MA15101 **MATRICES AND CALCULUS** **3 2 0 4**

(Common to all Branches)

OBJECTIVES:

To enable students to,

- understand the concepts of Eigen values and Eigen vectors of real matrices and its applications inthe process of diagonalization of real symmetric matrices.
- Study the basic concepts of differentiation, curvature, calculate the radius of curvature and centre of curvature and find the evolute, involute and envelope of curves.
- learn the concept of partial differentiation and its applications to maxima and minima offunctions of two or more variables.
- develop a thorough knowledge of definite and indefinite integrals
- learn the concepts of multiple integrals and their applications

UNIT I MATRICES 9+6

Characteristic equation – Eigen values and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II DIFFERENTIAL CALCULUS 9+6

Limit - Continuity, properties of limit and classification of discontinuities - Simple problems. Differentiation – Standard forms, Successive differentiation and Leibnitz theorem. Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9+6

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor's expansion – Maxima and Minima – Method of Lagrangian multipliers.

UNIT IV INTEGRAL CALCULUS 9+6

Indefinite and definite integrals – Standard form of integrals, properties of integrals, integration of simple function. Methods of integration – Decomposition method, substitution method, integration by parts – Reduction formulae involving exponential and trigonometric functions, Bernoulli's formula.

UNIT V MULTIPLE INTEGRALS 9+6

Double integration – Cartesian and polar coordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates – Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral.

TOTAL : 75 PERIODS

OUTCOMES:

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

- determine eigen values and eigen vectors and diagonalize real symmetric matrices.
- classify various types of functions involved in engineering fields, their differentiation techniquesand applications
- find partial derivatives and apply the same to find maxima and minima of two or more variables
- implement different methods of integration used in engineering problems
- execute suitable integration techniques to calculate surface areas and volumes.

BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi,(2011).
2. P.Jayakumar, B.Kishokkumar and M.Vimala, "Mathematics -I", Global Publishers, Chennai.,(2014).

REFERENCES:

1. T. Veerarajan., "Engineering Mathematics", 3rd Edition, Tata McGraw Hill, (2011).
2. Erwin Kreyszig., "Advanced Engineering Mathematics" 10th Edition, Wiley Publications.
3. Dass, H.K., and Er. RajnishVerma," Higher Engineering Mathematics", S. Chand Private Ltd.,(2011).
4. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education,(2012).
5. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2008).

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO3	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO4	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	2	3

ME 15201 ENGINEERING MECHANICS 3 2 0 4

COURSE OBJECTIVES

- To develop the ability to solve engineering problems dealing with force, displacement, velocity and acceleration by understanding the basic concepts.
- To gain knowledge on concepts involved in equilibrium of rigid bodies.
- To impart analytical ability to solve problems involving moments of surfaces and solids
- To develop knowledge to analyse the forces acting in the dynamics of particles
- To solve rigid body problems subjected to friction and elements of rigid bodies.

UNIT I BASICS & STATICS OF PARTICLES 9+3

Introduction - Units and Dimensions - Laws of Mechanics - Lame's theorem, Parallelogram and triangular Law of forces - Vectors - Vectorial representation of forces and moments - Vector operations: additions, subtraction, dot product, cross product - Coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility.

UNIT II EQUILIBRIUM OF RIGID BODIES 9+3

Free body diagram - Types of supports and their reactions - requirements of stable equilibrium Moments and Couples - Moment of a force about a point and about an axis - Vectorial representation of moments and couples - Scalar components of a moment - Varignon's theorem - Equilibrium of Rigid bodies in two dimensions - Equilibrium of Rigid bodies in three dimensions – Examples

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9+3

Determination of Areas and Volumes - First moment of area and the Centroid of sections - Rectangle, circle, triangle from integration - T section, I section, - Angle section, Hollow section by using standard formula - second and product moments of plane area - Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow section by using standard formula - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia

UNIT IV DYNAMICS OF PARTICLES **9+3**

Displacements, Velocity and acceleration, their relationship - Relative motion - Curvilinear motion - Newton's law - Work Energy Equation of particles - Impulse and Momentum - Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS **9+3**

Frictional force - Laws of Coloumb friction - simple contact friction - Rolling resistance - Belt friction. Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion.

TOTAL(45+15): 60 PERIODS

COURSE OUTCOMES

- Ability to explain the differential principles applied to solve engineering problems dealing with force, displacement, velocity and acceleration.
- Gain indepth knowledge about equilibrium of rigid bodies.
- Identify and calculate the various properties of surfaces and solids
- Ability to analyse the forces in any structures.
- Ability to solve rigid body problems subjected to dynamic forces.

TEXT BOOK

1. Dr.N.Kottiswaran., "Engineering Mechanics"10th Edition, Sri Balaji Publications 2010.
2. Palanichamy, M.S., Nagam, S., "Engineering Mechanics - Statics & Dynamics", Tata McGraw-Hill, (2001).

REFERENCES

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, (1997).
2. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd.,

3. Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics”, 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., “ Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, Third Edition, John Wiley & Sons,1993.
5. Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics”, Vikas Publishing House Pvt. Ltd., (2000).

WEBLINK

- http://www.nptel.ac.in/courses/112103109/
- https://www.coursera.org/learn/engineering-mechanics-statics/home/info
- http://www.myopencourses.com/subject/engineering-mechanics-2

CO - PO Mapping

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO2	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO3	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO4	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	2	-	-	-	-	-	-	2	2	3

REFERENCES:

1. Egor. P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2001
2. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2007.
3. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Low Price Edition, 2007
4. Ferdinand P. Been, Russell Johnson, J.r. and John J. Dewole "Mechanics of Materials", Tata McGraw Hill Publishing 'co. Ltd., New Delhi, 2005.

CE6451 FLUID MECHANICS AND MACHINERY L T P C
3 0 0 3

OBJECTIVES:

- The applications of the conservation laws to flow through pipes and hydraulic machines are studied
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps and turbines.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 8

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS 8

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli-Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.

UNIT III DIMENSIONAL ANALYSIS 9

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV PUMPS 10

Impact of jets - Euler's equation - Theory of roto-dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps– working principle - work done by the impeller - performance curves - Reciprocating pump- working principle – Rotary pumps –classification.

