Curriculum Structure of

B. Voc. Mechatronics Engineering

and

Syllabus of B. Voc. Program

(Course 2023)

(Approved by Board of Studies, B. Voc. Program, PCCoE)

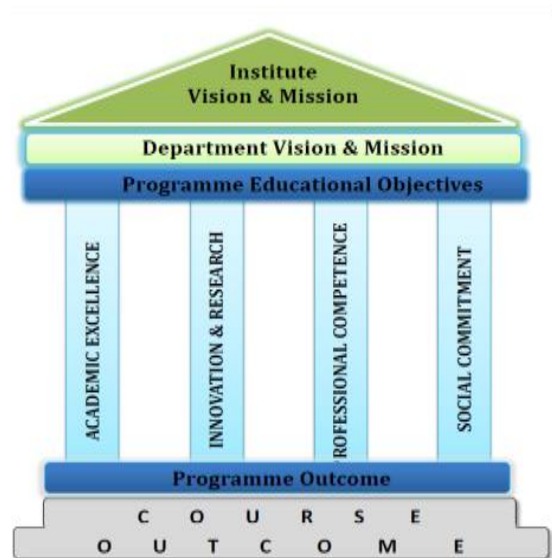# Effective from Academic Year 2023-24

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.

.

INDEX

ABBREVIATIONS

Abbreviations	Course Full Name
MJ	Major/ Core Course
MI	Minor/ Program Specific Course
MD	Multidisciplinary course
AEC	Ability Enhancement Course
VAC	Value added Course
SEC	Skill Enhancement Course: Internship/ Project/ Mini Project

CURRICULUM STRUCTURE

FOR IST YEAR B. Voc. (MECHATRONICS ENGINEERING)
SEMESTER I

B. Voc. Structure		Sem-I	Teaching Scheme				Examination Scheme						
Course Code	Course Type	Course Name	L	P	H	CR	IE1	IE2	ETE	TW	OR	PR	Total
VME21101	MJ	Core Course I:: Sensors and Actuators	3	-	3	3	25	25	50	-	-	-	100
VME21201/ VLM21201	MI	Pr. Sp. EL. Course I	3	-	3	3	25	25	50	-	-	-	100
VME21301	MD	Multidisciplinary Course I: Applied Science	2	-	2	2	20	20	40	-	-	-	80
VME21401	AEC	Ability Enhancement Course I: Writing skills		2	2	1	-	-	-	50	-	-	50
VME21501	VAC	Value added Course I: Health & wellness		2	2	1	-	-	-	50	-	-	50
VME21601	SEC	Internship I: On Job Training: CON/Q1003	-	20	20	10	-	-	-	-	-	200	200
		Total	8	24	32	20	70	70	140	100	-	200	580

SEMESTER II

B. Voc. Structure		Sem-II	Teaching Scheme				Examination Scheme						
Course Code	Course Type	Course Name	L	P	H	CR	IE1	IE2	ETE	TW	OR	PR	Total
VME22102	MJ	Core Course II: Microcontrollers	3	-	3	3	25	25	50	-	-	-	100
VME22202/ VLM22202	MI	Pr. Sp. EL. Course II	3	-	3	3	25	25	50	-	-	-	100
VME22302	MD	Multidisciplinary Course II: Applied Mathematics	2	-	2	2	20	20	40	-	-	-	80
VME22402	AEC	Ability Enhancement Course II: Language I (Soft Skill)		2	2	1	-	-	-	50	-	-	50
VME22502	VAC	Value added Course II: IT Tools		2	2	1	-	-	-	50	-	-	50
VME22602	SEC	Internship II: On Job Training.	-	20	20	10	-	-	-	-	-	200	200
		Total	8	24	32	20	70	70	140	100	-	200	580

LIST OF COURSES – PROGRAM-SPECIFIC ELECTIVE COURSE I

Course Code	Course Name	
VME21201	Engineering Drawing	Choose any one
VLM21201	Introduction to Logistics Management	

LIST OF COURSES – PROGRAM-SPECIFIC ELECTIVE COURSE **II**

Course Code	Course Name	
VME22202	Basics of Electrical & Electronics	Choose any one
VLM22202	Marketing Management & Customer Relationship Management	

Abbreviation: L- Lecture; **P**- Practical; **H**- Hours; **CR**- Credits; **IE 1** – Internal Evaluation-1; **IE 2**– Internal Evaluation-II; **ETE** – End Term Examination; **TW** – Term Work; **OR** – Oral Exam, **PR** – Practical Exam.

STRUCTURE FOR IIND YEAR B. Voc. (MECHATRONICS ENGINEERING) SEMESTER III

B. Voc. Structure		Sem-III	Teaching Scheme				Examination Scheme						
Course Code	Course Type	Course Name	L	P	H	CR	IE 1	IE 2	ETE	TW	OR	PR	Tota
VME23103	MJ	Core Course III	2	-	2	2	20	20	40	-	-	-	80
VME23104	MJ	Core Course III	-	2	2	1	-	-	-	-	-	50	50
VME23203	MI	Pr. Sp. Course III	2	-	2	2	20	20	40	-	-	-	80
VME23204	MI	Pr. Sp. Course IV	-	2	2	1	-	-	-	-	-	50	50
VME23303	MD	Multidisciplinary Course III	2	-	2	2	20	20	40	-	-	-	80
VME23403	AEC	Ability Enhancement Course III		2	2	1	-	-	-	50	-	-	50
VME23503	VAC	Value added Course III		2	2	1	-	-	-	50	-	-	50
VME23603	SEC	Internship III: On Job Training	-	20	20	10	-	-	-	-	-	200	200
		Total	**6**	**28**	**34**	20	60	60	**120**	**100**	**-**	**300**	**640**

