

CHANDIGARH UNIVERSITY GHARUAN

Mechatronics Engineering



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Chandigarh University
Gharuan, Mohali-140413

Branch: Mechatronics Engineering

Course: Bachelor of Engineering (B.E)

Duration of Course: 4 years

Course code: BE ME-204

Program Outcomes (PO)

- PO1.** An ability to apply knowledge of mathematics, science and engineering.
- PO2.** An ability to design and conduct experiments, to evaluate the performance of a Mechatronics system or component with respect to specifications, as well as to analyze and interpret data.
- PO3.** An ability to design mechatronics system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
- PO4.** An ability to function effectively as members of multi-disciplinary teams.
- PO5.** An ability to identify, formulate and solve engineering problems.
- PO6.** An ability to identify and evaluate ethical ramifications and professional responsibilities in a variety of situations.
- PO7.** An ability to communicate technical matters effectively in oral, written and graphical form.
- PO8.** The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and social context.
- PO9.** The recognition of the need for and ability to engage in lifelong learning.
- PO10.** An ability to discuss the impact of engineering on society, safety, and environment in relation to contemporary issues.
- PO11.** An ability to use techniques, skills and modern mechatronics engineering tools necessary for engineering practice.
- PO12.** An ability to work on concept, design and manufacturing of mechatronics engineering goods, machines, systems and tools for sustenance of comfortable, economical and ethical life with experts from other branches of engineering to implement specialized projects.

Program Specific Outcome (PSO)

- PSO1.** To recognize and apply the recent technological advancements for developing Mechatronics products to cater the global needs.
- PSO2.** To automate and maintain the mechanical systems by using electrical and electronic devices as well as computational tools.
- PSO3.** To empower the students to apply practical skills, knowledge in major streams such as automation, manufacturing and industrial engineering.
- PSO4.** To enable the student to take-up career in industries or to pursue higher studies in mechatronics and interdisciplinary programs with high regard for ethical values, environmental and social issues.

Program Educational Objectives (PEO)


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- PEO1.** To develop an attitude for scientific thinking and acquire deep knowledge of basic sciences and Mechatronics Engineering in order to understand engineering problems, projects, plans and solutions.
- PEO2.** Effective communication skills for exchange of ideas about technical plans, strategies and implementation; strong knowledge of English and other languages for communication and technical documentation.
- PEO3.** Broad knowledge of all areas of specialization of Mechatronics Engineering such as sensors, transducers and actuators, signal conditioning and data acquisition, robotics, electrical drives and PLC, design of mechatronics system along with research and development capability in all areas with adaptable rapid manageability.
- PEO4.** Capability for successful career in wide areas of specialization of Mechatronics engineering including basic and applied R&D, manufacturing, education sector, development of global mindset, incorporation of human values at each stage of innovation, to develop engineering education uplift of surrounding rural area and open professional career avenues for local youth.



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Semester 1

Subject Code: SMT-121

Name of the subject: CALCULUS & MATRICES

L	T	P	C
3	2	0	5

- CO:1.** To be able to understand the basic concept of calculus, Rolle's Theorem and Taylor's Theorem with some applications
- CO:2.** To be able to understand the infinite series, sequences and Fourier series for advanced Engineering Mathematics.
- CO:3.** To be able to find maxima and minima using partial derivatives
- CO:4.** To be able to understand about matrices and linear algebra in a comprehensive manner. Also they will learn gradient, curl & divergence.

Subject Code: SHT-121

Name of the subject: Applied Chemistry

L	T	P	C
3	1	0	4

- CO:1.** To be able to understand the atomic and molecular structure
- CO:2.** To be able to understand about different intermolecular forces
- CO:3.** To be able to understand chemical analysis of corrosion.
- CO:4.** To be able to learn about the concept of stereochemistry and instrumental techniques.