UNIT V TURBINES 10

Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner – draft tube. Specific speed - unit quantities – performance curves for turbines – governing of turbines.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOK:

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2004.

REFERENCES:

1. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010
2. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2004
3. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.
4. Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011

EC6302 DIGITAL ELECTRONICS L T P C
3 0 0 3

OBJECTIVES:

- To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits
- and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of synchronous and asynchronous sequential circuits

UNIT I MINIMIZATION TECHNIQUES AND LOGIC GATES 9

Minimization Techniques: Boolean postulates and laws – De-Morgan's Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions –– Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions – Quine - Mc Cluskey method of minimization.

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations – Multi
level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

UNIT II COMBINATIONAL CIRCUITS 9

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

UNIT III SEQUENTIAL CIRCUITS 9

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

UNIT IV MEMORY DEVICES **9**

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell –Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

UNIT V SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS **9**

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits

Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits. Design of Combinational and Sequential circuits using VERILOG.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to:

- Analyze different methods used for simplification of Boolean expressions.
- Design and implement Combinational circuits.
- Design and implement synchronous and asynchronous sequential circuits.
- Write simple HDL codes for the circuits.

TEXT BOOK:

1. M. Morris Mano, “Digital Design”, 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.

REFERENCES:

1. John F.Wakerly, “Digital Design”, Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.
3. Charles H.Roth. “Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, “Digital Principles and Applications”, 6th Edition, TMH, 2006.
5. Thomas L. Floyd, “Digital Fundamentals”, 10th Edition, Pearson Education Inc, 2011
6. Donald D.Givone, “Digital Principles and Design”, TMH, 2003.

EE6358 ELECTRICAL MACHINES AND DRIVES **L T P C 3 0 0 3**

OBJECTIVES:

- The students will learn basic principle ,A.C , D.C Circuits, Transformers, Characteristics , starting methods, of D.C. and A.C. motors ,induction motor. and controlling the speed of D.C. and A.C. motors using solid state devices.

UNIT I ELECTRICAL CIRCUITS AND TRANSFORMERS **6**

D.C. Voltage, current, power – Ohms law – series, parallel circuits – Kirchhoff’s laws – mesh analysis – A.C. voltage – sinusoidal waves, – power factor – complex power – basic operation of transformers – simple problems.

UNIT II ELECTRICAL MOTORS 12

Constructional details, principle of operation and performance characteristics of D.C. motors, single phase induction motor, three phase induction motor, synchronous motors, universal motors, stepper motors and reluctance motor.

UNIT III SPEED CONTROL AND STRATING 9

Speed control of D.C. motors – three phase induction motors – starting methods of D.C. motor and three phase induction motor – electrical braking – simple problems.

UNIT IV ELECTRICAL DRIVES 9

Type of Electrical Drives – Selection & factors influencing the selection – heating and cooling curves – loading condition and classes of duty – determination of power rating – simple problems.

UNIT V SOLID STATE DRIVES(QUALITATIVE TREATMENT ONLY) 9

Advantages of solid state drives – D.C. motor control using rectifiers and choppers – control of induction motor by V, V/f and slip power recovery scheme using inverters and A.C. power regulators.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance

TEXT BOOKS:

1. Vukosavic, "Digital Control of Electrical Drives", Springer, Indian Reprint, 2010.
2. Vedam Subramaniam. "Electric Drives", Tata McGraw Hill , New Delhi , 2007.
3. De. N.K., & Sen. P.K “Electric Drives”, Prentice Hall India Pvt Limited 2002.

REFERENCES:

1. Crowder, "Electric Drives and Electromechanical Systems", Elsevier, Indian Reprint, 2009
2. Metha. V.K. & Rohit Metha, "Principle of Electrical Engineering", S.Chand & Co .2006.
3. Dubey.G.K. “Fundamental Electrical Drives” 2nd Edition, Narosa Publications, 2002
4. Bhattacharya S.K. & Brinjinder Singh , "Control of Electrical Machines", New Age International Publishers, 2002.

ME6401 KINEMATICS OF MACHINERY L T P C

3 0 0 3

OBJECTIVES:

- To understand the basic components and layout of linkages in the assembly of a system/ machine.
- To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
- To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
- To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.

UNIT I BASICS OF MECHANISMS 9

Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, Mobility – Kutzbach criterion, Gruebler’s criterion – Grashof’s Law – Kinematic inversions of four-bar chain and slider crank chains – Limit positions – Mechanical advantage – Transmission Angle –

Description of some common mechanisms – Quick return mechanisms, Straight line generators, Universal Joint – rocker mechanisms.

UNIT II KINEMATICS OF LINKAGE MECHANISMS 9

Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method– Velocity and acceleration polygons – Velocity analysis using instantaneous centres – kinematic analysis of simple mechanisms – Coincident points – Coriolis component of Acceleration – Introduction to linkage synthesis problem.

UNIT III KINEMATICS OF CAM MECHANISMS 9

Classification of cams and followers – Terminology and definitions – Displacement diagrams –Uniform velocity, parabolic, simple harmonic and cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Specified contour cams – Circular arc and tangent cams – Pressure angle and undercutting – sizing of cams.

UNIT IV GEARS AND GEAR TRAINS 9

Law of toothed gearing – Involutes and cycloidal tooth profiles –Spur Gear terminology and definitions –Gear tooth action – contact ratio – Interference and undercutting. Helical, Bevel, Worm, Rack and Pinion gears [Basics only]. Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains.

UNIT V FRICTION IN MACHINE ELEMENTS 9

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads –Bearings and lubrication – Friction clutches – Belt and rope drives – Friction in brakes- Band and Block brakes.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply fundamentals of mechanism for the design of new mechanisms and analyse them for optimum design.

TEXT BOOKS:

1. Uicker, J.J., Pennock G.R and Shigley, J.E., “Theory of Machines and Mechanisms”, 3rdEdition, Oxford University Press, 2009.
2. Rattan, S.S, “Theory of Machines”, 3rd Edition, Tata McGraw-Hill, 2009.

