THIRD SEMESTER
(Detailed Syllabus)

'AUTOMATION
&
ROBOTICS'

AN INTRODUCTION TO ROBOTICS

Course Code:	0463001
Course Title	An Introduction to Robotics
No. of Credits	4 (TH:4,T:0,P:0)

COURSE OUTCOMES: At the end of the course, the student will be able to:

1. Understand the fundamental concepts and principles of robotics engineering, including the history, definition, and basic principles of robots.
2. Identify & describe the various components and sensors used in robotics.
3. Analyze the advantages and disadvantages of different robot control methods and their applications, including lead-through programming, teach programming, telerobotic, offline programming, autonomous operation, teleoperation, and human-robot interaction.
4. Classify robots based on their drive technologies, work envelope geometries, motion control methods, degrees of freedom, robot motion, platform, power source, intelligence, and application area.
5. Understand and interpret technical robotics terms related to robot specifications, including the number of axes, capacity and speed, reach & stroke, tool orientation, repeatability, precision & accuracy, operating environment, degrees of freedom, joints, coordinates, reference frames, programming modes & workspace characteristics.
6. Apply the acquired knowledge and skills to analyze, design, and select appropriate robots and components for specific applications, considering their advantages, disadvantages, and social implications.

COURSE CONTENTS

Unit - 1 : Introduction :

Introduction to Robotics Engineering, Brief History, Basic Principles in Robotics, Advantages & Disadvantages of Robots, Robot Applications, Growth of the Industry, Social Issues & Safety

Unit - 2 : Robots Components (Brief Idea)

Power source; Actuation Methods- Electric motors, Linear actuators, Series elastic actuators, Piezo motors, Elastic nanotubes; Sensors in Robotics- Light Sensors i.e. Photo resistor, Photovoltaic cell, Sound Sensor, Proximity Sensor, Touch Sensor or Contact Sensor, Temperature Sensor, Navigation and Positioning Sensors, Acceleration Sensor; Mechanical grippers; Suction end-effectors; General purpose effectors; Basics of robotic Locomotion.

Unit - 3 : Types of Robot

(Based on Drive Technologies, Work Envelope Geometries, Motion Control Methods)

Classification of robots on the basis of- Degrees of Freedom, Robot Motion, Platform used, Power Source, Intelligence level, Application Area.

Unit- 4 Robot Specifications (Technical Robotics Terminology)

Number of Axes, Capacity & speed, Reach & Stroke, Tool Orientation, Repeatability, Precision & Accuracy, Operating Environment, Degree of Freedom, Joints, Coordinates, Reference Frames, Programming Modes, Workspace, Characteristics

References /Suggested Learning Resources:

1. Robotics: Fundamental Concepts and Analysis, By Ashitava Ghosal, Publisher-OUP India, 2006
2. Introduction to Robotics, By S K Saha, Publisher- Tata McGraw-Hill Education
3. Introduction To Robotics: Analysis, Control, Applications, 2nd Edition By Saeed Benjamin Niku 2011, Publisher: Wiley India Pvt. Limited
4. Fundamentals of Robotics Engineering, By Harry H. Poole, Publisher: Springer Science & Business Media, 2012

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ANALOG ELECTRONICS & DEVICES

Course Code:	453004
Course Title	Analog Electronics & Devices
No. of Credits	6 (TH:4,T:0,P:4)

COURSE OUTCOMES :- After completion of the course the Student is able to:

1. Develop a comprehensive understanding of semi-conductor materials as well as the characteristics of N-type and P-type semiconductors.
2. Gain proficiency in analyzing the V-I characteristics of PN junction diodes and their practical applications.
3. Acquire knowledge of various transistors configurations.
4. Acquire knowledge of FETs, MOSFETs, UJT and their applications.
5. Develop an in-depth understanding of SCR, DIAC, & TRIAC and explore their applications as switches.
6. Develop proficiency in using operational amplifiers (op-amps) in various configurations (inverting amplifier, summing amplifier, non-inverting amplifier, etc.). Besides, that also gain practical knowledge of the 555 timer and its applications as an astable multivibrator, monostable multivibrator, Schmitt trigger, sequence timer, and PWM generator.