Subject Code MTT-102

Name of the subject: INNOVATION AND INVENTIONS IN MECHATRONICS ENGINEERING

L	T	P	C
2	0	0	2

- CO:1.** To inculcate the evolution of Mechatronics Engineering from historical point of view.
- CO:2.** To understand the changes in technology in different ages like stone age to modern age of technology

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- CO:3.** To understand the latest innovations and inventions in the field of Mechatronics Engineering
- CO:4.** To understand the recent trends in the field of automation and robotics and explore various aspects of innovation and inventions

Subject Code: UCT-144

Name of the subject: Computer Programming & Utilization

L	T	P	C
2	0	0	2

- CO:1.** To be able to apply concepts and features of C language, structure of C Program and decision making statements
- CO:2.** To be able utilize the concepts of array, declaration and initialization of arrays and concepts of user defined functions and pointers
- CO:3.** To be able to classify the different structures and dynamic memory allocation
- CO:4.** To be able to apply useful functions like file management in practical environment.

Subject Code: UCT-141

Name of the subject: Communication Skills

L	T	P	C
2	0	0	2

- CO:1.** The student would be able to produce contextual written text and speech.
- CO:2.** The student would be able to write short compositions in the form of paragraph writing and business correspondence etc.
- CO:3.** The student would have the strategic competence to use both spoken & written language in a wide range of communication.
- CO:4.** Student would demonstrate linguistic competence- through accuracy in grammar, pronunciation and vocabulary and be able to speak fluently through regular practice and speaking drills.

Subject Code MTT-101

Name of the subject: INTRODUCTION TO AUTOMATION

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L	T	P	C
3	0	0	3

- CO:1.** The student will understand working and construction of hydraulic and pneumatic circuits
- CO:2.** The student will understand and diagnose an automated system.
- CO:3.** The student will explore about PLC basics and its functionality features.
- CO:4.** The student will understand about basics and application of Robotics.

Subject Code UCP-145

Name of the subject: Computer Programming & Utilization Lab

L	T	P	C
0	0	4	2

- CO:1.** To be able to perform the function like addition, subtraction, Nested-If-Else statement, Bit-wise operators, Swap () and interchange the value of two variables
- CO:2.** To be able utilize the Concepts of array, declaration and initialization of arrays and Concepts of user defined functions and pointers experimentally
- CO:3.** To be able to use string, different structures and Dynamic memory allocation in real life applications
- CO:4.** To be able to apply the useful functions like file management in practical environment

Subject Code MEP-160

Name of the subject: Workshop Practice

L	T	P	C
0	0	4	2

- CO:1.** To be able to operate various tools used in workshops and & safety precautions as per the floor shops
- CO:2.** To be able to perform basic operations and be able to prepare an accurate job.
- CO:3.** To be able to apply the basics tools & processes used in daily life routine tasks.



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Subject Code: UCP-142

Name of the subject: Communication Skills Lab

L	T	P	C
0	0	2	1

- CO:1.** Student would be confident in listening and speaking skills necessary for interaction in academic, professional and cultural situations
- CO:2.** Student would use language effectively for group discussions and public speaking and would utilize non-verbal skills appropriate to the social environment.
- CO:3.** The student would be self aware and enhance soft skills for the professional world.
- CO:4.** The student would use correct intonation, stress, pronunciation and neutral accent to communicate in English.

Subject Code SHP-122

Name of the subject: Applied Chemistry Lab

L	T	P	C
0	0	2	1

- CO:1.** To be able to analyze the mechanism of synthesis of polymers and quality of the polymeric material.
- CO:2.** To be able use viscometer to find the molecular weight of a polymer, understand the effect of plasticizer during the preparation of a polymer.
- CO:3.** To be able to demonstrate flash point & fire point of various lubricants, redwood viscometer and can use stalgamometer to find the surface tension of an unknown liquid.
- CO:4.** To be able to analyse the coal sample, perform spectroscopic analysis of cobalt and can estimate the silica content in cement and to find the residual chlorine content in a given water sample.



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Semester 2nd

Subject Code SMT-171

Name of the subject: Integral Calculus, ODE & Complex Variable

L	T	P	C
3	2	0	5

- CO:1.** To be able apply the ODE & LDE and the methods of solution for these differential equations.
- CO:2.** To be able to learn and apply multiple integration and its applications.
- CO:3.** To be able to utilize the concepts of Complex Numbers, Elementary functions and Infinite series.
- CO:4.** To be able to apply the tools of complex variables for use in various engineering problems.