REFERENCES:

1. Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors, 2005.
2. Cleghorn. W. L, “Mechanisms of Machines”, Oxford University Press, 2005
3. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.
4. Allen S. Hall Jr., “Kinematics and Linkage Design”, Prentice Hall, 1961
5. Ghosh. A and Mallick, A.K., “Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., New Delhi, 1988.
6. Rao.J.S. and Dukkipati.R.V. "Mechanisms and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.
7. John Hannah and Stephens R.C., "Mechanics of Machines", Viva Low-Prices Student Edition, 1999.
8. Ramamurthi. V, "Mechanics of Machines", Narosa Publishing House, 2002.
9. Khurmi, R.S., ”Theory of Machines”,14th Edition, S Chand Publications, 2005
10. Sadhu Sigh : Theory of Machines, "Kinematics of Machine", Third Edition, Pearson Education, 2012

CE6461 FLUID MECHANICS AND MACHINERY LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.,

LIST OF EXPERIMENTS

1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/ submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to use the measurement equipments for flow measurement
- Ability to do performance trust on different fluid machinery

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	NAME OF THE EQUIPMENT	Qty.
1	Orifice meter setup	1
2	Venturi meter setup	1
3	Rotameter setup	1
4	Pipe Flow analysis setup	1
5	Centrifugal pump/submergible pump setup	1
6	Reciprocating pump setup	1
7	Gear pump setup	1
8	Pelton wheel setup	1
9	Francis turbine setup	1
10	Kaplan turbine setup	1

EE6362 ELECTRICAL MACHINES AND DRIVES LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- To expose the students the operation of electric drives to gain hands on experience.

LIST OF EXPERIMENTS

1. Load test on D.C. shunt motor.
2. Speed control of D.C. shunt motor.
3. Swinburne's test.

4. Load test on three phase induction motor.
5. No load and blocked rotor tests on three – phase induction motor.
6. Load test on single phase induction motor.
7. No load and blocked rotor tests on single phase induction motor.
8. Load test on Synchronous motors.
9. Performance characteristics of Stepper motor.
10. Performance characteristics of single phase transformer.

TOTAL: 45 PERIODS

OUTCOMES

- Ability to perform load test on D.C. shunt motor
- Ability to perform speed control test
- Abilty to do characteristics of different electrical motors

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.NO	NAME OF THE EQUIPMENT	Qty
1	Shunt motor 5HP	3
2	Single phase Induction Motor 2HP	2
3	Three phase induction Motor 5HP	2
4	Single phase transformer 2KVA	1
5	Three phase auto transformer	2
6	Single phase auto transformer	2
7	3 point starter	3
8	DPST, TPST Each	2
9	DC source 300v, 100A	1
10	Ammeter(0-5A),(0-10A)MC Each	2
11	Ammeter(0-5A),(0-10A)MI Each	2
12	Voltmeter(0-300V) MC	3
13	Voltmeter(0-150V),(0-300V),(0-600V)MI Each	2
14	Wattmeter 150/300V, 5/10A UPF	2
15	Wattmeter 300/600V,5/10A UPF	2
16	Wattmeter 150/300V,5/10A LPF	2
17	Wattmeter 300/600V,5/10A LPF	2
18	Stepper motor 5Kg	1
19	Synchronous motor 5KW	1
20	Rheostat 360 ohm/1.2A	3
21	Tachometer	5
22	Rheostat 50 ohm/5A	3

MT6311 COMPUTER AIDED MACHINE DRAWING

L	T	P	C
0	0	3	2

OBJECTIVES

- To introduce the students the Indian standard code of practice for engineering drawing and general symbols and abbreviation used on the drawing.
- To provide hands on experience to develop 2D and 3D models of engineering components.
- To provide knowledge to use Drawing/Modeling software.

UNIT I **9**

Indian standard code of practice for engineering drawing – general principles of Presentation. Conventional representations of threaded parts, springs, gear and Common features. Abbreviations and symbols for use on technical drawings. Conventions for sectioning and dimensioning.

UNIT II **9**

Tolerances – types – representation of tolerances on drawing, fits – types – selection of Fits – allowance. Geometric tolerances – form and positional tolerances – datum, datum Features. Maximum material principle – symbols and methods of indicating it on drawing Surface finish symbols – welding symbols and methods of indicating it on drawing.

UNIT III DRAFTING WORK USING MINI DRAFTER **9**

Preparation of part and assembly drawings of Plummer block, screw jack, machine vice, lathe tailstock, tool head of the shaper, stuffing box, piston & connecting rod universal join)

UNIT IV **9**

Introduction to the use of any drafting software – creation of simple geometric bodies using primitives (line, arc, circle etc.,) and editing for the drawing, Dimensioning and text writing, concept of layer creation and setting, line types.

UNIT V **9**

Preparation of 2-D drawings using CAD software for components and assemblies of Plummer block, screw jack, machine vice, lathe tailstock, tool head of the shaper. Introduction to 3-Dmodeling solid and frame modeling.

TOTAL: 45 PERIODS

OUTCOMES

- Ability to develop engineering drawing for the industrial component using Indian Standard code of practice.
- Ability to develop 2D and 3D models of the component using manual/software.

TEXT BOOKS:

1. Sadhu Singh & P.L. Sah, "Fundamentals of Machine Dynamics", Prentice Hall of India 2003
2. Rao. P.N., "CAD/CAM Principles and Applications", Tata McGraw – Hill 2003.

REFERNCE:

1. Venugopal. K., "Engineering Graphics AutoCAD", John Wiley& Sons, 2002

MA6452 STATISTICS AND NUMERICAL METHODS **L T P C**
3 1 0 4

OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.

UNIT I TESTING OF HYPOTHESIS **9+3**

Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, χ^2 and F distributions for testing means and variances – Contingency table (Test for Independency) – Goodness of fit.