COURSE CONTENTS

Unit - 1 : Diodes and Bipolar Junction Transistor (BJT)

1.1 Semiconductor: Definition, Extrinsic/Intrinsic, N-type & p-type;

1.2 PN Junction Diode – Forward and Reverse Bias Characteristics;

1.3 Diode Rectifiers – Half Wave and Full Wave, bridge rectifier;

1.4 NPN and PNP Transistor–Operation and characteristics;

1.5 Transistor CB, CE & CC Configurations.

Unit - 2 : Field Effect Transistors

2.1 FET – Working Principle, Classification;

2.2 N-Channel / P-Channel MOSFETs – characteristics;

2.3 Enhancement and depletion mode;

2.4 Uni-Junction Transistor – equivalent circuit and operation, Applications

Unit - 3 : SCR, DIAC & TRIAC

3.1 SCR - Construction, operation, working, characteristics;

3.2 DIAC-Construction, operation, working, characteristics;

3.3 TRIAC-Construction, operation, working, characteristics;

3.4 SCR and MOSFET as a Switch;

3.5 DIAC as bidirectional switch;

3.6 Comparison of SCR, DIAC, TRIAC & MOSFET.

Unit - 4 : Amplifiers and Oscillators

4.1 Classification of amplifiers Feedback Amplifiers – Properties of negative Feedback, impact of feedback on different parameters;

4.2 Oscillator – Basic Principles, Crystal Oscillator, Non-linear/ Pulse Oscillator.

Unit - 5 : Operational Amplifiers and Timers

5.1 Operational amplifier; Ideal Op. Amp; Block diagram and characteristics;

5.2 Op-amp parameters – CMRR, Slew rate, band width, Gain, Virtual ground, Applications of op-amp;

5.3 Inverting amplifier, Summing amplifier, Non inverting amplifier;

5.4 Instrumentation amplifier, Voltage follower

5.5 555 Timer – Functional Block diagram, Astable, Monostable and Schmitt Trigger, Sequence timer, 555 timer used as PWM.

PRACTICAL OUTCOMES: At the end of the course, the student will be able to:

1. Understand the characteristics and behavior of electronic components such as PN Junction diodes, transistors, FET transistors, and operational amplifiers (IC 741).
2. Gain practical knowledge of different rectifier circuits (half wave rectifier, full wave rectifier and bridge rectifier) and observe their respective wave shapes.
3. Develop skills in plotting input and output characteristics of transistors in CE configuration and calculating relevant parameters.
4. Gain hands-on experience in using the IC 555 timer as a monostable multivibrator and observe the output for different values of RC.
5. Verify and interpret truth tables for various logic gates (AND, OR, NOT, NAND, NOR, and EX-OR) using corresponding integrated circuits (7408, 7432, 7404, 7400, 7402, and 7486).
6. Design and implement digital circuits such as half adders, full adders, 4-bit parallel adders, Multiplexers, Demultiplexers, Decoders, D flip-flops, JK flip-flops, 4-bit SISO, SIPO using D Flip Flop, and 4-bit Binary Counters.

List of Practicals :

1. To plot V-I characteristics of PN Junction diode.
2. To observe the wave shape of following rectifier circuit
   - Half wave rectifier
   - Full wave rectifier
   - Bridge rectifier
3. To plot input and output characteristics and calculate parameter of transistor in CE configuration
4. To plot V-I characteristics of FET Transistor
5. Use of IC 555 as monostable multivibrator and observe the output for different values of RC
6. To use IC 741 (op-amplifier) as an i) Inverter, ii) Adder, iii) Subtractor iv) Integrator
7. Plot the V-I characteristics of SCR.
8. Plot the V-I characteristics of DIAC.
9. Plot the V-I characteristics of TRAIC.
10. Verification and interpretation of truth tables for AND (7408), OR (7432), NOT (7404), NAND (7400), NOR (7402) and Exclusive OR (EX-OR) (7486) gates
11. To design a half adder & full adder using XOR(7486) and NAND (7410)gates and verification of its Truth Table.
12. Verification of truth table of D flip-flop (7474) and JK flip-flops (7476)

References /Suggested Learning Resources:

1. Electronic Devices and Circuits S. Salivahanan and N. Suresh Kumar McGraw Hill Education; Fourth edition (1July 2017), ISBN: 978-9339219505.
2. Electronics Devices and circuit theory Boyestad & Nashelsky Pearson Education India; 11 edition (2015), ISBN: 978-9332542600.
3. Electronic Principles Albert Malvino & David Bates Tata McGraw Hill Publication 2010, ISBN: 978- 0070634244.
4. Electronics Devices & Circuits Jacob Millman McGraw Hill Education; 4 edition (2015), ISBN: 978-9339219543.
5. Design with operational amplifiers and analog integrated circuits, 3rd Edition Sergio Franco Tata McGraw-Hill, 2007.
6. OP-AMP and Linear ICs by Ramakant A.Gayakwad Prentice Hall / Pearson Education, 4th Edition, 2001.
7. Analog Circuits , A K Maini, Khanna Publishing House, Ed. 2018, ISBN: 978-93-86173-584.
8. Digital Electronics M.Morris Mano, Pearson.

Suggested Software/learning Websites:

1. https://www.electronics-tutorials.ws/
2. https://www.youtube.com/watch?v=Rx43l-QpeWQ
3. https://electronicsforu.com/resources/electronic-devices-and-circuit-theory

DIGITAL ELECTRONICS

Course Code:	453003
Course Title	Digital Electronics
No. of Credits	4 (TH:4,T:0,P:0)

COURSE OUTCOMES :- After completion of the course the student will be able to -

1. Understand number systems and their conversions, codes, and complement representations.
2. Gain proficiency in logic gates, Boolean algebra, and simplification techniques using Karnaugh maps.
3. Design and analyze combinational logic circuits, including arithmetic circuits and multiplexers.
4. Learn sequential logic circuits, including flip flops, counters, and shift registers.
5. Understand memory devices, including RAM and ROM, and data converters.
6. Develop technical skills in digital circuit analysis, design, and implementation.

COURSE CONTENTS

Unit - 1 : Number Systems & Boolean Algebra

1.1 Introduction to different number systems – Binary, Octal, Decimal, Hexadecimal;

1.2 Conversion from one number system to another;

1.3 Familiarization with Different types of codes- Gray code, Excess-3, BCD code;

1.4 Concept of 1's and 2's complement;

1.5 Binary Addition, subtraction, multiplication & division;

Unit - 2 : Logic Gates

2.1 Logic Gates – AND, OR, NOT, NAND, NOR, XOR, XNOR: Symbolic representation and truth table;

2.2 Boolean variables – Laws of Boolean algebra;

2.3 De-Morgan's Theorem;

2.4 Karnaugh Maps and their use for simplification of Boolean expressions upto 4 Variables.

2.5 Implementation of Boolean expressions and Logic Functions using universal gates;

2.6 Simplification of expressions using Boolean algebra.

Unit - 3 : Combinational Logic Circuits

3.1 Arithmetic Circuits: Addition, Subtraction, subtraction using 1's & 2's complement method,

3.2 Combinational logic circuit: Half Adder, Full Adder, Half Subtractor, Full Subtractor circuit;

3.3 Encoder and Decoder circuits;

3.4 Multiplexer – 2 to 1 MUX, 4 to 1 MUX, 8 to 1 MUX.

3.5 Demultiplexer – 1 to 2 DEMUX, 1- 4 DEMUX, 1- 8 DEMUX.

Unit - 4 : Sequential Logic Circuits

4.1 Flip Flops – Basic SR, JK, T, D, JK-MS, Triggering;

4.2 Counters – 4 bit Up – Down Counters, Syncronous, Asynchronous/ Ripple Counter;

4.3 Registers – 4 bit Shift Register: Serial in Serial Out, Serial in Parallel Out, Parallel In Serial Out, and Parallel In Parallel Out (Basic Overview Only)

Unit - 5 : Memory Devices

5.1 Classification of Memories – RAM Organization, Address Lines and Memory Size;

5.2 Static RAM, Dynamic RAM;

5.3 Read only memory – ROM organization, PROM, EPROM, EEPROM, Flash memory;

5.4 Data Converters – Basic block diagram of Digital to Analog converters, Analog to Digital Converters.

References /Suggested Learning Resources:

1. Digital principles & Applications Albert Paul Malvino & Donald P. Leach McGraw Hill Education; Eighth edition, ISBN: 978-9339203405.
2. Digital Electronics Roger L. Tokheim Macmillian McGraw-Hill Education (ISE Editions); International 2 Revised edition, ISBN: 978-0071167963.
3. Digital Electronics – an introduction to theory and practice William H. Gothmann Prentice Hall India Learning Private Limited; 2 edition, ISBN: 978-8120303485.
4. Fundamentals of Logic Design Charles H. Roth Jr. Jaico Publishing House; First edition, ISBN: 978-8172247744.
5. Digital Electronics R. Anand Khanna Publications, New Delhi (Edition 2018), ISBN: 978-93- 82609445.