SEMESTER-IV

B. Voc. Structure		Sem-IV	Teaching Scheme				Examination Scheme						
Course Code	Course Type	Course Name	L	P	H	CR	IE 1	IE 2	ETE	TW	OR	PR	Total
VME24104	MJ	Core Course IV	2	-	2	3	25	25	50	-	-	-	100
VME24105	MJ	Core Course V	-	2	2	1	-	-	-	-	-	50	50
VME24205	MI	Pr. Sp. Course V	2	-	2	2	20	20	40	-	-	-	80
VME24404	AEC	Ability Enhancement Course IV		2	2	1	-	-	-	50	-	-	50
VME24504	VAC	Value added Course IV		2	2	1	-	-	-	50	-	-	50
VME24604	SEC	Project I: Mini Project	-	4	4	2	-	-	-	-	-	50	50
VME24605	SEC	Internship III: On Job Training	-	20	20	10	-	-	-	-	-	200	200
		Total	**4**	**30**	**34**	20	45	45	**90**	**100**	**-**	**300**	**580**

Abbreviation: L- Lecture; **P**- Practical; **H**- Hours; **CR**- Credits; **IE 1** – Internal Evaluation-1; **IE 2**– Internal Evaluation-II; **ETE** – End Term Examination; **TW** – Term Work; **OR** – Oral Exam, **PR** – Practical Exam.

STRUCTURE FOR III^RD YEAR B. Voc. (MECHATRONICS ENGINEERING)

SEMESTER V

B. Voc. Structure		Sem-V	Teaching Scheme				Examination Scheme						
Course Code	Course Type	Course Name	L	P	H	CR	IE 1	IE 2	ETE	TW	OR	PR	Tota
VME25106	MJ	Core Course VI	2	-	2	3	25	25	50	-	-	-	100
VME25107	MJ	Core Course VII	-	2	2	1	-	-	-	-	-	50	50
VME25108	MJ	Core Course VIII	2	-	2	3	25	25	50	-	-	-	100
VME25109	MJ	Core Course IX	-	2	2	1	-	-	-	-	-	50	50
VME25206	MI	Pr. Sp. Course VI	2	-	2	2	20	20	40	-	-	-	80
VME25606	SEC	Internship V: On Job Training	-	20	20	10	-	-	-	-	-	200	200
		Total	6	24	30	20	70	70	140	-	-	300	580

SEMESTER-VI

B. Voc. Structure		Sem-VI	Teaching Scheme				Examination Scheme						
Course Code	Course Type	Course Name	L	P	H	CR	IE 1	IE 2	ETE	TW	OR	PR	Tota
VME26110	MJ	Core Course X	2	-	2	3	25	25	50	-	-	-	100
VME26111	MJ	Core Course XI	-	2	2	1	-	-	-	-	-	50	50
VME26207	MI	Pr. Sp. course VII	2	-	2	2	20	20	40	-	-	-	80
VME26607	SEC	Project II: Project	-	8	8	4	-	-	-	50	150	-	200
VME26608	SEC	Internship VI: On Job Training	-	20	20	10	-	-	-	-	-	200	200
Total			4	30	34	20	45	45	90	50	150	250	630

Abbreviation: L- Lecture; **P**- Practical; **H**- Hours; **CR**- Credits; **IE 1** – Internal Evaluation-1; **IE 2**– Internal Evaluation-II; **ETE** – End Term Examination; **TW** – Term Work; **OR** – Oral Exam, **PR** – Practical Exam.

Course Syllabus
Semester-I

Pimpri Chinchwad College of Engineering

Program:	B. Voc. (Mechatronics Engineering)			Semester: I		
Course:	Sensors and Actuators			Code: VME21101		
Teaching Scheme			**Evaluation Scheme**			
Lecture	Hours	Credit	IE 1	IE 2	ETE	Total
3	3	3	25	25	50	100

Course Objectives:
1. Study of means of measuring various physical variables.
1. Study of different types of sensors and actuators.

Course outcomes:
After learning the course, student will be able to
1. To understand role of Sensor and transducers in instrumentation
2. To understand Motion, Proximity and Ranging Sensors
3. To understand Force, Magnetic and Heading Sensors
4. To understand Optical, Pressure and Temperature Sensors
5. To understand Signal Conditioning and DAQ Systems
1. To understand different actuators

Detailed Syllabus:

Unit	Description	Duration (45 Hrs)
1	**Introduction** Mechatronics system building block, Basics of Measurement and types – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types, sensor selection	7
2	**Motion, Proximity And Ranging Sensors** Motion Sensors – Potentiometers, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT, RVDT, Accelerometer., GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR)	7
3	**Force, Magnetic And Heading Sensors** Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers	7
4	**Optical, Pressure And Temperature Sensors** Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermister, RTD, Pt 100, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors	8
5	**Signal Conditioning And DAQ Systems** Amplification – Filtering – Sample and Hold circuits, analog to digital conversion, Data Acquisition: Single channel and multi- channel data acquisition – Data logging – applications - Automobile, Aerospace, Home appliances, Manufacturing	8
6	**Actuators** Stepper and Servo motors, Basics of Stepper and Servo motors, Types of Stepper and servomotors, Construction, working principle, technical specifications and selection, Advantages and Disadvantages, Solenoids: Construction, working principle	8

Text Books:

1. Bolton W., *Mechatronics: Electronics Control Systems in Mechanical and Electrical Engineering*, Pearson Publication, 2019.

2. Ramchandran K. P., Vijayaraghavan G. K., Balasundaram M. S., *Mechatronics: Integrated Mechanical Electronic Systems*, Willey Publication, 2008.

Reference Books:

1. Alciatore D. G., *Introduction to Mechatronics and Measurement Systems*, Mc-Graw Hill publication, 2019.
2. Mahalik N. P., *Mechatronics Principles, concepts and applications*, Tata Mc-Graw Hill publication, 2016.

Program:	B. Voc. (Mechatronics Engineering)		Semester: I			
Course:	Engineering Drawing		Code: Code: VME21201			
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**IE 1**	**IE 2**	**ETE**	**Total**
3	3	3	25	25	50	100

Course Objectives:
1. To develop imagination of physical objects to be represented on paper for engineering communication.
2. To develop the interpretation and manual drawing skills.
3. To develop the physical realization and manual drawing skill

Course Outcomes:
After learning the course, students will be able to

1. Understand the drawing sheets, dimensioning and tolerances
2. Understand and draw the projections of point and line on reference planes, inclined planes.
3. Understand the orthographic projections, first and third angle projections methods, draw orthographic views
4. Understand and draw the Isometric scale, construction of Isometric view of simple objects
5. Understand and draw the development of lateral surfaces of simple solids.
6. Understand and draw the free hand sketches of standard components of machine.