Subject Code SPT-121

Name of the subject: Applied Modern Physics

L	T	P	C
3	1	0	4

- CO:1.** To be able to investigate the principle of various lasers, its components and the working principle in holography.
- CO:2.** To be able to apply the principle of optical fibre, investigate the losses in optical fibre communication and can demonstrate the wide applications of optical fibre.
- CO:3.** To be able to investigate the oscillations and wave, sound wave propagation, Acoustics of buildings, ultrasound wave and methods of its production and applications.
- CO:4.** To be able to apply the concepts of quantum mechanics and its applications and be able to investigate the properties of nano-materials, their synthesis and applications.

Subject Code EET-110

Name of the subject: Basics of Electrical and Electronics Engineering

L	T	P	C
3	1	0	4

- CO:1.** The student will be able to Classify the Electrical machines, operational principles of AC and DC machines and Difference between asynchronous and synchronous machines

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- CO:2.** To be able to investigate the Single-phase transformers, concept of voltage regulation, open-circuit and short-circuit testing of transformers, Autotransformer and its comparison with single- phase transformer.
- CO:3.** To be able to utilize the need of earthing, components of earthing system and can differentiate between grounding, earthing and bonding.
- CO:4.** To be able to classify the transducer and understand the working and applications of LVDT, thermistor, digital multimeter and Cathode ray oscilloscope

Subject Code MET-164

Name of the subject: Engineering Graphics and Drawing

L	T	P	C
2	0	2	3

- CO:1.** To be able to deduce the various concepts, elements and grammar of engineering graphics.
- CO:2.** To be able to enhance imagination, visualization, presentation and interpretation skills.
- CO:3.** To be able to recognize the engineering drawing as a formal and precise way of communicating information about the shape, size, feature and precision of physical objects.
- CO:4.** To accurately and unambiguously capture all the geometric features of a product or a component and understand the conversion of 2D drawings into 3D and vice versa.

Subject Code CST-152

Name of the subject: Paradigms of Computer Programming

L	T	P	C
2	0	0	2

- CO:1.** To be able to learn and apply the various paradigms of computer programming
- CO:2.** To be able to learn Imperative and Object Oriented Programming using C++.
- CO:3.** To be able to identify the strengths and weaknesses of different programming paradigms
- CO:4.** To provide in-depth knowledge of various concepts of programming paradigm.

Subject Code PCT-191

Name of the subject: Professional Communication Skills

L	T	P	C
2	0	0	2



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- CO:1.** The student will be able to perform research and write short official and technical research report.
- CO:2.** The student would be able to initiate and participate in discussion with group members and be able to present and summarize information, ideas and opinions coherently both within and outside the organization
- CO:3.** The student will be able to write a set of effective and easy to understand technical description, instructions and convey the same using global information technology
- CO:4.** To make the student capable of creating official content digitally for further communication in the corporate environment.

Subject Code PCP-192

Name of the subject: Professional communication skills Lab

L	T	P	C
0	0	2	1

- CO:1.** To be able to develop soft skills and interpersonal skills for a smoother transition from university to the workplace.
- CO:2.** To enhance the employability of students for Placements and to equip students with effective speaking and presentation skills in English.
- CO:3.** To develop communication skills and professional ethics amongst the students.
- CO:4.** To perfect the accent neutralization in English for correct pronunciation.

Subject Code SPP-122

Name of the subject: Modern Applied Physics Lab

L	T	P	C
0	0	2	1

- CO:1.** To be able to demonstrate the practical skill on measurements and instrumentation techniques of physics and can determine the diffraction using LASER beam
- CO:2.** Students will develop skills by the practice of setting up and conducting an experiment to determine the numerical aperture of optical fibre, attenuation and propagation losses in optical fibre.
- CO:3.** To be able to investigate the velocity of ultrasonic wave in the given liquid and doppler-effect with ultrasonic waves.
- CO:4.** To be able to determine the particle size of any nanomaterial and cracks in a metallic sample using ultrasonic flaw detector and be able to investigate the magneto resistance of a material


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Subject Code EEP-116

Name of the subject: Basics of Electrical and Electronic Engineering Lab

L	T	P	C
0	0	2	1

- CO:1.** To be able to use Digital multimeter for measuring current, voltage and power in AC/DC circuits.
- CO:2.** To be able to measure power and power factor in a single-phase AC circuit, perform open circuit and short circuit test on a single phase transformer and would be able to calculate the efficiency of single phase transformer.
- CO:3.** To be able to demonstrate the feedback concept in amplifier in different situations and the electric circuit of differential OP-AMP on bread board
- CO:4.** To be able to verify the truth table of logic gates, measure frequency, voltage and current on CRO and also observe the wave shapes of function generator on CRO.