EC6405 CONTROL SYSTEM ENGINEERING **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the elements of control system and their modeling using various Techniques.
- To introduce methods for analyzing the time response, the frequency response and the stability of systems
- To introduce the state variable analysis method

UNIT I CONTROL SYSTEM MODELING **9**

Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph

UNIT II TIME RESPONSE ANALYSIS **9**

Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

UNIT III FREQUENCY RESPONSE ANALYSIS **9**

Frequency Response - Bode Plot, Polar Plot, Nyquist Plot - Frequency Domain specifications from the plots - Constant M and N Circles - Nichol's Chart - Use of Nichol's Chart in Control System Analysis. Series, Parallel, series-parallel Compensators - Lead, Lag, and Lead Lag Compensators, Analysis using MATLAB.

UNIT IV STABILITY ANALYSIS **9**

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability, Analysis using MATLAB

UNIT V STATE VARIABLE ANALYSIS **9**

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations - Concepts of Controllability and Observability – State space representation for Discrete time systems. Sampled Data control systems – Sampling Theorem – Sampler & Hold – Open loop & Closed loop sampled data systems.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Perform time domain and frequency domain analysis of control systems required for stability analysis.
- Design the compensation technique that can be used to stabilize control systems.

TEXTBOOK:

1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.

REFERENCES:

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition,1995.
2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.
3. Schaum's Outline Series, "Feed back and Control Systems" Tata Mc Graw-Hill, 2007.
4. John J.D'Azzo & Constantine H.Houpis, "Linear Control System Analysis and Design'", Tata Mc Graw-Hill, Inc., 1995.
5. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison – Wesley, 1999.

ME6352 **MANUFACTURING TECHNOLOGY** **L T P C**
3 0 0 3

OBJECTIVES:

- The automobile components such as piston, connecting rod, crankshaft, engine block, front axle, frame, body etc., are manufactured by various types of production processes involving casting, welding, machining, metal forming, power metallurgy etc. Hence B.E. Automobile Engineering students must study this course Production Technology.

UNIT I CASTING **8**

Casting types, procedure to make sand mould, types of core making, moulding tools, machine moulding, special moulding processes – CO_2 moulding; shell moulding, investment moulding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting, casting defects.

UNIT II WELDING **8**

Classification of welding processes. Principles of Oxy-acetylene gas welding. A.C metal arc welding, resistance welding, submerged arc welding, tungsten inert gas welding, metal inert gas welding, plasma arc welding, thermit welding, electron beam welding, laser beam welding, defects in welding, soldering and brazing.

UNIT III MACHINING **13**

General principles (with schematic diagrams only) of working and commonly performed operations in the following machines: Lathe, Shaper, Planer, Horizontal milling machine, Universal drilling machine, Cylindrical grinding machine, Capstan and Turret lathe. Basics of CNC machines. General principles and applications of the following processes: Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Plasma arc machining, Electron beam machining and Laser beam machining.

UNIT IV FORMING AND SHAPING OF PLASTICS **7**

Types of plastics - Characteristics of the forming and shaping processes – Moulding of Thermoplastics – Working principles and typical applications of - Injection moulding – Plunger and screw machines – Blow moulding – Rotational moulding – Film blowing – Extrusion - Typical industrial applications – Thermoforming – Processing of Thermosets – Working principles and typical applications - Compression moulding – Transfer moulding – Bonding of Thermoplastics – Fusion and solvent methods – Induction and Ultrasonic methods

UNIT V METAL FORMING AND POWDER METALLURGY **9**

Principles and applications of the following processes: Forging, Rolling, Extrusion, Wire drawing and Spinning, Powder metallurgy – Principal steps involved advantages, disadvantages and limitations of powder metallurgy.

TOTAL: 45 PERIODS

OUTCOMES:

- The Students can able to use different manufacturing process and use this in industry for component production

TEXT BOOKS:

1. Hajra Choudhury, “Elements of Workshop Technology”, Vol. I and II, Media Promoters and Publishers Pvt., Ltd., Mumbai, 2005.
2. Nagendra Parashar B.S. and Mittal R.K., “Elements of Manufacturing Processes”, Prentice-Hall of India Private Limited, 2007.

REFERENCES:

1. Serope Kalpajian, Steven R.Schmid, "Manufacturing Processes for Engineering Materials", 4th Edition, Pearson Education, Inc. 2007.
2. Jain. R.K. and S.C. Gupta, "Production Technology", Khanna Publishers. 16th Edition, 2001.
3. "H.M.T. Production Technology – Handbook", Tata McGraw-Hill, 2000.
4. Roy. A. Linberg, "Process and Materials of Manufacture", PHI, 2000.
5. Adithan. M and A.B. Gupta, "Manufacturing Technology", New Age, 2006.

ME6504 METROLOGY AND MEASUREMENTS L T P C
3 0 0 3

OBJETCTIVES:

- To provide knowledge on various Metrological equipments available to measure the dimension of the components.
- To provide knowledge on the correct procedure to be adopted to measure the dimension of the components.

UNIT I .BASICS OF METROLOGY 5

Introduction to Metrology – Need – Elements – Work piece, Instruments – Persons – Environment – their effect on Precision and Accuracy – Errors – Errors in Measurements – Types – Control – Types of standards.

UNIT II LINEAR AND ANGULAR MEASUREMENTS 10

Linear Measuring Instruments – Evolution – Types – Classification – Limit gauges – gauge design – terminology – procedure – concepts of interchange ability and selective assembly – Angular measuring instruments – Types – Bevel protractor clinometers angle gauges, spirit levels sine bar – Angle alignment telescope – Autocollimator – Applications.

UNIT III ADVANCES IN METROLOGY 12

Basic concept of lasers Advantages of lasers – laser Interferometers – types – DC and AC Lasers interferometer – Applications – Straightness – Alignment. Basic concept of CMM – Types of CMM – Constructional features – Probes – Accessories – Software – Applications – Basic concepts of Machine Vision System – Element – Applications.

UNIT IV FORM MEASUREMENT 10

Principles and Methods of straightness – Flatness measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications.