Detailed Syllabus:

Unit	Description	Duration (45 Hrs)
1	**Introduction** Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Tolerances – methods of representing tolerances, unilateral and bilateral tolerances, tolerance on linear and angular dimensions, geometrical tolerances.	7
2	**Projection of Line and Planes** Introduction, Projection of points – points on the different quadrants and on the reference planes. Projection of straight lines (only first angle projection method) – Line on the reference planes - perpendicular to one plane and parallel to other plane – inclined to one plane and parallel to the other plane – parallel to both the planes –inclined to both the planes. Projection of planes (only first angle projection method) - Types of planes, Projection of planes perpendicular to both the reference planes, Perpendicular to one plane and parallel to other plane, Perpendicular to one plane and inclined to the other plane, Inclined to both planes.	8

3	**Orthographic Projections** Reference planes, types of orthographic projections – First angle projections, Third angle projections, methods of obtaining orthographic views by First angle method.	6
4	**Isometric View** Introduction, Isometric scale, construction of Isometric view of simple objects from given orthographic.	8
5	**Development of Lateral Surfaces of Solids** Introduction, Development of lateral surfaces of Cone, Cylinder, Pyramid and Prism.	8
6	**Freehand Sketching and introduction of AutoCAD software** Free hand sketching -- FV and TV of standard machine parts – Hexagonal headed nut and bolt, foundation bolts, shafts, keys, couplings, springs, human heights, doors, windows	8

Text Books:
1. Bhatt N.D., and Panchal V.M., *Engineering Drawing, Charotar Publishing House*, 2010.
2. Agrawal B., and Agrawal C M "*Engineering drawing*", Tata McGraw Hill Education Private Limited., 2014.

Reference books:
1. Gill P.S., *Engineering drawing*, S.K. Kataria & Sons., 2016.
2. Gopalakrishnan.K.R., *Engineering Drawing*, (Vol.I and Vol.II), Dhanalakshmi publishers, 1970.
3. Venugopal. K, and Sreekanjana G., *Engineering Graphics*, New Age International Publishers. 2019.
4. Natarajan K. V., *A text book of Engineering Drawing Graphics*. Dhanalakshmi Publishers, 2008.

Program:	B. Voc. (Mechatronics Engineering)			Semester: I			
Course:	Introduction to Logistics Management			Course Code: VLM21201			
Teaching Scheme				Evaluation Scheme			
Lecture	Hours	Credit	IE 1	IE 2	ETE	Total	
3	3	3	25	25	50	100	

Course Objectives:

1. To develop knowledge about key elements of logistics processes,.
2. To understand about the interconnectedness of business units and organizations (via the flow of products, money, and information) through Logistics Management.
3. To incorporate and learn the critical elements of logistics management processes based on the most relevant application in forward-thinking companies.
4. To incorporate a meaningful focus on the rate of change occurring in business today, and more specifically, in business logistics.

Course Outcomes:

After learning the course, students will be able to

1. **Understand** the fundamentals & various aspects of Logistics management .
2. **Understand** the critical elements of logistics Strategies.
3. **Apply t**he rationale process of planning and resourcing in Logistic Management.
4. **Develop** in depth knowledge about the vehicles costing and related documentation
5. **Understand** the concept of Concept of Integrated Logistics and Quality Customer Service
6. **Apply** current trends & Technologies of Logistics Information Systems .

Detailed Syllabus		
Unit	Description	Duration (45 Hrs)
1	**Introduction to Logistics** Concept and Definition of Logistics, Evolution of Logistics, Objectives of Logistics, Elements of Logistics, Importance of Logistics, Types of Logistics Process of Logistic Cycle Functions of Logistics, Concept and definition of Logistics Management, Key logistics efficiency metrics of Logistics Management, Model in Logistics Management., Role of logistics management, Effective Logistics and Competitive Advantage. Integrated Logistics Management, Logistics interface with marketing, Retails logistics. **Case –Study – Mumbai Dabbawalas**	8
2	**Logistics Strategies** Concept and definition of Manufacturing Logistics, three key components to effective manufacturing logistics, Common Challenges in Manufacturing Logistics. What is 4PL and what is 3PL? The difference between 4PL and 3PL, Concept and Definition of Logistics Strategy, Strategic role of logistics, Designing & implementing logistical Strategies. Strategy options: Lean strategies, Agile strategies & other strategies. Emerging concepts in logistics. Outsourcing Logistics: Reasons for outsourcing, Third party logistics provider, and Fourth party Logistics providers (4PL), Role of logistics providers. **Case –Studies on Lean & Agile Strategies**	8
3	**Planning and Resourcing** Need for Planning, Fleet management , Main types of road freight transport, Transport resource requirements, Vehicle routing and scheduling Vehicle Selection: Types of vehicle, Types of operations, Load types and characteristics, Main types of vehicle body, Implications of vehicle selection ,Vehicle acquisition.	7

4	**Vehicle Costing** Reasons for road freight transport vehicle costing , Main types of costing systems, Vehicle standing costs, Vehicle running costs, Overhead costs, Costing the total transport operation Documenting and Information Flow: Advices, Planning, FTL, LTL, Documentation– Road Receipts/Truck Receipts/Waybills(RR/LR) Consignment note CMR(EU&Canada) Booking – Invoicing & Information Flow - Long Haul – Coordination with terminals Exceptional Loads (Project Cargo). Legislation: Operator licensing – Driver licensing – Driver's hours regulations. **Case Studies on Documentation of Vehicle Planning**	8
5	**Integrated Logistics & Quality Customer Service** Concept of Integrated Logistics, Customer service, importance, elements, the order cycle system, distribution channels, Functions performed, Types, designing. **Case studies**	7
6	**CURRENT Contours** Logistics Information Systems – Need, Characteristics and Design. E-Logistics – Structure and Operation. Logistics Resource Management e-LRM. Automatic Identification Technologies. Reverse Logistics – Scope, design and as a competitive tool - Green Logistics	7

Text Books

1. David J. Bloomberg, Stephen Lemay, *Logistic,* 8th edition, Pearson Education Dorling Kindersley; 1st edition, 2015.

2. Satish C. Ailawadi& Rakesh Singh, *Logistics Management*, 2nd Edition, Prentice-Hall of India Pvt Ltd., New Delhi,2013.

