Hartenberg parameters, direct kinematics of robots. Algebraic solution and Geometric solution for inverse kinematics.	10
3.	**Velocities and static forces** Linear and angular velocity of links, velocity propagation, manipulator Jacobians, Singularity analysis, Static forces in manipulators	10
4.	**Trajectory generation** Considerations in path description, Joint space schemes, and Cartesian space schemes. Geometric problems with paths.	10
5.	**Basics of Robot Programming** Method, Robot Programming as a path in space, Motion interpolation, motion & task level Languages, Robot languages classifications and structures.	10
6.	**Robot Language: VAL** VAL language commands, motion control, hand control, program control, pick and place application, palletizing application, welding application	10
	Total	60

Text Books:

1. Craig, J., (2021), Introduction to Robotics: Mechanics and Control, Pearson, ISBN: 9781292164939
2. Saha, S. K., (2017), "Introduction to Robotics" McGraw-Hill Education, ISBN: 9789332902800
3. Deb, S. R., Deb, S., (2017), "Robotics Technology and Flexible Automation," McGraw Hill Education, ISBN: 9780070077911

Reference Books:

1. Sandler, B. Z., (1999), "Robotics: Designing the Mechanisms for Automated Machinery," Academic Press/Prentice Hall, ISBN: 9780137816002
2. Tsai, L. W., (1999), "Robot Analysis: The Mechanics of Serial and Parallel Manipulators," Wiley-Interscience, ISBN: 9780471325932
3. Nagarajan, R., (2016), "Introduction to Industrial Robotics," Pearson Education India, ISBN: 9789332544802
4. Gupta, A. K., Arora, S. K., Westcott, J. R., (2016), "Industrial Automation and Robotics: An Introduction," Mercury Learning & Information, ISBN: 9781938549304
5. Niku, S. B., (2020), "Introduction to Robotics, Analysis, Control, Applications," Wiley, ISBN: 9781119527626
6. Mittle, R., Nagrath, I., (2017), "Robotics and Control," McGraw Hill Education, ISBN: 9780070482937

Program:	Honor in Automation and Robotics							Semester : VI
Course:	Robotics: Kinematics and Programming Lab							Code : HME6978
Teaching Scheme				Evaluation Scheme				
Lecture	Practical	Hours	Credit	IE 1	MTE	TW	OR	ETE	Total
-	2	2	1	-	-	25	25	-	50

Prior knowledge of:

a. Theory of Machines,
b. Mechatronics,
c. Basics of Electrical and Electronics Engineering……..are essential

Course Objectives:

Students are expected to study,

1. Simulation of various type of Robots
2. Write robot programs

Course Outcomes:

After learning the course, the students should be able to:

1. Simulate configuration of robots
2. Generate trajectory for various paths
3. Write and Simulate robot program

Detailed Syllabus: (24 Hours)

List of Experiments:

1. Simulation of Cartesian/ cylindrical/ spherical robot.
2. Simulation of Articulated/ SCARA robot.
3. Virtual modelling for kinematics of robot using suitable software
4. Generate trajectory for a path generation task
5. **Robot program for** pick and place application
6. **Robot program for** palletizing application
7. **Robot program for** welding application

Text Books:

1. Craig, J., (2021), Introduction to Robotics: Mechanics and Control, Pearson, ISBN: 9781292164939
2. Saha, S. K., (2017), "Introduction to Robotics" McGraw-Hill Education, ISBN: 9789332902800
3. Deb, S. R., Deb, S., (2017), "Robotics Technology and Flexible Automation," McGraw Hill Education, ISBN: 9780070077911

Reference Books:

1. Sandler, B. Z., (1999), "Robotics: Designing the Mechanisms for Automated Machinery," Academic Press/Prentice Hall, ISBN: 9780137816002
2. Tsai, L. W., (1999), "Robot Analysis: The Mechanics of Serial and Parallel Manipulators," Wiley-Interscience, ISBN: 9780471325932
3. Nagarajan, R., (2016), "Introduction to Industrial Robotics," Pearson Education India, ISBN: 9789332544802
4. Gupta, A. K., Arora, S. K., Westcott, J. R., (2016), "Industrial Automation and Robotics: An Introduction," Mercury Learning & Information, ISBN: 9781938549304
5. Niku, S. B., (2020), "Introduction to Robotics, Analysis, Control, Applications," Wiley, ISBN: 9781119527626
6. Mittle, R., Nagrath, I., (2017), "Robotics and Control," McGraw Hill Education, ISBN: 9780070482937

Course Syllabus

AUTOMATION AND ROBOTICS

Semester - VII

Program:	Honor in Automation and Robotics						Semester: VII		
Course:	Control system						Code: HME7975		
Teaching Scheme				Evaluation Scheme					
Lecture	Practical	Hours	Credit	IE1	MTE	TW	OR	ETE	Total
3	-	3	3	20	30	-	-	50	100

Prior knowledge of:

a. Mechatronics
b. Fundamentals of electricals and electronics
c. Basics of Mathematics
d. Basics of Simulation and Coding using tools like MATLAB ……..are essential

Course Objectives:

Students are expected to study,

1. Basics of control systems and identify an appropriate control system for any mechanical / electro-mechanical application
2. The mechanical system modelling and stability analysis of the mechanical system

Course Outcomes:

After learning the course, the students should be able to:

1. Categorize, identify and select an appropriate control system for any application.
2. Perform system modelling and stability analysis of a mechanical system.

Detailed Syllabus:

Unit	Description	Duration (H)
1.	**Basic concepts of control systems** Definition, classification, Relative merits and demerits of open loop and closed loop control systems, Linear and non-linear systems.	7
2.	**Types of control systems and their applications** Servo systems, Automatic regulating systems, Process control systems, Adaptive control systems, Learning control systems, Discrete control systems, Multivariable control systems.	8
3.	**System modeling and control** Concept of the transfer function, Block diagram reduction, Signal flow graph: Mason's gain formula, Modeling of mechanical systems.	7
4.	**PID control system** Introduction & applications of PID, PI controller design, PD controller design, PID controller design, Lead compensation, Lag compensation, Lead and Lag compensation, PID tuning.	8
5.	**Stability analysis** Concept of stability analysis, Routh-Hurwitz criterion, Root locus techniques, Nyquist criterion.	7
6.	**State space analysis** Concept of state, state variables and state models, state space equations, transfer function from state variable representation, transfer model, State space representation of dynamic systems, state transition matrix, controllability and observability	8
	Total	**45**

Text Books:

1. William Bolton, Mechatronics: Electronics Control Systems in Mechanical and Electrical Engineering, 6th Ed, 2019
2. K.P. Ramchandran, G.K. Vijyaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical
3. Electronic Systems, Willey Publication, 2008
4. Esposito A, Fluid Power with application, Prentice Hall
5. Majumdar S.R, Oil Hydraulic system- Principle and maintenance, Tata McGraw Hill
6. Majumdar S.R, Pneumatics Systems Principles and Maintenance, Tata McGraw Hill
7. Stewart H. L, Hydraulics and Pneumatics, Taraporewala Publication

Reference Books:

1. Alciatore and Histand, Introduction to Mechatronics and Measurement Systems, 5th Ed, 2019
2. Bishop (Editor), Mechatronics – An Introduction CRC 2006
3. Mahalik, Mechatronics – Principles, concepts and applications, Tata Mc-Graw Hill publication, New Delhi
4. C.D.Johnson, Process Control Instrumentation Technology, Prentice Hall,New Delhi 5. Bolton, Programmable Logic Controller, 4th Ed, Newnes, 2006
5. 5.Bolton, Programmable Logic Controller, 4th Ed, Newnes, 2006
6. Pipenger J. J, Industrial Hydraulics, McGraw Hill
7. Pinches, Industrial Fluid Power, Prentice Hall
8. Yeaple, Fluid Power Design Handbook
9. Andrew A. Parr, Hydraulics and Pneumatics, Elsevier Science and Technology Books
10. ISO - 1219, Fluid Systems and components, Graphic Symbols