UNIT V MEASUREMENT OF POWER, FLOW AND TEMPERATURE 8

Force, torque, power - mechanical , Pneumatic, Hydraulic and Electrical type. Flow measurement: Venturimeter, Orifice meter, rotameter, pitot tube – Temperature: bimetallic strip, thermocouples, electrical resistance thermometer – Reliability and Calibration – Readability and Reliability.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of this course, the Students can demonstrate different measurement technologies and use of them in Industrial Components

TEXT BOOKS:

1. Jain R.K. “Engineering Metrology”, Khanna Publishers, 2005.
2. Gupta. I.C., “Engineering Metrology”, Dhanpatrai Publications, 2005.

REFERENCES:

1. Shot bolt, “Metrology for Engineers”, McGraw Hill, 1990.
2. Backwith, Marangoni, Lienhard, “Mechanical Measurements”, Pearson Education , 2006.

MT6401 MICROPROCESSORS AND APPLICATIONS L T P C
3 0 0 3

OBJECTIVES:

- Most of the Mechatronics systems control is based on Microprocessor or Microcontroller. The students will be exposed to the knowledge of Microprocessor , Microcontrollers and design of mechatronics using them.systems.

UNIT I INTRODUCTION 10

Organization of 8085: Architecture, Internal Register Organization and Pin Configuration – Instruction Set of 8085 – addressing modes – instruction machine cycles with states and timing diagram.- 8085 assembly language programming- Examples.

UNIT II INTERFACING TECHNIQUES 9

Need for Interfacing - Memory Interfacing, address space partitioning – address map – Address decoding – Designing decoders circuit. I/O Interfacing: Data transfer schemes – programmed Synchronous and asynchronous – Interrupt driven Transfer – Multiple devices and multiple interrupt levels – enabling disabling and masking of interrupts. DMA transfer: Cycle stealing – Burst mode – Multiple DMA devices – DMA transfer in 8085 system – serial data transfer.

UNIT III INTERFACING DEVICES 9

Programmable peripheral device (8255) – programmable interval timer (8353) – Programmable communication interface (8251) (USART) – Programmable interrupt controller – Programmable DMA Controller (8257)- Programmable Keyboard/display controllers.(8279)

UNIT IV DESIGN USING PERIPHERAL DEVICES 9

Interfacing A/D and D/A converters – Matrix Keyboard design using 8255 with 8085 programs. Designing real time clock, detecting power failure, detecting presence of objects using 8253 - Design of Keyboard and display interfacing using 8279 – Design of digital transmission with modems and telephone lines using 8251 A.

UNIT V MICROPROCESSOR APPLICATIONS 8

Temperature monitoring system – Automotive applications – Closed loop process control – Stepper motor control.

TOTAL: 45 PERIODS

OUTCOMES:

- At the end of the course the students will be able to design microprocessor based systems.

TEXT BOOKS:

1. Rafiquzzaman, "Microprocessors and Microcomputer-Based System Design" 2nd Edition, Taylor & Francis, Indian Reprint, 2009
2. Ramesh Gonakar, "Microprocessor Architecture. Programming and Applications with the 8085" 5th edition – Penram International Publishing (India) Private Limited. 2005.

REFERENCES:

1. Aditya P Mathur , "Introduction to Microprocessor" 3rd Edition, Tata McGraw Hill Publishing Co Ltd., New Delhi, 2003.
2. Douglas V. Hall. "Microprocessors and Interfacing, Programming and Hardware" Tata McGraw – Hill Publishing Company Ltd., New Delhi, 1997.

MT6411 MICROPROCESSOR LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- To expose the students to microprocessor and trvia them to perform simple programming
- To provide knowledge on interfacing

LIST OF EXPERIMENTS.

I PROGRAMMING **30**

1. Addition of two 8 – bit numbers, sum of 8 – bits and 16 bits.
2. Decimal addition of two 8 – bit numbers Sum: 16 bits.
3. 8 - bit subtraction.
4. 8 – bit decimal subtraction.
5. Additional of two 16 – bit numbers, Sum: 16 bits or more.
6. Multibyte subtraction.
7. To arrange a series of numbers in Ascending order.
8. To arrange a series of numbers in Descending order.
9. 8 – bit Multiplication.
10. 8 – bit Division.
11. Decimal to hexadecimal conversion and hexadecimal to decimal number conversion.

II. INTERFACING **15**

1. Analog to digital conversion.
2. Digital to analog conversion.
3. Steeper motor controller.
4. Temperature controller.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to use the microprocessor to perform simple programmes like addition, subtraction, multiplication, division etc.,
- Ability to use the microprocessor for interfacing for conversion of signals.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Name of the Equipment	Qty
1	8085 Microprocessor trainer kits	15
2	ADC interface card	3
3	DAC interface card	3
4	Stepper motor interfacing card with stepper motor	3
5	Temperature controller with sensors(thermocouple)	3

ME6465 **MANUFACTURING TECHNOLOGY LABORATORY** **L T P C**
0 0 3 2

OBJECTIVES:

- Demonstration and study of the VARIOUS machines. The Main emphasis will be on a complete understanding of the machine capabilities and processes.

LIST OF EXPERIMENTS

UNIT I LATHE PRACTICE

a. Plain Turning
b. Taper Turning
c. Thread Cutting
Estimation of machining time for the above turning processes.

UNIT II DRILLING PRACTICE

a. Drilling
b. Tapping
c. Reaming.

UNIT III MILLING

a. Surface Milling.
b. Gear Cutting.
c. Contour Milling.

UNIT IV PLANNING AND SHAPING

a. Cutting Key Ways.
b. Dove tail machining.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to use different machine tools to manufacturing gears.
- Ability to use different machine tools for finishing operations
- Ability to manufacture tools using cutter grinder
- Develop CNC part programming

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1	. Lathe -	15 Nos.
2	Drilling Machine -	1 No
3	Milling Machine -	2 Nos.
4	Planning Machine -	1 No
5	Shaping Machine -	2 Nos.

ME6511 **DYNAMICS LABORATORY** **L T P C**
0 0 3 2

OBJECTIVES:

- To supplement the principles learnt in kinematics and Dynamics of Machinery.
- To understand how certain measuring devices are used for dynamic testing.