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'C ' PROGRAMMING

Course Code:	433004
Course Title	'C ' Programming
No. of Credits	6 (TH:4,T:0,P:4)

COURSE OUTCOMES: At the end of the course, the student will be able to:

1. Develop algorithms and flowcharts to solve programming problems and understand the steps involved in program development.
2. Demonstrate proficiency in writing and executing C programs, including understanding program structure, I/O statements, variables, data types, and storage classes.
3. Apply control structures such as decision-making statements (IF-ELSE, nested IF, and switch), loops (while, do-while, for), and break/continue statements to control program flow.
4. Understand the concept of functions, including global and local variables, function declaration and calling, different types of functions, and parameter passing.
5. Manipulate arrays and strings effectively, including array declaration, accessing array elements, multidimensional arrays, and using string-related functions.
6. Demonstrate understanding of pointers, including static and dynamic memory allocation, working with addresses and pointers, and utilizing pointers to arrays and structures.

DETAILED CONTENTS

1. Algorithm and Programming Development

Steps in development of a program, algorithm development, concept of flowcharts, programming & use of programming, various techniques of program-ming, Structured Programming, Pre-processors, Debugging, Compiling.

2. Program Structure

Structure of C program, Writing and executing the first C program, Translator: Assembler, Interpreter, Compiler, I/O statement, assign statement, Keywords, constants, variables and data types, storage classes, operators and expressions, Unformatted and Formatted IOS, Data Type Casting

3. Control Structures

Introduction, decision making with IF – statement, IF – Else and Nested IF, Ladder, if-else, Loop: While, do-while, for, Break, Continue, goto and switch statements.

4. Functions

Introduction to functions, Global and Local Variables, Function Declaration, Function Call and Return, Types of Functions, Standard functions, Parameters and Parameter Passing, Call-by value/ reference, recursive function, function with array, function with string.

5. Arrays and Strings

Introduction to Arrays, Array Declaration, Length of array, Manipulating array elements, Single & Multidimensional Array, Arrays of characters, Passing an array to function, Introduction of Strings, String declaration and definition, Overview of String Related function.

6. Pointers

Introduction to pointers, Static and dynamic memory allocation, Address operator and pointers, Declaring and initializing pointers, Single pointer, Pointers to an array.

7. Structures and Unions

Declaration of structures, Accessing structure members, Structure initialization, array of structure variable, Pointer to a structures, Union, Declaration of Union.

8. File Handling

Basics of File Handling, opening and closing of File, reading and writing character from a file.

PRACTICAL OUTCOMES: After undergoing the subject, the students will be able to:

1. Identify the problem and formulate an algorithm for it.
2. Use pointer in an array and structure.
3. Use structures and union for data handling.
4. Install C software on the PC and debug the programme.
5. Explain & execute member functions of C in the programme
6. Describe and implement array concept in C programme
7. Expose File System using File Handling.

List of Practicals :-

1. Programming exercises on executing & editing a C program.
2. Programming exercises on defining variables and assigning values to variables.
3. Programming exercises on arithmetic, logical and relational operators.
4. Programming exercises on arithmetic expressions and their evaluation.
5. Programming exercises on formatting input/output using printf and scanf & their return type values.
6. Programming exercises using if statement.
7. Programming exercises using if – Else.
8. Programming exercises on switch statement.
9. Programming exercises on while and do– while statement.
10. Programming exercises on for – statement.
11. Simple programs using functions and recursive function.
12. Programming Exercise on array.
13. Simple programs using pointers.
14. Simple programs using structures.
15. Simple programs for File Handling

References :-

1. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
2. C Programming Absolute Beginner's Guide, Dean Miller and Greg perry
3. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India

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ELECTRICAL MACHINES

Course Code:	453002
Course Title	Electrical Machines
No. of Credits	6 (TH:4,T:0,P:4)