Program:	Honor in Automation and Robotics						Semester: VII		
Course:	Control system Lab						Code: HME7976		
Teaching Scheme				Evaluation Scheme					
Lecture	Practical	Hours	Credit	IE 1	MTE	TW	OR	ETE	Total
-	2	2	1	-	-	25	25		50

Prior knowledge of:

a. Mechatronics
b. Fundamentals of electricals and electronics
c. Basics of Mathematics
d. Basics of Simulation and Coding using tools like MATLAB……..are essential

Course Objectives:

Students are expected to study,

1. The mechanical system modelling and stability analysis of the mechanical system
2. The design and analysis of mechanical / electro-mechanical system using any modern technique

Course Outcomes:

After learning the course, the students should be able to:

1. Perform system modelling and stability analysis of mechanical system.
2. Design and Analyse the mechanical / electromechanical control systems using any modern technique

Detailed Syllabus: (24 Hours)

Assignments:

1. Modeling and analysis of mechanical / electro-mechanical system using computer simulation
2. Design and analyze PID Controller for DC Motor
3. Design of PID controller for any mechanical system using simulation software
4. Design of PID Controller for first order and second order systems
5. Stability analysis using Routh- Hurwitz method
6. Stability analysis of linear system using graphical method

Text Books:

1. William Bolton, Mechatronics: Electronics Control Systems in Mechanical and Electrical Engineering, 6th Ed, 2019
2. K.P. Ramchandran, G.K. Vijyaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical
3. Electronic Systems, Willey Publication, 2008
4. Esposito A, Fluid Power with application, Prentice Hall
5. Majumdar S.R, Oil Hydraulic system- Principle and maintenance, Tata McGraw Hill
6. Majumdar S.R, Pneumatics Systems Principles and Maintenance, Tata McGraw Hill
7. Stewart H. L, Hydraulics and Pneumatics, Taraporewala Publication

Reference Books:

1. Alciatore and Histand, Introduction to Mechatronics and Measurement Systems, 5th Ed, 2019
2. Bishop (Editor), Mechatronics – An Introduction CRC 2006
3. Mahalik, Mechatronics – Principles, concepts and applications, Tata Mc-Graw Hill publication, New Delhi
4. C.D.Johnson, Process Control Instrumentation Technology, Prentice Hall,New Delhi 5. Bolton, Programmable Logic Controller, 4th Ed, Newnes, 2006
5. 5.Bolton, Programmable Logic Controller, 4th Ed, Newnes, 2006
6. Pipenger J. J, Industrial Hydraulics, McGraw Hill
7. Pinches, Industrial Fluid Power, Prentice Hall
8. Yeaple, Fluid Power Design Handbook
9. Andrew A. Parr, Hydraulics and Pneumatics, Elsevier Science and Technology Books
10. ISO - 1219, Fluid Systems and components, Graphic Symbols

Program:	Honor in Automation and Robotics						Semester: VII		
Course:	Seminar/Mini-Project/MOOC/Industrial Training						Code: HME7977		
Teaching Scheme				Evaluation Scheme					
Lecture	Practical	Hours	Credit	IE 1	MTE	TW	OR	ETE	Total
-	4	4	2	-	-	25	25	-	50

Prior knowledge of:

a. Robot Kinematics,
b. Programming,
c. Control System,
d. Mechatronics,
e. Theory of Mechanisms…….are essential

Course Objectives:

Students are expected,

1. To identify practical learning skills and concepts and learn to communicate them to society.
2. To encourage the personal growth of students and the development of practical communication skills.

Course Outcomes:

After learning the course, the students should be able to:

1. Get an overview of the current trends and learn them in more detail.
2. Improve Practice in written and oral presentations.
3. Learn the research methods used in that specific field.