Subject Code MEP-164

Name of the subject: Engineering Graphics and Drawing Lab

L	T	P	C
0	0	2	1

- CO:1.** To be able to apply the various concepts and elements of engineering graphics using CAD software.
- CO:2.** To be able to apply the fundamentals of CAD in 2D and 3D graphics.
- CO:3.** To be able to apply the fundamentals of CAD to obtain isometric projections and surface development.
- CO:4.** To be able to convert 2D drawings into 3D and vice versa.

Subject Code CSP-157

Name of the subject: Paradigms of Computer Programming Lab

L	T	P	C
0	0	4	2

- CO:1.** To be able to conduct and run program based on basic data types and operator in C++.
- CO:2.** Students will be able to conduct and run program based on conditional construct and on looping
- CO:3.** To be able conduct and run program based on structure and class, polymorphism and inheritance
- CO:4.** To be able to analyze the program based on pointers and dynamic memory allocation and can implement the logic programming concepts in PROLOG

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Semester 3rd

Subject Code MTT-201

NAME OF THE SUBJECT: ENGINEERING MECHANICS

L	T	P	C
3	1	0	4

- CO:1.** To impart the knowledge of basic principles of mechanics and to familiarize with the concept of moment & couple and bodies in equilibrium.
- CO:2.** To impart the knowledge of centroid & moment of inertia of complex figures.
- CO:3.** To be able to analyze the concepts of simple stress strains on deforming bodies.
- CO:4.** To be able to understand the concept of shear force and bending moments in beams along with the analysis of torsion and the effect of slope and deflection.

Subject Code MTT-202

Name of the subject: Sensors, Transducers and Data Acquisition

L	T	P	C
3	0	0	3

After the completion of the course students will be able to:

- CO:1.** Understand the fundamental concepts and classification of numerous sensors and transducers.
- CO:2.** Understand the concept of Data Acquisition hardware and software
- CO:3.** Understand the concept and methods of Triggering and Synchronization in Data Acquisition.
- CO:4.** Understand the concept and differentiate between Analog Input and Output architecture in NI-DAQ system


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Subject Code MTT-203

Name of the subject: SIGNALS AND SYSTEMS

L	T	P	C
3	0	0	3

- CO:1. The student will explore development of analog as well as discrete signal generation and applications
- CO:2. The student will explore physical significance of random signals and its applications in the emerging field of communication engineering
- CO:3. The student will explore the application of Fourier series and Fourier transform in the field of communication and signal processing
- CO:1. The student will explore the concepts and applications of sampling and Laplace transform in the field of signal processing.

Subject Code MTT-204

Name of the subject: KINEMATICS AND DYNAMICS OF MACHINES

L	T	P	C
3	0	0	3

- CO:1. The student will explore the fundamental concept of Kinematics of Machines along with the concept of mechanism and their inversion of kinematic chain
- CO:2. The student will examine the turning moment diagram of various engine and fundamentals of engine dynamic & correlation to other machine
- CO:3. The student will examine the undesirable effect of unbalancing in rotor and engine along with the knowledge of basics of gears & different types of Gears
- CO:4. The student will calculate the velocities of gear trains and the principle of governor

Subject Code MTP-205

Name of the subject: Sensors, Transducers and Data Acquisition LAB

L	T	P	C
0	0	2	1



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After the completion of the course students will:

- CO:1.** To be able to understand the basics of LABVIEW Software and NI-ELVIS trainer Kit.
- CO:2.** To be able to illustrate the fundamentals of ten of the most commonly used analog and digital sensors using NI-ELVIS kit.
- CO:3.** To be able to interface sensors and carry out simulation of control system using myRIO kit.
- CO:4.** To be able to explore the NI myRIO FPGA Shipping Personality.