COURSE OUTCOMES : At the end of the course, the student will be able to:

1. Develop practical skills in dismantling a DC machine and understanding its components.
2. Gain proficiency in reversing the direction of rotation of a DC shunt motor.
3. Learn different methods to control the speed of a DC shunt motor and apply them in practical scenarios.
4. Understand various techniques to control the speed of a DC series motor and implement them in lab experiments.
5. Acquire knowledge of the different parts, their functions, and materials used in single-phase and three-phase induction motors.
6. Connect and operate three-phase squirrel cage induction motors in both directions using DOL, star-delta, & auto-transformer starters, demonstrating an understanding of motor control techniques.

COURSE CONTENTS

Unit 1 - DC Generators

1.1 Construction, parts, materials and their functions;

1.2 Principle of operation of DC generator;

1.3 E.M.F. equation of generators;

1.4 Armature reaction.

Unit 2 - D.C. Motors

2.1 Types of DC motors;

2.2 Principle of operation;

2.3 Back e.m.f. and its significance;

2.4 Voltage equation of DC motor;

2.5 Torque: Armature torque, Shaft torque;

2.6 Losses;

2.7 Efficiency;

2.8 Speed control of DC shunt and series motor, Speed Regulation

Unit 3 - Three Phase Induction Motor

3.1 Basic working principle;

3.2 Production of rotating magnetic field;

3.3 Synchronous speed, Rotor, Slip;

3.4 Elementary idea of construction of 3-phase induction motors;

3.5 Power factor at starting and running condition;

3.6 Characteristics of torque versus slip (speed);

3.7 Starters: Need and types, Stator resistance, Auto transformer, Star delta, Rotor Resistance;

Unit- 4 :Single Phase Induction & Special Purpose Motors

4.1 Construction, working and application of following special purpose motors (Brief idea only);

4.1.1 BLDC motor;

4.1.2 Single phase Synchronous Motor

4.1.3 Stepper motors;

4.1.4 AC and DC servomotors;

4.1.5 Repulsion induction motor;

4.1.6 Universal motor.

Unit 5- Three Phase Alternators & Synchronous Motor

5.1 Construction of three phase alternator;

5.2 Working principle of three phase alternator;

5.3 Principle of working /operation of synchronous;

5.4 Starting methods of Synchronous Motor.

Practical Outcomes: At the end of the course, the student will be able to:

1. Develop practical skills in dismantling a DC machine and get an insight of its components.
2. Gain proficiency in reversing the direction of rotation of a DC shunt motor.
3. Learn different methods to control the speed of a DC shunt motor and apply them in practical scenarios.
4. Acquire knowledge of the different parts, their functions, and materials used in single-phase and three-phase induction motors.
5. Understand the motor control techniques of three-phase induction motors in both directions.

List of Practicals:-

1 Dismantle a DC machine.

2 Reverse the direction of rotation of the DC shunt motor.

3 Control the speed of DC shunt motor by different methods.

4 Control the speed of DC series motor by different methods.

5 Identify the different parts (along with function and materials) for the given single phase and three phase induction motor.

6 Connect and run the three- phase squirrel cage induction motors (in both directions) using the DOL, star-delta, auto-transformer starters (any one).

7 Dismantling and reassembling of single-phase motors used for ceiling fans, universal motor for mixer.

8 Control the speed & reverse the direction of stepper motor.

9 Control the speed and reverse the direction of the AC/DC servo motor.

References /Suggested Learning Resources:

1. P.S. Bimbhra, Electric Machines, Khanna Book Publishing Co., New Delhi.
2. Mittle, V. N. and Mittle, Arvind, Basic Electrical Engineering, McGraw Hill Education New Delhi.
3. Kothari, D. P. and Nagrath, I. J., Electrical Machines, McGraw Hill Education. New Delhi.
4. Bhattacharya, S. K., Electrical Machines, McGraw Hill Education, New Delhi.
5. Theraja, B. L., Electrical Technology Vol-II (AC and DC machines), S. Chand and Co. Ltd., New Delhi.
6. Sen, S. K., Special Purpose Electrical Machines, Khanna Publishers, New Delhi.
7. Janardanan E. G, Special Electrical Machines, Prentice Hall India, New Delhi.
8. Hughes E., Electrical Technology, ELBS
9. Cotton H., Electrical Technology, ELBS