LIST OF EXPERIMENTS

1. a) Study of gear parameters.
   b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
2. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.
   b) Kinematics of single and double universal joints.
3. a) Determination of Mass moment of inertia of Fly wheel and Axle system.
   b) Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus.
   c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
4. Motorized gyroscope – Study of gyroscopic effect and couple.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
6. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
7. a) Single degree of freedom Spring Mass System – Determination of natural Frequency and verification of Laws of springs – Damping coefficient determination.
   b) Multi degree freedom suspension system – Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and Double Rotor systems.- Undamped and Damped Natural frequencies.
   b) Vibration Absorber – Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system – undamped and damped vibration.
10. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads.
11. a) Balancing of rotating masses. (b) Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam – with and without concentrated masses.
    b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.
    c) Determination of transmissibility ratio using vibrating table.

TOTAL : 45 PERIODS

OUTCOME

- Ability to demonstrate the principles of kinematics and dynamics of machinery
- Ability to use the measuring devices for dynamic testing.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Cam follower setup.	1 No.
2	Motorised gyroscope.	1 No.
3	Governor apparatus - Watt, Porter, Proell and Hartnell governors.	1 No.
4	Whirling of shaft apparatus.	1 No.
5	Dynamic balancing machine.	1 No.
6	Two rotor vibration setup.	1 No.
7	Spring mass vibration system.	1 No.
8	Torsional Vibration of single rotor system setup.	1 No.
9	Gear Models	1 No.
10	Kinematic Models to study various mechanisms.	1 No.
11	Turn table apparatus.	1 No.
12	Transverse vibration setup of a) cantilever b) Free-Free beam c) Simply supported beam.	1 No.

ME6503 **DESIGN OF MACHINE ELEMENTS** **L T P C**
3 0 0 3

OBJECTIVES:

- To familiarize the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of acomponent to satisfy functional and strength requirements.
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components
  (Use of P S G Design Data Book is permitted)

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS **10**

Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties - Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – curved beams – crane hook and 'C' frame- Factor of safety - theories of failure – Design based on strength and stiffness – stress concentration – Design for variable loading.

UNIT II SHAFTS AND COUPLINGS **8**

Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, keyways and splines – crankshafts - Rigid and flexible couplings

UNIT III TEMPORARY AND PERMANENT JOINTS **9**

Threaded fastners - Bolted joints including eccentric loading, Knuckle joints, Cotter joints – Welded joints, riveted joints for structures - theory of bonded joints.

UNIT IV ENERGY STORING ELEMENTS AND ENGINE COMPONENTS **9**

Various types of springs, optimization of helical springs - rubber springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNIT V BEARINGS **9**

Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, Sommerfeld Number, Raimondi and Boyd graphs, -- Selection of Rolling Contact bearings.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to successfully design engine components

TEXT BOOKS:

1. Bhandari V, "Design of Machine Elements", 3rd Edition, Tata McGraw-Hill Book Co, 2010.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett "Mechanical Engineering Design", 8th Edition, Tata McGraw-Hill, 2008.

REFERENCES:

1. Sundararajamoorthy T. V. Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2003.
2. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design",4thEdition,Wiley, 2005
3. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill BookCo.(Schaum's Outline), 2010

4. Bernard Hamrock,Steven Schmid,Bo Jacobson, “Fundamentals of Machine Elements”,2nd Edition, Tata McGraw-Hill Book Co., 2006.
5. Orthwein W, “Machine Component Design”, Jaico Publishing Co, 2003.
6. Ansel Ugural, “Mechanical Design – An Integral Approach", 1st Edition, Tata McGraw-HillBook Co, 2003.
7. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, “Design of Machine Elements” 8th Edition, Prentice Hall, 2003.

EE6503 POWER ELECTRONICS L T P C
3 0 0 3

OBJECTIVES:

- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and various configurations.

UNIT I POWERSEMI-CONDUCTOR DEVICES 9

Study of switching devices, Diode, SCR,TRIAC, GTO, BJT, MOSFET, IGBT-Static and Dynamic characteristics - Triggering and commutation circuit for SCR- Design of Driver and snubber circuit.

UNIT II PHASE-CONTROLLED CONVERTERS 9

2-pulse,3-pulse and 6-pulseconverters– performance parameters –Effect of source inductance— Gate Circuit Schemes for Phase Control–Dual converters.

UNIT III DC TO DC CONVERTER 9

Step-down and step-up chopper-control strategy–Forced commutated chopper–Voltage commutated, Current commutated, Load commutated, Switched mode regulators- Buck, boost, buck- boost converter, Introduction to Resonant Converters.

UNIT IV INVERTERS 9

Single phase and three phase voltage source inverters(both 120^0modeand 180^0mode)–Voltage& harmonic control--PWM techniques: Sinusoidal PWM, modified sinusoidal PWM - multiple PWM – Introduction to space vector modulation –Current source inverter.

UNIT V AC TO AC CONVERTERS 9

Single phase and Three phase AC voltage controllers–Control strategy- Power Factor Control – Multistage sequence control -single phase and three phase cyclo converters –Introduction to Matrix converters.

TOTAL:45 PERIODS

OUTCOMES:

- Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

1. M.H.Rashid, ‘Power Electronics: Circuits, Devices and Applications’, Pearson Education, PHI Third Edition, New Delhi, 2004.
2. P.S.Bimbra “Power Electronics” Khanna Publishers, third Edition, 2003.

3. L. Umanand, " Power Electronics Essentials and Applications", Wiley, 2010.

REFERENCES:

1. Joseph Vithayathil,' Power Electronics, Principles and Applications', McGraw Hill Series, 6th Reprint, 2013.
2. Ashfaq Ahmed Power Electronics for Technology Pearson Education, Indian reprint, 2003.
3. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.
4. Ned Mohan, Tore. M. Undel and, William. P. Robbins,' Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition,2003.
5. Daniel.W.Hart, "Power Electronics", Indian Edition, Mc Graw Hill, 3rd Print, 2013.
6. M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.

MT6501 SENSORS AND SIGNAL PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- Students will be exposed to basics of sensors and the methods of processing their signals.