Detailed Guidelines: (48 Hours)

Seminar/Mini-Project/MOOC/Industrial Training is a course requirement where in under the guidance of a faculty member a student is expected to do an in-depth study on the topic relevant to latest trends in the field of concerned Honor selected by him / her and approved by the authority; by doing literature survey, understanding different aspects of the problem and arriving at a status report in that area. While doing Seminar/Mini-Project/MOOC/Industrial Training, the student is expected to learn investigation methodologies, study relevant research papers, correlate work of various authors/researchers critically, study concepts, techniques, prevailing results etc., analyze it and present a seminar report. It is mandatory to give a presentation on Seminar/Mini-Project/MOOC/Industrial Training before a panel constituted for the purpose. The grading will be done on the basis of the depth of the work done, understanding of the problem, report and presentation by the student concerned.

1. Guidelines for the Preparation of Seminar/Mini-Project/MOOC/Industrial Training Report

- Report should have at least 20 and at most 30 pages.
- The entire pages of the report should be in A4 size strictly, with 1" top and bottom margin and 1.25" left and right margin.
- The entire report should be typed in Times New Roman with (12 Pt.)
- The title and main headings of the paragraphs are to be in bold.
- Report may be divided into the number of chapters as required, with chapter number assigned on the top left corner and chapter name immediately below it (with single line spacing) using Times New Roman (16 Pt. Bold).
- Every sub heading should be given decimal of whole number of the heading. (e.g1.1).
- The complete text should be justified in the report (no left or right aligning).
- No short forms are to be used in the report besides the specified areas.
- Numbering of each figure and table should be done according to the chapter number.
- Numbering of each page should be done in the footer section at the bottom right corner.
- Each line should be separated by a line spacing of 1.5, and each paragraph by line spacing of 2.

2. Contents in the Report:

- The Cover
- Cover page. (Same as The Cover)
- Certificate from Department/Industry
- Acknowledgement.
- Abstract.
- Table of content.
- List of figures and tables
- The report.
- References and appendices

3. Guidelines for Presentation:

- The presentation shall be limited to 15 minutes plus 10 minutes questions and answers.

Course Syllabus

AUTOMATION AND ROBOTICS

Semester - VIII

Program:	Honor in Automation and Robotics					Semester: VIII	
Course:	Integrated Project					Code: HME8979	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Hours	Credit	IE	TW	OR	Total
-	10	10	5	50	50	50	150

Prior knowledge of:

a. Robot Kinematics,
b. Programming,
c. Control System,
d. Mechatronics,
e. Theory of Mechanisms……..are essential

Course Objectives:

Students are expected to study,

1. Interdisciplinary implementation of Automation and Robotics

Course Outcomes:

The students will be able to,

1. Understand, plan and execute a project.
2. Design a real-time application
3. Prepare a technical report based on the project.
4. Deliver technical seminars based on the project work carried out.
5. Understand publication and copyright process of research

Guidelines: Total: 40 h (contact) + 80 h (non-contact/implementation)

1. A group of 3 to 4 students needs to design and demonstrate the project under the guidance of the allocated guide.
2. Students can choose the project considering their implementation in Major Project.
3. The hardware implementation and or software simulation is compulsory.
4. Project Report should be submitted in compliance with term work associated with the subject.
5. Paper publication associated with the project as research outcome is appreciable.
6. Project work preferably should be completed in the laboratory/ industry.

Detailed Syllabus

Sr. No.	Activity	Duration (H)
1	Semester VIII (week 1 & 2): Project guide allotment, Finalization of topic and platform, Planning of the work, Literature review, identifying a problem, and formulating the problem for the project	20
2	Semester VIII (week 3 & 4): Methodology finalization, finalizing project proposal, Review 1 for finalization of topic and specification.	20
3	Semester VIII (week 5 & 6): Simulation of Ideas on appropriate software tools and finalization of hardware	20
4	Semester VIII (week 7 & 8): Implementation of the project as a prototype. Review 2 to understand the progress of the project	20
5	Semester VIII (week 9 & 10): Project Report writing and publication or copyright planning and execution.	20
6	Semester VIII (week 11 & 12): Demonstration of Project work and Final Review for submission and term work compliances.	20
	Total	120