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KINEMATICS & DYNAMICS OF MACHINES

Course Code:	463002
Course Title	Kinematics & Dynamics of Machines
No. of Credits	6 (TH:4,T:0,P:4)

COURSE OUTCOMES: After completion of the course the Student will be able to:

1. Understand mechanisms, including terminology and kinematic inversions.
2. Analyze kinematics in simple mechanisms using polygons and analytical methods.
3. Classify and analyze different types of cams and their motion characteristics.
4. Study gears and gear trains, including toothed gearing and different types of gear systems.
5. Apply friction principles to analyze sliding, rolling, and thread friction, as well as friction drives.
6. Perform force analysis in static and dynamic scenarios, considering equilibrium conditions and inertia effects.

COURSE CONTENTS

Unit - 1 : Kinematic of Machines

1.1 Mechanisms
1.2 Terminology and definitions
1.3 Kinematics inversions of 4 bar and slide crank chain
1.4 Kinematics analysis in simple mechanisms (Brief Idea).
    1.4.1 Velocity and acceleration polygons
    1.4.2 Analytical methods
    1.4.3 Computer approach
1.5 Cams
    1.5.1 Classifications
    1.5.2 Displacement diagrams
    1.5.3 Layout of plate cam profiles
    1.5.4 Circular arc and tangent cams.

Unit - 2 : Gears And Gear Trains

2.1 Spur gear
2.2 Law of toothed gearing
2.3 Involute gearing
2.4 Interchangeable gears
2.5 Gear tooth action
2.6 Gear trains (Brief Idea)
    2.6.1 Parallel axis gears trains
    2.6.2 Epicyclical gear trains
    2.6.3 Automotive transmission gear trains.

Unit - 3 : Friction

3.1 Sliding and Rolling Friction angle
3.2 friction in threads
3.3 Friction Drives- Belt and rope drives.

Unit - 4 : Force Analysis

4.1 Applied and Constrained Forces

4.2 Free body diagrams

4.3 Static Equilibrium conditions

4.4 Static Force analysis in simple machine members

Unit - 5 : Balancing and Vibration

5.1 Static and Dynamic balancing

5.2 Balancing of revolving and reciprocating masses

5.3 Balancing machines

5.4 Free vibrations

5.5 Bending critical speed of simple shaft.

ACTICAL OUTCOMES:- After completion of the course the Student will be able to:

1. Gain a comprehensive understanding of gear parameters and their significance in mechanical systems.
2. Conduct experiments to study the velocity ratios of gear trains.
3. Utilize the turntable apparatus to determine the mass moment of inertia of axisymmetric bodies.
4. Understand and create cam profiles, motion curves in cams.
5. Understand critical speed and balancing phenomenon.

List of Practicals :

1. Study of gear parameters.
2. Experimental study of velocity ratios of gear trains.
3. Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus.
4. Cams – Cam profile drawing, Motion curves.
5. Determination of natural Frequency and verification of Laws of springs – Damping coefficient determination.
6. Determination of critical speeds of shafts with concentrated loads.
7. Balancing of rotating masses.

References /Suggested Learning Resources:

1. Ambekar A.G., "Mechanism and Machine Theory" Prentice Hall of India, New Delhi, 2007
2. Shigley J.E., Pennock G.R and Uicker J.J., "Theory of Machines and Mechanisms", Oxford University Press, 2003
3. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
4. Ghosh. A, and A.K. Mallick, "Theory and Machine", Affiliated East-West Pvt. Ltd., New Delhi,1988.
5. RaoJ. S. and Dukkipatti R.V. "Mechanisms and Machines", Wiley-Eastern Ltd., New Delhi, 1992.
6. John Hannah and Stephens R.C., "Mechanics of Machines", Viva Low Prices Student Edition,1999.
7. V. Ramamurthi, Mechanisms of Machine, Narosa Publishing House, 2002.
8. Robert L. Norton, Design of Machinery, McGraw-Hill, 2004.