Subject Code MTP-206

Name of the subject: Signals and Systems Lab

L	T	P	C
0	0	2	1

- CO:1.** To be able to explore the basics of signals and systems using MATLAB.
- CO:2.** To be able to perform the basic elementary operations on continuous and discrete domain signals and sequences.
- CO:3.** To be able to obtain convolution of two signals in discrete domain and response of LTI system described by difference equation.
- CO:4.** To be able to perform sampling of signals using MATLAB and prove sampling theorem.

Subject Code MTP-207

Name of the subject: Machine drawing and 3D Modeling Lab

L	T	P	C
0	0	2	1

- CO:1.** To be able to read and interpret mechanical engineering drawings and get familiar with CAD software to produce machine drawings in 2D and 3D form
- CO:2.** To be able to use Fits and Tolerances in machine drawings components and prepare assembly drawing of various machine elements.
- CO:3.** To be able to draw orthographic views of the assembly of a Oldham's coupling, Gib and cotter joint, a knuckle joint and will be able to prepare Bill of Material.
- CO:4.** To be able to make assembled views of a screw jack, Connecting rod, Piston and crank shaft, Plummer block and Tail Stock.


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Subject Code MTY-201 (MNG)

Name of the subject: Mechanical Measurement and Metrology

L	T	P	C
3	0	0	3*

- CO:1.** The student will explore basic concepts of mechanical measurement, errors and its types in measurement systems
- CO:2.** The student will explore basic principles of different measuring instruments.
- CO:3.** The student will explore the selection process of gauges according to the process requirements
- CO:4.** The student will explore about measurement of surface roughness, temperature and shaft power

Subject Code MTY-201 (MNG)

Name of the subject: Recapitulation of Machine Drawing

L	T	P	C
0	0	2	1*

- CO:1.** To be able to differentiate between graphics and Machine Drawing.
- CO:2.** To be able to get familiar with Solid-works software to produce machine drawings such as Part drawing, in 2D, 3D and their assembly.
- CO:3.** To be able to use Fits and Tolerances in machine drawings.
- CO:4.** To be able to prepare assembly drawing of various machine elements.

SMY-222: Engineering Mathematics (LEET) (MNG)

L	T	P	C
3	1	0	4*

- CO:1.** To have knowledge in linear algebra and infinite series and improving the student's ability of computation in matrices and complex nos.
- CO:2.** To familiarize students with partial differentiation and enable the students to apply the notions practically
- CO:3.** To introduce various ordinary and linear differential equations and practice various methods of solving these differential equations.
- CO:4.** To have knowledge of Multiple Integral And Vector Calculus

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Semester 4th

Subject Code SMT-273

Name of the subject: Applied Engg. MATHEMATICS-III

L	T	P	C
3	2	0	5

Students will be able to understand

- CO:1.** The concept of partial differential equations in various forms
- CO:2.** The applications of partial differential equations of first and higher order.
- CO:3.** The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- CO:4.** The basic ideas of statistics including measures of central tendency, correlation and regression.

Subject Code MTT-251

Name of the subject: DIGITAL ELECTRONICS

L	T	P	C
3	0	0	3

- CO 1** The student will explore basic of analog electronics including basics of transistor (BJT and MOSFET) and operational amplifier along with their applications
- CO 2** The student will explore the basics of Digital electronics including Number system and Logic gates along with their minimization using K-maps
- CO 3** The student will explore the concept of various types of Binary codes namely BCD, Gray code and Excess-3 code along with their applications
- CO 4** The student will explore the concept of Combinational and Sequential Logic Circuits

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Subject Code MTT-252

Name of the subject INTRODUCTION TO THERMO-FLUIDS

L	T	P	C
3	1	0	4

CO 1 The student will explore the concept of fluid properties and examine the fields of Fluid statics and Fluid kinematics

CO 2 The student will perform in depth analysis of the field of fluid dynamics

CO3 The student will explore the basic concept of heat transfer along with different modes of heat transfer namely Heat Conduction, Heat Convection and Thermal Radiation

CO 4 The student will explore the concept of mass transfer, viscous flows, laminar flows, turbulent flows, pressure, flow measurement devices and heat exchangers