Reference books:

1. F. Robert Jacobs, William Berry , D. Clay Whybark , *Manufacturing Planning and Control for Supply Chain Management*, McGraw-Hill Professional Publishing.

2. Manish Govil and Marie Proth, *Supply Chain Design and Management: Strategic and Tactical Perspectives*, JeanAcademic Press.

Program:	B. Voc. (Mechatronics Engineering)		Semester: I			
Course:	Applied Science		Code: VME21301			
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**IE 1**	**IE 2**	**ETE**	**Total**
2	2	2	20	20	40	80

Course Objectives:

To develop an ability of understanding the phenomena with the help of science concepts and relate them to applications.

Course Outcomes:

After learning the course, students will be able to

1. Understand the quality of water, its softening techniques and quality of fuel and its different types.
2. Interpret the optical phenomena - reflection, refraction, polarization with wave nature of light.
3. Understand what is corrosion, its types and its consequences in environment.
4. Summarize production of ultrasonic waves and their applications.

Detailed Syllabus:

Unit	Description	Duration (30Hrs)
1	**Water** Impurities in water, methods of their removal, hardness of water, its types and units. Chemical analysis of water by determination of hardness by EDTA method and its numericals. Disadvantages of hard water in boilers, Water softening techniques: Permutit Water purification by reverse osmosis **Fuel and their Classification** Definition, characteristics, classification into solid, liquid and gaseous fuel. Calorific value of fuels – GCV, NCV and their relation. Coal, its types and their properties, proximate analysis and ultimate analysis. Gaseous fuels- Gaseous fuels: Hydrogen gas as a future fuel, production by steam reforming of methane and coke, storage and transportation. .	8
2	**Optics:** Electromagnetic wave nature of light, electromagnetic spectrum, reflection and refraction of a wave from a plane surface, laws of reflection and refraction, total internal reflection, plane polarized light, Law of Malus.	8
3	**Corrosion** Theory of corrosion. Different types of corrosion: Pitting corrosion, concentration cell corrosion, stress corrosion and soil corrosion. Factors affecting corrosion: nature of metal and nature of environment. Prevention of corrosion by various methods using metallic and non- metallic coatings like – hot dipping, cladding, electroplating and cementation and powder coating.	7
4	**Vibrations &Ultrasonic waves:**	7

	Vibration as simple spring mass system, elementary and qualitative concept of free and forced vibrations, resonance	
	Ultrasonic waves, properties of ultrasonic waves, Productions of ultrasonic waves by magnetostriction and piezo-electric effect, application of ultrasonic in industry	

Text Books:
1. Jain and Jain, Engineering Chemistry, Dhanpat Rai Publishing Co., sixteenth edition ,2016.
2. M. N. Avadhanulu ,P.G. Kshirsagar , A text book of Engineering Physics, S. Chand publication ,revised edition, 2015

Reference books:
1. Wiley Editorial, Engineering Chemistry, Wiley India, 2nd edition, 2012.
2. O.G. Palanna, Engineering Chemistry, Tata McGraw-Hill Education, 2009.
3. R. K. *Gaur*, S. L. *Gupta ,* Engineering Physics, Dhanpat Rai Publications, 8th edition ,2001.

Pimpri Chinchwad College of Engineering

Program:	B. Voc. (Mechatronics Engineering)		Semester: I			
Course:	Writing Skills		Code: Code: VME21401			
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**IE 1**	**IE 2**	**TW**	**Total**
2	2	1	-	-	50	50

Objectives:
1. To introduce students to effective writing.
2. To expose students to various types of documents
3. To equip students with fundamental skills for effective written communication.

Course Outcomes: After learning the course students will;
1. Understand different writing styles such as descriptive and narrative writing.
2. Write summaries and persuasive letters
3. Write business emails and structured reports
4. Write job applications and resume/CV for job purposes

Detailed Syllabus:

Sr No	Description
1	**Introduction to Effective Writing Skills** Aspects and characteristics of writing skills. Importance of cohesion and coherence in writing.
2	**Write a descriptive paragraph:** Write a descriptive paragraph about a person, place, or object. Encourage them to use sensory details and vivid language to create a picture in the reader's mind.
3	**Write a personal narrative:** Write a personal narrative about a memorable event. Use descriptive language, dialogue, and reflection to make the story come alive.
4	**Write a summary and response:** Read an article or essay and write a summary of the main points, followed by a personal response that explains your thoughts and reactions to the piece.
5	**Write a persuasive letter:** Write a persuasive letter to a local or national government representative, expressing your opinions on a current issue or proposing a solution to a problem.
6	**Business email writing:** Write a business email on a given scenario. Write a formal email, using appropriate tone, format, and language..
7	**Report writing assignment:** Write a report on a given topic. Use clear prompt, a report outline, in a structured and professional format, using appropriate language and terminology.
8	**Job Application/ Cover Letter:** Write a job application in a professional format with all the necessary details.
9	**Resume/CV writing assignment:** Write a professional resume or CV. Use a professional format. Highlight skills, experiences, and qualifications relevant to the target job or industry.