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COMPUTER AIDED MACHINE DRAWING (WITH SOLID WORKS)

Course Code:	463003
Course Title	Computer Aided Machine Drawing (With Solid works)
No. of Credits	2 (TH:0,T:0,P:4)

PRACTICALOUTCOMES:- After completion of the course the Student will be able to:

1. Explain the 2D commands and features of a CAD software
2. Explain the 3D commands and features of a CAD software
3. Create 3D solid model and find the mass properties of simple solids
4. Develop the part program using simulation software
5. Assess the part program, edit and execute.

List of Practicals : The following contents are to be done by any 2D software package. Conventional representation of materials and components:

Detachable Joints: Drawing of thread profiles, hexagonal and square-headed bolts and nuts, bolted joint with washer and locknut, stud joint, screw joint and foundation bolts.

Riveted joints: Drawing of rivet, lap joint, butt joint with single strap, single riveted, double riveted double strap joints. Welded joints: Lap joint and T joint with fillet, butt joint with conventions.

Keys: Taper key, sunk taper key, round key, saddle key, feather key, woodruff key. Shaft coupling, bushed pin-type flange coupling, universal coupling, Oldham's' coupling.

The following contents to be done by the 3D software package Sectional views Creating solid models of complex machine parts and create sectional views.

Assembly drawings: (Any four of the following using the solid model software) Lathe tool post, tool head of shaping machine, tail stock, machine vice, gate valve, carburetor, piston, connecting rod, eccentric, screw jack, plumber block, axle bearing, pipe vice, clamping device, Geneva cam, universal coupling.

Manufacturing drawing: Representation of limits, fits and tolerances for mating parts. Use any four parts of above assembly drawings and prepare manufacturing drawing with dimensional and geometric tolerances.

Reference Books:

1. Machine Drawing – P.S. Gill S. K. Kataria & Sons, Delhi., 17th Revised edition, 2001
2. Mechanical Draughtsmanship - G.L. Tamta Dhanpat Rai & Sons, Delhi, 1992
3. Inside AutoCAD – D. Raker and H. Rice, BPB Publications, New Delhi, 1985
4. CAD/CAM/CIM – P. Radhakrishnan, S. Subramaniyan & V. Raju, New Age International Pvt. Ltd., New Delhi, 3rd Edition,
5. Engineering AutoCAD, A.P. Gautam & Pradeep Jain, Khanna Book Publishing Co., Delhi

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SUMMER INTERNSHIP-I

Course Code:	AS301
Course Title	Summer Internship - I
No. of Credits	2 (TH:0,T:0,P:0)

Summer Internship provides an invaluable opportunity for students pursuing their Diploma in Engineering to gain real-world experience and exposure to various industrial production units and commercial activities related to their field of study. This program aims to bridge the gap between theoretical knowledge and practical application, equipping students with the necessary skills and expertise to thrive in the branch related industry.

At the end of the **Second semester**, students will undertake a minimum 3 to 4-week Summer Internship, scheduled during the semester break following the Second Semester examinations. The respective Heads of Departments (HoDs) and experienced faculty members will guide and assist students in securing suitable training opportunities that align with their specialization. Each student will have a personalized training schedule developed in collaboration with the training providers, ensuring a comprehensive and enriching learning experience.

Before starting their training, students will receive a comprehensive briefing about the organizational setup, product range, manufacturing processes, and significant machinery and materials used in the training organization. This preliminary understanding will enhance their engagement and productivity during the internship.

To ensure a fruitful learning experience, faculty members will supervise students during their training in the industry or field organization. Each faculty member will mentor a small group of 4-5 students, providing personalized attention and guidance. Students will be encouraged to maintain daily reports in their diaries, which will assist them in composing their final training report and presentation.

The evaluation process for the Summer Internship will include both internal and external assessments, as per the study and evaluation scheme of the **Third Semester**. During the viva - voce / presentation examination, students' understanding of materials, industrial processes, practices in the industry, and problem-solving abilities will be assessed. The evaluation will also focus on their application of knowledge and skills in real-life situations.

The components of evaluation will comprise:

(a) Punctuality and regularity: 15%

(b) Initiative in learning new things: 15%

(c) Relationship with peers and colleagues: 10%

(d) Summer Internship report: 25%

(e) Viva-Voce: 35%

The purpose of summer Internship program is to create a transformative experience for students, empowering them to excel in their future careers and make meaningful contributions to the Engineering industry. The collaborative efforts of experienced faculty members and industry partners will ensure that students may gain valuable insights and practical skills during this immersive learning journey.

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