Subject Code MTT-253

Name of the subject: MICROPROCESSOR AND MICROCONTROLLERS SYSTEMS

L	T	P	C
3	0	0	3

- CO:1.** The student will explore the detailed architecture and working of 8085 microprocessor along with memory interfacing modes
- CO:2.** The student will examine the architecture and working of 8051 microcontroller, functions of constituting components and their applications
- CO:3.** The student will explore in detail the different types of instructions for both 8085 and 8051, the results produced by their execution and timing analysis
- CO:4.** The student will explore the real-world interfacing of several hardware components and their applications

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Subject Code MTT-254

Name of the subject: Modeling and Control

L	T	P	C
3	1	0	4

- CO:1.** The student will explore the basic concepts of control systems
- CO:2.** The student will explore the formulation of the equations of linear electrical and non-electrical systems and establishing analogies between them
- CO:3.** The student will perform in depth analysis of time domain and frequency domain systems and thereby determining the stability of any given system
- CO:4.** The student will explore the importance of compensating networks and their design

Subject Code MTP-255

Name of the subject: DIGITAL ELECTRONICS LAB

L	T	P	C
0	0	2	1

- CO:1.** To be able to understand basics of analog electronics
- CO:2.** To be able to understand basics of transistor and operational amplifier
- CO:3.** To be able to understand Digital Electronics: Combinational Circuits
- CO:4.** To be able to understand Sequential Circuits and Digital Integrated Circuits in Digital Electronics

Subject Code MTP-256

Name of the subject: Microprocessors and Microcontrollers LAB

L	T	P	C
0	0	2	1

- CO:1.** To be able to understand basics of assembly programming of 8085 microprocessor.
- CO:2.** To be able to perform addition and multiplication operations involving both 8 bit and 16-bit numbers using 8085 microprocessor kit.
- CO:3.** To be able to understand basics of programming of Arduino UNO development board.

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CO:4. To be able to perform real-world interfacing and programming of Arduino UNO with LED, LCD, and numerous analog and digital sensors.

Subject Code MTP-257

Name of the subject: Thermo Fluids LAB

L	T	P	C
0	0	2	1

- CO:1.** To understand the concept of Coefficient of velocity, discharge, practical application and verification of Bernoulli's theorem.
- CO:2.** To understand types of fluid flow like laminar and turbulent etc.
- CO:3.** To understand the concept of thermal conductivity by carrying out its analysis using metal bar and insulating powder
- CO:4.** To understand the concept of heat transfer and convection by carrying out its analysis using black body and pin fin.

Subject Code MTY-253

Name of the subject: Digital and Embedded System LAB

L	T	P	C
0	0	2	1*

- CO:1.** To understand and explore the concepts of hardware design of digital circuits.
- CO:2.** The student will carry out design of digital systems using hardware description language VHDL.
- CO:3.** The students will explore and implement combinational circuits, synchronous sequential logic and finite state machines.



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Semester 5th

Subject Code MTT-302

Name of the subject: Electrical Drives and PLC (MTT 302)

L	T	P	Cr.
3	0	0	3

- CO:1.** The student will understand the basics and importance of drives used in automation industry.
- CO:2.** The student will perform modeling and analysis of dc, induction and synchronous motor drives.
- CO:3.** The student will apply the theories of electrical machines, power electronic converters and control system design to implement drive systems which are appropriate for specific performances.
- CO:4.** The student will understand the basics, classification and programming of Programmable Logic Controllers

Subject Code MTT-303

Name of the subject: STRENGTH OF MATERIALS

L	T	P	C
3	1	0	4

- CO:1.** The student will explore and analyze the concepts of simple stress strains on deforming bodies.
- CO:2.** The student will perform in depth analysis of two dimensional stress systems and Mohr's circle.
- CO:3.** The student will explore the shear force plots & bending moment diagrams for beams under different loadings, to solve problems for bending stresses in beam of different cross-sections.
- CO:4.** The student will explore the concept of torsion and perform analysis of the effect of slope and deflection.

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Subject Code MTT-304

Name of the subject: ROBOTICS

L	T	P	C
3	0	0	3

- CO:1.** The student will explore the basic fundamentals of robotics
- CO:2.** The student will explore various component parts and the robotic internal and external sensors
- CO:3.** The student will understand robot transformation system and its application to the kinematic structure of a robot.
- CO:4.** The student will understand the vision, programming and applications of field of Robotics.