Instructions:
- First lab activity is mandatory

- Any six assignments other than first lab activity to be conducted

Reference Books:

1. Seely, John. Oxford Guide to *Effective Writing and Speaking*. OUP 2nd edition, 2005
2. Goins, Jeff. *You Are a Writer* (So Start Acting Like One). Tribe Press
3. Brohaugh, William. *Write Tight: Say Exactly What You Mean with Precision and Power*.
4. Janzer. Anne. *The Writer's Process: Getting Your Brain in Gear.* Cuesta Park Consulting, 2016
5. King, Stephen. *On Writing: A Memoir of the Craft*. Scribner, 2010

Program:	B. Voc. (Mechatronics Engineering)			Semester: I		
Course:	Health and wellness			Code: Code: VME21501		
Teaching Scheme			**Evaluation Scheme**			
Practical	Hours	Credit	IE 1	IE 2	TW	Total
2	2	1	-	-	50	50

Objectives:

1. Prepare graduates to become wellness, health, fitness, nutrition education or foodservice professionals.
2. Prepare students for a variety of careers in wellness, fitness, food and nutrition education and foodservice.

Course Outcomes: After learning the course students will be able to;

1. Students will be able to describe the principles of health and wellness from a multidimensional and interdisciplinary perspective.
2. Students will be able to think and act ethically in the context of health, nutrition and wellness.

Guideline:

Total: Any 5 experiments/assignments to be conducted

Detailed Syllabus:

Sr.No	Description
1	**Psychology of happiness:** What is happiness? What makes us happy? Socio-economic factors and happiness; Positive emotions.
2	**Can we become happier?** Genetic set-point and hedonic adaptation; Sustainable happiness model and intentional activities.
3	**Happiness Activities 1:** Expressing gratitude and positive thinking; Love and kindness; Avoiding overthinking and social comparison.
4	**Happiness Activities 2:** Identifying signature strengths; achieving happiness with "Flow".
5	**Is happiness sufficient?** The concept of eudaimonic well-being; Self-determination and motivation.
6	**Meaning and purpose in life:** The concept of meaning in life and logo-therapy; Life goals., correlation with program specific case studies.

Reference Books:

1. W. Weiten, and M. A. Lloyd, *Psychology Applied to Modern Life*: Adjustment in the 21st Century, Wadsworth Publishing, 2007
2. R. Harington, *Stress, Health and well-being:* Thriving in the 21st century, Wadsworth Publishing, 2013.
3. I. Boniwell, *Positive psychology in a nutshell*, McGraw-Hill Education, 2012.
4. S. Lyubomirsky, *The how of happiness*, Penguine Press, 2008.

Program:	B. Voc. (Mechatronics Engineering)			Semester: I		
Course:	On Job Training			Code: VME21601		
Teaching Scheme			Evaluation Scheme			
Practical	Hours	Credit	TW	PR	OR	Total
20	20	10	-	200	-	200

Objectives:
1. To expose students to the industry environment and enhance their technical skills while working in private/public enterprises, government agencies, research labs, or any other organized technical club.
2. To apply knowledge and abilities relevant to engineering technology concepts, principles, and techniques to real-life industrial work/projects.
3. To develop higher-order thinking skills to work with people of diverse backgrounds and cultures and work effectively within cross-disciplined environments.

Outcomes:

On the completion of the OJT, students will be able to –
1. To apply the theoretical knowledge in real-life applications with new perspectives to problem-solving.
2. To practice communication and teamwork skills while building a professional network of prospective employment.
3. To write technical reports and document the project outcomes along with enhancing the technical presentations skills

Guidelines: Students will take on job training in the industry in the domain of Mechatronics Engineering as per the following job description and personal attributes.

Job Role: Mechatronics Maintenance Specialist

	Job Description
	A Mechatronics Maintenance Specialist is responsible for installing, testing, and using sensors, actuators, and microcontrollers in the mechatronics system. The individual is also responsible for carrying out the repair and maintenance of the mechatronics system.
	Personal Attributes
	The individual must have attention to detail, problem-solving skills and the ability to work in coordination with others. The individual must be able to work for long durations with concentration.

Course Syllabus
Semester-II

Pimpri Chinchwad College of Engineering

Program:	B. Voc. (Mechatronics Engineering)		Semester: II			
Course:	Microcontrollers		Code: VME22102			
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**IE 1**	**IE 2**	**ETE**	**Total**
3	3	3	25	25	50	100

Course-Objective:
1. Describe the architecture of 8086 microprocessors.
2. Develop programs for microprocessor and microcontrollers environmental issues
3. Compare microprocessors and microcontrollers
4. Understand 8051 microcontroller concepts, architecture and programming

Course Outcomes:
After learning the course, student will be able

1. Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, Interfacing of 8051 to external memory and Instruction set of 8051.
2. Write 8051 Assembly level programs using 8051 instruction set.
3. Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051.
4. Write 8051 Assembly language program to generate timings and waveforms using 8051 timers, to send & receive serial data using 8051 serial port and to generate an external interrupt using a switch.
5. Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 / Arduino

Detailed Syllabus:

Unit	Description	Duration (45 Hrs)
1	**8051 Microcontroller:** Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.	7
2	**8051 Instruction Set:** Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples (without loops) to use these instructions.	7
3	**8051 Stack, I/O Port Interfacing and Programming:** 8051 Stack, Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops. Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.	7
4	**8051 Timers and Serial Port:** 8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode- 2 on a port pin. 8051 Serial Communication- Basics of Serial Data Communication, RS- 232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.	8
5	**8051 Interrupts and Interfacing Applications:** 8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a switch, 8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Stepper motor and their 8051 Assembly language interfacing programming.	8

6	**Introduction to Arduino** role of embedded systems, open source embedded platforms, Introduction to Arduino IDE- features, IDE overview, Programming concepts: variables, functions, conditional statements, Concept of GPIO in Atmega328 based Arduino board, digital input and output. Interfacing of Atmega328 based Arduino board with LED and LCD/serial monitor, serial communication using Arduino IDE, Concept of ADC in Atmega328 based Arduino board, interfacing of Atmega328 based Arduino board with temperature sensor (LM35), LVDT, strain gauge	8

Text Books:

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay "The 8051 Microcontroller and Embedded Systems – using assembly and C", PHI, 2006
2. Kenneth J. Ayala "The 8051 Microcontroller", 3rd Edition, Thomson/Cengage Learning.
3. Barret Steven F, "Arduino Microcontroller Processing for Everyone!", 3rd Ed, Morgan and Claypool Publishers

Reference Books:

1. Manish K Patel "The 8051 Microcontroller Based Embedded Systems", McGraw Hill, 2014
2. Raj Kamal "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.