UNIT I SCIENCE OF MEASUREMENT 9

Units and Standards – Calibration techniques –Errors in Measurements – Generalized Measurement System – Static and dynamic characteristics of transducers – Generalized Performance of Zero Order and First Order Systems - Response of transducers to different time varying inputs – Classification of transducers

UNIT II MECHANICAL MEASUREMENTS 9

Temperature: Filled thermometer – Bimetallic thermometer – monometers – elastic transducers – bourdon gauge – bellows – diaphragm. Vacuum: McLeod gauge, thermal conductivity gauge – Ionization gauge, flow measurement: orifice, venture, nozzle, pilot tube, turbine flow meter, hot wire anemometer.'

UNIT III ELECTRICAL MEASUREMENTS 9

Resistive transducers – Potentiometer– RTD – Thermistor – Thermocouple – Strain gauges – use in displacement, temperature, force measurement – Inductive transducer – LVDT – RVDT – use in displacement – Capacitive transducer – Piezo electric transducer – Digital displacement transducers.

UNIT IV SMART SENSORS 9

Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors – applications - Automobile, Aerospace, Home appliances, Manufacturing, Medical diagnostics, Environmental monitoring.

UNIT V SIGNAL CONDITIONING AND DATA ACQUISITION 9

Amplification – Filtering – Sample and Hold circuits –Data Acquisition: Single channel and multi channel data acquisition – Data logging.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be able to use Sensors, various electrical and mechanical instruments in industries.

TEXT BOOKS:

1. Doebelin. E. O., "Measurement Systems – Applications and Design", Tata McGraw Hill, 1992
2. Patranabis. D, “Sensors and Transducers”, 2nd Edition PHI, New Delhi, 2003.

REFERENCES:

1. Ian Sinclair .R "Sensors and transducers", Newnes ,Elaiver Indian print 2011.
2. Beckwith, Marangoni and Lienhard, "Mechanical Measurements", Addison Wesley, 2000..
3. Venkatesan. S.P, "Mechanical Measurements", Ane Books Pvt Ltd, India 2008.

GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

To the study of nature and the facts about environment.

- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 12

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 10

Definition – causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry- Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry;- Mitigation procedures- Control of particulate and gaseous emission, Control of SO_2, NO_X, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies –
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark). enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods, earthquake, cyclone and landslides. Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies.

TOTAL : 45 PERIODS

OUTCOMES:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXT BOOKS :

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd Edition, Pearson Education, 2004.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.

REFERENCES :

1. Trivedi R.K., 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

MF6505 **CNC MACHINING TECHNOLOGY** **L T P C**
3 0 0 3

OBJECTIVES:

Upon completion of this subject, student will be able to:

- Understand evolution and principle of CNC machine tools
- Describe constructional features of CNC machine tools
- Explain drives and positional transducers used in CNC machine tools
- Write simple programs for CNC turning and machining centres
- Generate CNC programs for popular CNC controllers
- Describe tooling and work holding devices for CNC machine tools

UNIT I INTRODUCTION TO CNC MACHINE TOOLS **6**

Evolution of CNC Technology, principles, features, advantages, applications,CNC and DNC concept, classification of CNC Machines – turning centre, machining centre, grinding machine, EDM, types of control systems, CNC controllers, characteristics, interpolators– Computer Aided Inspection

UNIT II STRUCTURE OF CNC MACHINE TOOL **10**

CNC Machine building, structural details, configuration and design, guide ways – Friction, Anti friction and other types of guide ways, elements used to convert the rotary motion to a linear motion – Screw and nut, recirculating ball screw, planetary roller screw, recirculating roller screw, rack and pinion, spindle assembly, torque transmission elements – gears, timing belts, flexible couplings, Bearings.

UNIT III DRIVES AND CONTROLS **9**

Spindle drives – DC shunt motor, 3 phase AC induction motor, feed drives –stepper motor, servo principle, DC and AC servomotors, Open loop and closed loop control, Axis measuring system – synchro, synchro-resolver, gratings, moiré fringe gratings, encoders, inductosysn, laser interferometer.

UNIT IV CNC PROGRAMMING **11**

Coordinate system, structure of a part program, G & M Codes, tool length compensation, cutter radius and tool nose radius compensation, do loops, subroutines, canned cycles, mirror image, parametric programming, machining cycles, programming for machining centre and turning centre for well known controllers such as Fanuc, Heidenhain, Sinumerik etc., generation of CNC codes from CAM packages.

UNIT V TOOLING AND WORK HOLDING DEVICES **9**

Introduction to cutting tool materials – Carbides, Ceramics, CBN, PCD–inserts classification- PMK, NSH, qualified, semi qualified and preset tooling, tooling system for Machining centre and Turning centre, work holding devices for rotating and fixed work parts, economics of CNC, maintenance of CNC machines.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of this course the student and can to provide knowledge on principle, constructional features, programming, tooling and workholding devices in CNC machine tools

TEXT BOOKS:

1. HMT, "Mechatronics", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2005.
2. Warren S.Seamers, "Computer Numeric Control", Fourth Edition – Thomson Delmar, 2002.

REFERENCES:

1. James Madison, "CNC Machining Hand Book", Industrial Press Inc., 1996.
2. Ken Evans, John Polywka & Stanley Gabrel, "Programming of CNC Machines", Second Edition – Industrial Press Inc, New York, 2002
3. Peter Smid, "CNC Programming Hand book", Industrial Press Inc., 2000

4. Berry Leathan – Jones, "Introduction to Computer Numerical Control", Pitman, London, 1987.
5. Radhakrishnan P "Computer Numerical Control Machines", New Central Book Agency, 2002.
6. Rao P.N., "CAD/CAM", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2002.

MT6502 THERMODYNAMICS PRINCIPLES AND APPLICATIONS L T P C
3 0 0 3

OBJECTIVES:

- The laws of thermodynamics are introduced. Types of I.C engines ,air conditioning and refregiration techniques and heat transfer methods are introduced.