Subject Code MTP-305

Name of the subject: ELECTRICAL DRIVES AND PLC LAB

L	T	P	C
0	0	2	1

- CO:1.** The student will understand the basics of Electrical Drives and PLC Panels.
- CO:2.** To be able to understand the concept of regenerative braking and perform speed control of synchronous and induction motor by programming through PLC software
- CO:3.** To be able to understand the working and programming of three phase fully controlled bridge rectifier, dc separately excited motor along with slip ring motor control using motor resistance starter.
- CO:4.** To be able to program PLC based Pneumatic System Control.

Subject Code MTP-306

Name of the subject: STRENGTH OF MATERIALS LAB

L	T	P	C
0	0	2	1

- CO:1.** To be able to conduct the tensile test, Shear test and compression test and can draw stress-strain curve for each case
- CO:2.** To be able to determine the hardness number by different methods
- CO:3.** To be able to determine stiffness and the modulus of rigidity of spring material
- CO:4.** To be able to determine the Buckling load of column and perform fatigue test, verification of MAXWELL Reciprocal theorem.

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MTY-301: Engineering Economics

Course Outcomes

L	T	P	C
3	0	0	3*

- CO:1.** To be able to understand the concept of economics and its application.
- CO:2.** To be able to apply the principle of economics so as to balance the demand and supply of goods.
- CO:3.** To be able to control cost of product by undergoing estimation and costing analysis
- CO:4.** To be able to deliver effective monetary system of cost control.

Semester 6th

Subject Code: MTT351

Name of the subject: MANUFACTURING TECHNIQUES

L	T	P	C
3	0	0	3

- CO:1.** The student will explore the fundamentals of metal forming technology necessary for understanding of industrial processes.
- CO:2.** The student will explore about basic machining operations & different type of machines used in industry along with their applications.
- CO:3.** The student will explore about the basics of cutting tool materials and their applications.
- CO:4.** The student will explore about the concept of CNC Machining and its elements like, control system feedback control, ATC and Sustainable machining and role of Lubrication in machining operation

Subject Code: MTT352

Name of the subject: DESIGN OF MACHINE ELEMENTS

L	T	P	C
2	2	0	4


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- CO:1.** The student will understand the basic concept of design & procedure and to study the concept of different fasteners like rivets, bolts & welds.
- CO:2.** The student will explore about joints, transmission shaft and keys along with their design problems.
- CO:3.** To make familiarize about the stresses developed in the different pipe joints and lever of any machine.
- CO:4.** The students will explore about coupling, its design, springs, their types to solve various design related problems.

Subject Code MTP-353

Name of the subject: MANUFACTURING TECHNIQUES LAB

L	T	P	C
0	0	2	1

- CO:1.** To be able to determine the Moisture content & Shatter index Green strength & clay content of Sand.
- CO:2.** To be able to fabricate butt, lap and T joint by using MIG Welding and a lap joint with the help of spot welding.
- CO:3.** To be able to understand the effect of quenching, normalizing and tempering on steel component.
- CO:4.** To be able to understand hardenability of steel specimen by Jominy END quench test.

MTY-355: Total Quality Management

L	T	P	C
3	0	0	3*

Course Outcomes

- CO:1.** To be able to understand the concepts of quality and total quality management
- CO:2.** To be able to understand the benefits of JIT and its implementations.
- CO:3.** To be able to apply knowledge for process planning and bench marking
- CO:4.** To be able to apply quality control tools and advanced TQM techniques.


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Professional Electives Subjects

MTB-351: PLANT MAINTENANCE AND LAYOUT

Course Outcomes

L	T	P	C
3	0	0	3

- CO:1.** To enable students to understand the various components and functions of Plant engineering
- CO:2.** To enable students to understand the various requirements of Plant layout planning and types of layouts.
- CO:3.** To enable students to understand the types of plant maintenance, concepts of plant safety and energy conservation.
- CO:4.** To enable students to understand about material handling equipments and their principles.