Program:	B. Voc. (Mechatronics Engineering)		Semester: II			
Course:	Basics of Electrical & Electronics		Code: VME22202			
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**IE1**	**IE2**	**ETE**	**Total**
3	3	3	25	25	50	100

Course Objectives:

1. To build strong conceptual understanding and fundamentals of basic electrical circuit, single phase and polyphase AC systems.

2. To impart basic knowledge for conceptual understanding of DC and AC machines

3. To acquire the basic knowledge of digital and analog electronics.

4. Familiarize students with various electrical measuring instruments and drives used in electrical and electronics engineering

Course Outcomes: After learning the course, students will be able to

1. Understand fundamental concepts of electrical engineering, DC circuits and work power and energy.

2. Apply the knowledge of single phase and three phase circuits to determine unknown electrical quantities.

3. Demonstrate the constructional features and operational details of DC and AC machines

4. Understand the concept of a number system and logic gates to implement any logic function.

5. Understand the characteristics and applications of Zener diodes, PN junction diode, LED and Photo diode.

6. Describe the different types of electrical drives and instruments used for voltage, current, and power measurements in various industrial applications.

Detailed Syllabus:

Unit	Description	Duration (45 Hrs)
1	**Elementary Concepts:** Concept of Potential difference. Current and resistance. Series and parallel circuits, Voltage and current dividers, Power and energy calculations, Ohm's law, Kirchhoff's Law, SI units of work Power and Energy, Conversion of energy from one form to another (Electricity bill verification as an activity)	7
2	**Single phase and poly phase A. C. circuits:** Generation of single phase sinusoidal A.C. voltages, AC quantities, phasor representation, Pure R, Pure L, and Pure C circuits, impedance, admittance, concept of active, reactive, apparent power and power factor. **(Verification of power factor for RL and RC circuit on multisim)** Polyphase A.C. Circuits: Introduction to 3 phase supply and its necessity, balance three phase system, relation between line and phase quantities (with phasor diagram), power in three phase circuits for star and delta connection **(Verification of line and phase values for star and delta on simulation platform)**	7

3	**DC and AC machines** **DC Machines:** Construction, working principle of D.C. generator, emf equation of DC generator (derivation not expected), working principle of D.C. motor, types of D.C. motor, Back emf (Numerical), Industrial applications. **(Demonstration of machine parts)** **AC Machines:** Single phase transformers: Construction, operating principle, emf equation, voltage and current ratios. Losses, Efficiency and regulation, Autotransformer. **(Understating of direct loading test on single phase transformer)**		8
4	**Fundamentals of Digital Electronics: Number System:** Introduction to number system, Conversion of number systems, Binary Code, 1's complement and 2's complement, Introduction to Digital Electronics: Basic logic Gates, Boolean Postulates/laws, De-Morgan Theorems. **(Verification of logic gates on digital trainer kit)**		7
5	**Basics of Semiconductor:** The P-N Junction Diode, V-I characteristics, Diode as Rectifier, specifications of Rectifier Diodes, Half Wave, Full wave, Bridge rectifiers, Zener Diode, Characteristics, Specifications, Zener Voltage Regulator, Types of Diodes: LED, Photodiode **(Demonstration of above devices on Virtual labs)**		8
6	**Measuring instrument and drives:** Measurement of Voltage, Current, and Power, Study of Energy meters, Use of CT and PT for measurement of power /energy in single phase and three phase Drives: Advantages of electrical and electronic drives, individual and group drive, selection of drives depending on load characteristics. **(Case study on selection of drive)**		8

Text Books:

1. I. J. Nagrath and Kothari (PHI learning Pvt.Ltd). "*Theory and problems of Basic Electrical Engineering*, Eastern Economy Edition.

2. Ashfaq Husain. "*Fundamentals of Electrical Engineering*", 4 th Edition, Dhanpat Rai & Co.),

3. V. N. Mittal and Arvind Mittal,. "*Basic Electrical Engineering*", 2 nd Edition, McGrawHill.

4. V.K. Mehta. "*Basic Electrical Engineering*", 1 st Revised Edition ,S. Chand & Co. Pvt. Ltd. NewDelhi.

5. R.P. Jain, Modern Digital Electronics, Prentice Hall of India,New Delhi 4 th edition

Reference Books:

1. D. C. Kulshreshta . "*Basic Electrical Engineering" ,1 st Edition ,Tata McGraw hill.*

2. B. L. Theraja and A. K. Theraja S. *A textbook of Electrical Technology Vol I S. Chand &*

amp; Co. Pvt. Ltd. New Delhi,1 st Edition.

3. B. L. Theraja and A. K. Theraj . *A textbook of Electrical Technology Vol II , S. Chand & amp; Co. Pvt. Ltd. New Delhi,1 st Edition*

4. Edward Hughes. *"Electrical Technology", 10 th Edition ,*Pearson.Ltd..

5. A. K. Sawhney Publisher*: Dhanpat Rai Publications,"* A Course in Electrical and Electronic Measurements and Instrumentation.

6. R. L. Boylestad & Louis Nashlesky *Electronic Devices Circuit Theory,* Pearson Education.

Pimpri Chinchwad College of Engineering

Program:	B. Voc. (Mechatronics Engineering)		Semester: II		
Course:	Marketing Management & Customer Relationship Management		Course Code: VLM22202		
Teaching Scheme			**Evaluation Scheme**		
Lecture	**Hours**	**Credit**	**IE 1**	**IE 2**	**ETE**	**Total**
3	**3**	**3**	**25**	**25**	**50**	**100**

Course Objectives:

1. To outline key marketing concepts and its application of market management.
2. To identify factors and processes essential for designing marketing strategy
3. To analyze and examine the implementation of marketing concepts, CRM and strategy to Firms.