MTB-401: PRODUCTION PLANNING & CONTROL

Course Outcomes

L	T	P	C
3	0	0	3

- CO:1.** To enable students to understand the various components and functions of production planning and control such as work study, product planning, process planning, production
- CO:2.** To enable students to understand the concept of route sheets, common charts, linear programming and scheduling
- CO:3.** To enable students to understand the concept of work study and inventory control
- CO:4.** To enable students to understand the usage of just in time, ERP and MRP-II

MTB-402: WORK STUDY & ERGONOMICS

L	T	P	C
3	0	0	3

Course Outcomes

- CO:1.** To enable students to understand the various components, techniques and functions of work study.
- CO:2.** To make the students familiar with the concept of Work measurement and work sampling.
- CO:3.** To enable students to understand the concept and scope of ergonomics.
- CO:4.** To enable students to understand the usage of Anthropometric principles & human capabilities.

MTB-454: QUALITY CONTROL & ASSURANCE

Course Outcomes

L	T	P	C
3	0	0	3

- CO:1.** To enable students to understand the concept of Quality control.
- CO:2.** To familiarize students with the concept of Control Charts along with acceptance sampling & its attributes
- CO:3.** To enable students to understand the concept of total quality management & its techniques
- CO:4.** To enable students to understand the concept of quality & reliability and make them familiarize with the concept of Quality assurance & ISO 9000 series


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MTB-455: INDUSTRIAL SAFETY

Course Outcomes

L	T	P	C
3	0	0	3

- CO:1.** To enable students to understand the concept of safety at work place.
CO:2. To enable students to understand the various safety standards and legislation.
CO:3. To make the students familiar with the concept of environment requirements and standards.
CO:4. To understand the concept of ventilation, lighting, noise & vibrations.

Subject Code MTA-353

Name of the subject: Mechatronics System Design

L	T	P	C
3	0	0	3

- CO:1.** To enable the students to understand the basic concept of Mechatronics system design.
CO:2. To enable the students to understand the design procedure and design modeling of Mechatronics system.
CO:3. To enable the students to understand about real-time interfacing and HMI interface of numerous Mechatronics system
CO:4. To make students aware about the several case studies of latest Mechatronics system design along with the understanding of Micro-Mechatronics system and their applications.

Subject Code MTA-354

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Name of the subject: Advance Control System
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L	T	P	C
3	0	0	3

CO 1 The student will explore the basic concepts of control systems

CO 2 The student will explore the analysis and design of control system in state space

CO 3 The student will perform in depth analysis of PID and modified PID controllers.

CO 4 The student will explore the importance of compensating networks and their design

MTA-351: COMPUTER INTEGRATED MANUFACTURING

Course Outcomes

L	T	P	C
3	0	0	3

CO:1. To analyze Basic concepts Computer Integrated Manufacturing.

CO:2. To be able to solve problems related to Flexible Manufacturing Systems and group technology

CO:3. To be able to understand Geometric Transformations and solve problems related algebraic and geometric forms

CO:4. To be able to understand fundamentals of CNC Machining and Part Programming for CNC machines

MTA-403: Digital and Embedded Systems Design

Course Outcomes

L	T	P	C
3	0	0	3

CO:1. To enable students to explore design of digital systems using VHDL as hardware description language.

CO:2. The student will explore and implement combinational circuits, synchronous sequential logic and finite state machines

CO:3. The student will explore the concept, types and design process of an embedded system



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CO:4. The student will explore the concept of ARM embedded system, its architecture and applications.

MTA-453: Image processing and Machine Vision

L	T	P	C
3	0	0	3

- CO:1.** The student will understand Image fundamentals and processing of digital images
- CO:2.** An ability to explore several Image enhancement techniques and their application
- CO:3.** An ability to explore several Image compression techniques and their applicability
- CO:4.** The student will understand fundamentals of computer vision, geometrical features of images, object recognition and application of real time image processing.

MTA-455: Failure Mode Effect Analysis (FMEA)

L		P	C
3	0	0	3

- CO:1.** The student will understand the value and versatility of a methodical approach to systematic design of products and processes.
- CO:2.** The student will understand different types of FMEA and recognizing when each is to be used and when FMEA is not appropriate or effective
- CO:3.** The student will explore how to relate FMEA to other continuous improvement tools
- CO:4.** The student will carry out FMEA involving hazard identification and finding out safety measures.

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