Course Outcomes:

After learning the course, students will be able to

1. **Understand** the concept of Marketing & Marketing Mix .
2. **Understand** depth knowledge about Place Mix(Physical Distribution) in the business organizations.
3. **Develop** in depth knowledge about Customer Relationship Marketing.
4. **Understand** the basic concepts of Customer relationship management
5. **Apply** ECRM skills relevant to the corporate world.
6. **Apply** relevant skills for operational Customer relationship management.

Detailed Syllabus

Unit	Description	Duration (45 Hrs)
1	**Introduction to Marketing Management:** Introduction to Marketing and Marketing Management, Marketing Concepts – Functions of Marketing - The Marketing environment. Marketing Mix Product Decisions - concept of a Product - Product mix decisions - Product Life Cycle strategies- Stages in Product Life Cycle.	**8**
2	**Place/Physical Distribution Mix:** Meaning of Place/Physical Distribution Mix, Channels of Distribution, **Types of Distribution, Level/Channel,** factors which determine the choice of channels of distribution, **Components, of Physical Distribution,** Functions of Distribution Channel, Structure and Design of Marketing Channels Channel co-operation, conflict and competition–Retailers and wholesalers, **Factors determining Inventory Level. Case Studies**	**8**
3	**Customer Relationship Marketing (CRM):** Concept and definition of CRM, four main stages of CRM - Customer acquisition, Customer retention, Customer expansion, Customer reactivation, Customer relationship marketing, Benefits of Customer Relationship Marketing, **T**ypes of customer relationships**,** factors that impact customer relationships..**Case studies**	**8**

4	**Customer Relationship Management :** Concept of Customer relationship Management, Need for Customer Relationship Management, Steps to Customer Relationship Management, Types of CRM, Key cross functional CRM processes. Acquiring customers, customer's loyalty and optimizing customer relationships, strategic frame work of CRM –origins, the role of CRM, Case studies	**7**
5	**ECRM :** Concept & Definition of Electronic Customer Relationship Management (ECRM), Features of ECRM, differences between CRM and ECRM, The benefits of ECRM, Different levels of ECRM. Tools used in ECRM.	**7**
6	**IT System** Front office and back office applications –sales force automation, call centre management, marketing automation campaign management, selecting a CRM solution. Organizing for CRM implementation, CRM change and project management. Establishing a CRM performance monitoring system –standards, metrics and key performance indicators, CRM budget and CRM return on investment.	**7**

Text Books:

1. Ballou, R.H., Business Logistics Management: Planning, Organizing, and Controllingthe Supply Chain, 4th Ed., Prentice Hall, 1998.
2. Bowersox, D.J. and D.J., Closs, Logistical Management: The Integrated Supply ChainProcess, McGraw Hill, 1996.
3. Philip Kotler, Jha& Koshy, Marketing Management, Pearson Education, New Delhi.

Reference Books:

1. V. S Ramaswami& S. Namakumary, *Marketing Management*, MacMillan Publishers, New Delhi.
2. *Peelen E, D., Cutomer relationship management, Pearson Education 2010.*

Program:	B. Voc. (Mechatronics Engineering)		Semester: II	
Course:	Applied Mathematics		Code: VME22302	
Teaching Scheme			**Evaluation Scheme**			
Lecture	Hours	Credit	IE 1	IE 2	ETE	Total
2	2	2	20	20	40	80

Course Objectives: This course aims at enabling students,

    1. To familiarize with concepts and techniques in Elementary Calculus and Matrices.

    2. To get acquainted with statistic and probability techniques.

Course Outcomes: After learning the course, students will be able to

  1. Understand concepts of determinants and matrices and apply to solve simultaneous linear equation system.

  2. Solve differentiation and integration of different types of functions.

  3. Understand the concepts related to algebra of vectors.

  4. Apply statistic and probability techniques on different types of numerical data.

Detailed Syllabus:

Unit	Description	Duration (30 Hrs)
1.	**Linear Algebra:** Determinants: Definition and expansion of determinants of order 2 and 3, Cramer's rule to solve simultaneous equations in 2 and 3 unknowns Matrices: Definition of a matrix of order m X n and types of matrices, Algebra of matrices, Transpose of a matrix, Minor, cofactor of an element of a matrix, Adjoint of matrix and inverse of matrix by Adjoint method, Solution of simultaneous equations containing 2 and 3 unknowns by matrix inversion method.	7
2.	**Calculus:** **Differentiation:** Definition of derivatives, notations, Derivatives of standard functions, Rules of differentiation, Differentiation of Trigonometric, Exponential and Logarithmic function, Application of Derivatives: Geometrical meaning of derivative, tangent and normal, Maxima and minima. **Integration:** Definition of integration as anti-derivative. Integration of standard function, Rules of integration.	8
3.	**Vectors and Three-Dimensional Geometry:** Introduction to Three-Dimensional Geometry, Vectors: Definition of vector, position vector, Algebra of vectors (Equality, addition, subtraction and scalar multiplication) Dot (Scalar) product with properties, Vector (Cross) product with properties.	7
4.	**Statistics and Probability:** Measures of central tendency (mean, medium & mode) for ungrouped and grouped frequency distribution, Measures of Dispersion: range, mean deviation, standard deviation, Variance and coefficient of variation. Probability: Random Experiments and Events, Definition of probability, Addition and multiplication theorems of probability.	8

Total	**30**

Text Books:

1. J.K. Tyagi, S. K. Tyagi, Applied Mathematics-I, Khanna Publishing House, 1st Edition, 2012
2. Reena Garg, Engineering Mathematics,, Khanna Publishing House. 1st Edition, 2021

Reference Books:

1. H. K. Dass, Applied Mathematics for Polytechnics, CBS Publishers, India, 11th Edition, 2019
2. Dr. P. K. Shrivastava, Applied Mathematics – I,, Vayu Education of India, 2016
3. H. K. Dass, Dr. R. Verma, Rajesh Verma, Introduction to Engineering Mathematics, Vol. I, S. Chand Publication, 2018
4. H. K. Dass, Dr. R. Verma, Rajesh Verma, Introduction to Engineering Mathematics, Vol. II, S. Chand Publication, 9th Edition, 2019

Pimpri Chinchwad College of Engineering

Program:	B. Voc. (Mechatronics Engineering)			Semester: II			
Course:	Soft Skill			Code: VME22402			
Teaching Scheme			Evaluation Scheme				
Lecture	Hours	Credit	IE 1	IE 2	TW	Total	
2	2	2	-	-	50	50	

Objectives:

1. To introduce students to four skills of language
2. To expose students to public speaking
3. To equip students with fundamental skills for expressing thoughts in effective manner

Course Outcomes:

After learning the course students will be able

1. Understand the importance of listening and reading skills
2. Write well developed paragraphs and instructions
3. Develop skills required for public speaking
4. Present themselves effectively in different contexts

Detailed Syllabus:

Sr No	Description
1	**Introduction to Soft Skills with special reference to language skills** Importance, need of soft skills, Soft Skills V/s hard skills
2	**Listening Skills** Importance, Types and techniques for effective listening. Assignment: Listen and summarize the content.
3	**Reading Skills** Tips for effective reading, Types of reading. Assignment: Read the given article/text and summarize in your own words
4	**Writing Skills 1- Paragraph** Tips for effective writing, Cohesion and coherence in writing Assignment: Write a logical and well-developed paragraph on the given topic.
5	**Writing Skills 2 – Writing instructions** Writing clear, concise and compete instructions Assignment: Write instructions for processes or activities
6	**Speaking Skills 1 – Self Introductions** Tips for effective public speaking Assignment: Self introductions and describing job profiles.
7	**Speaking Skills 2 – Group Discussions** Assignment: Group Discussions and narrative incidents
8	**Speaking Skills 3 – Presentations** Assignment: Presenting ideas and thoughts before an audience**.**

| 9 | **Communication Skills**
Types of communication and barriers to communication
Assignment: Role play | |

Instructions:
1. First lab activity is mandatory
2. Any six assignments other than first lab activity to be conducted

Reference Books:
1. Rao Prasad N D V, English Grammar and Composition, S. Chand and Co. Pvt. Ltd, 2017.
2. Salaria R.S., and Kumar K.B., Effective Communication Skills, Khanna book publishing co. (P)Ltd, 2020.
3. Patil Z.N., Walke B., Thorat A., and Merchant Z., English For Practical Purposes, Macmillan Publication,2016.
4. Mishra S., and Muralikrishna C., Communication Skills for Engineers, Pearson India Publication,2011.
5. Bhatia V., Business Communication, Khanna book publishing co. (P)Ltd, 2013.

Program:	B. Voc. (Mechatronics Engineering)		Semester: II			
Course:	IT Tools		Code: VME22502			
Teaching Scheme			**Evaluation Scheme**			
Practical	Hours	Credit	IE 1	IE 2	TW	Total
2	2	1	-	-	50	50

Course Objectives:

1. To understand use of computer-based system in communication and fundamentals of Internet

2. To learn and understand MS office world using simple tools.

Course Outcomes: After learning the course, students will be able to

1. Demonstrate the computer components and how they are used for communication and networking.

2. Comprehend the use of MS office and Internet Communication

Guideline:

Total : 6 experiments/assignments to be conducted

Detailed Syllabus:

Sr No	Description
1	Study of Basic Computer fundamentals.
2	Demonstrate and Study of different types of computer networks and internet.
3	Create and manage professional documents using MS word.
4	Create and manage data using MS excel.
5	Create and manage presentation using power point.
6	Study of Internet Communication: Email, Social Media, etc.

Text Books:

1. Kumar B., *Mastering MS Office: Concise Handbook with screenshots*, V&S Publishers, 2017.
2. Orchids, *Microsoft Office 2007*, MS Office Series, 2018
3. Jain S., Kartika Geeta, *Microsoft Office 2010 Training Guide*, BPB Publications 2015.
4. Kurose James F., and Ross Keith W., *A Computer Networking: A top-down approach featuring the internet*, Pearson Publication, 2017.
5. Thareja Reema, *Fundamentals of Computers*, Oxford University Press, 2019.

Reference Books:

1. Ed Tittel, and Muthukumaran B., *Computer Networking*, Schaum's Outlines, TATA Mcgraw Hill Publications, 2006.
2. Peter Norton, *Introduction to Computers*, Tata Mcgraw Hill Publication, 2005.

Pimpri Chinchwad College of Engineering

Program:	B. Voc. (Mechatronics Engineering)			Semester: II			
Course:	On Job Training			Code: VME22602			
Teaching Scheme				Evaluation Scheme			
Practical	Hours		Credit	TW	PR	OR	Total
20	20		10	-	200	-	200

Objectives:
4. To expose students to the industry environment and enhance their technical skills while working in private/public enterprises, government agencies, research labs, or any other organized technical club.
5. To apply knowledge and abilities relevant to engineering technology concepts, principles, and techniques to real-life industrial work/projects.
6. To develop higher-order thinking skills to work with people of diverse backgrounds and cultures and work effectively within cross-disciplined environments.

Outcomes:
On the completion of the OJT, students will be able to –
4. To apply the theoretical knowledge in real-life applications with new perspectives to problem-solving.
5. To practice communication and teamwork skills while building a professional network of prospective employment.
6. To write technical reports and document the project outcomes along with enhancing the technical presentations skills

Guidelines: Students will take on job training in the industry in the domain of Mechatronics Engineering as per the following job description and personal attributes.

Job Role: Mechatronics Maintenance Specialist

	Job Description
	A Mechatronics Maintenance Specialist is responsible for installing, testing, and using sensors, actuators, and microcontrollers in the mechatronics system. The individual is also responsible for carrying out the repair and maintenance of the mechatronics system.
	Personal Attributes
	The individual must have attention to detail, problem-solving skills and the ability to work in coordination with others. The individual must be able to work for long durations with concentration.