UNIT I FIRST LAW OF THERMODYNAMICS 8

Thermodynamics – microscopic and macroscopic point of view – systems, properties, process, path, cycle. Units – pressure, temperature – Zeroth law. First law – application to closed and open systems, internal energy, specific heat capacities CV and CP – enthalpy

UNIT II SECOND LAW OF THERMODYNAMICS 8

Second Law of thermodynamics – statements – equivalents of Kelvin Plank and Clausius statements. Reversibility – Irreversibility, reversible cycle – Carnot cycle and theorem

UNIT III INTERNAL COMBUSTION ENGINES 12

Classification of IC engine - IC engine components and functions. Valve timing diagram and port timing diagram - Comparison of two stroke and four stroke engines, Comparison of petrol & diesel engine, Fuel supply systems, total fuel consumption, specific fuel consumption, mechanical efficiency, BHP, IHP, FP - Ignition Systems, Lubrication system, Cooling system,
MPFI, DTSI, CRDI.

UNIT IV REFRIGERATION AND AIR-CONDITIONING 8

Principles of refrigeration, refrigerator& heat pump cycle, refrigerants, refrigerant properties, refrigerant selection, vapour compression refrigeration cycle, vapour absorption cycle, dry bulb temperature, wet bulb temperature, relative humidity, comfort air-conditioning, Psychrometric chart, humidification, de-humidification, air coolers, cooling towers.

UNIT V HEAT TRANSFER (Qualitative Treatment Only) 9

Heat transfer through conduction and convection, Fourier's law of conduction - Problems on one dimensional heat conduction through plain walls, composite walls, cylinder walls, spheres. Extended surfaces: Fins. Problems on heat transfer through rectangular fin, triangular fin, circumferential fin, pin fin, fin efficiency, fin effectiveness. Heat transfer through radiation, Stefan Boltzman Law, black body, grey body, shape factor. Types of Heat Exchangers.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be able to apply the thermodynamics laws in the design of I.C engines , air conditioning and refrigeration equipments.

TEXT BOOK:

1. Nag P. K, 'Engineering Thermodynamics' Tata McGraw-Hill, 2005.

REFERENCES:

1. Michael A. Boles, Yunus A. Cengel, YunusCengel, "Thermodynamics", 2nd Edition, Mc Graw-Hill India, 2006.
2. Kothandaraman. C.P., Domkundwar. S. & Domkundwar. A.V., "A course in Thermal Engineering" Dhanpatrai & Co (P) Ltd, Fifth edition, 2000.
3. Kothandaraman. C.P., "Heat and Mass Transfer", New Age International (P) Publishers, 2002.
4. Holman.J.P., "Thermodynamics", 3rd Ed. McGraw-Hill, 2000.

MT6511	POWER ELECTRONICS LABORATORY	L T P C 0 0 3 2

OBJECTIVES:

- To introduce the students different power electronics components an duse of them in electronic circuits.
- To study characteristic of different power electronics of components.

LIST OF EXPERIMENTS

1. Study of SCR, MOSFET & IGBT characteristics
2. UJT, R, RC firing circuits for SCR
3. Voltage & current commutated chopper
4. SCR phase control circuit
5. TRIAC phase control circuit
6. Study of half controlled & fully controller converters
7. Study of three phase AC regulator
8. Speed control of DC shunt motor using three phase fully controlled converter.
9. SCR single-phase cyclo converter
10. SCR series and parallel inverters
11. IGBT Chopper
12. IGBT based PWM inverter (single phase)

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to use SCR, MOSFET, TRIAC in electronic circuit
- Ability to perform characteristic study on the electronics components.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Sl.No	Name of the Equipment	Qty
1	Study of SCR, MOSFET & IGBT characteristics module	1
2	UJT, R, RC firing circuits for SCR module	1
3	Voltage & current commutated chopper module	1
4	SCR phase control circuit module	1
5	TRIAC phase control circuit module	1
6	Study of half controlled & fully controller converters module	1
7	Study of three phase AC regulator module	1
8	Speed control of DC shunt motor using three phase fully controlled converter module	1
9	SCR single phase cyclo converter module	1
10	SCR series and parallel inverters module	1
11	IGBT chopper module	1
12	IGBT based PWM inverter (single phase) module	1

13	Ammeter (0-5A) MC, (0-2A) MC, (0-2A) MI, (0-5V) MI	15
14	Voltmeter (0-300V) MC, (0-600V) MC, (0-300V) MI, (0-600V) MI, Multimeter	16
15	CRO ,Transformer 1KVA, 1:1, 230V	Each 3

MT6512 SENSORS AND SIGNAL PROCESSING LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To provide knowledge sensors and signal processing
- To provide hand experience to measure different signal using sensor and processing them in required form.

LIST OF EXPERIMENTS

1. Measurement of temperature using thermocouple, thermistor and RTD
2. Measurement of displacement using POT, LVDT & Capacitive transducer
3. Torque measurement using torque measuring devices
4. Strain Measurement using strain gauge
5. Servomotor position control using photo electric pickup
6. Wave Shaping circuit
7. Analog to Digital Converters
8. Digital Comparator
9. Voltage to frequency converter
10. Frequency to Voltage Converter
11. Position and velocity measurement using encoders
12. Study on the application of data acquisition system for industrial purposes.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to use the sensors for the measurement of different signals and use of signal processing techniques to convert them to useful signal.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Name of the Equipment	Qty
1	Cathode Ray Oscilloscope	5
2	Function Generator	5
3	Regulated power supply	7
4	Displacement Measurement Trainer using LVDT	1
5	Capacitive pickup trainer module	1
6	Position and Velocity measurement using encoder kit	1
7	Servomotor Position control kit	1
8	Speed measurement and closed loop control of DC	1
9	Motor using photo electric pickup kit	1
10	RTD module	1
11	Thermistor module	1
12	Thermocouple module	1
13	Absolute encoder	1
14	Potentiometer trainer pickup	1
15	Strain gauge module	1
16	Load cell module	1

MT6513 **CNC LABORATORY** **L T P C**
0 0 3 2

OBJECTIVES:

- To train the students in manual and computer assisted part programming, tool path generation and control, operation and control of CNC machines tools.

LIST OF EXPERIMENTS

1. Manual part programming using G and M codes for Turning, step turning, Taper turning, thread cutting and radius turning on cylindrical components.
2. Programming and Simulation of machining using the following features.
   (i) Linear and Circular interpolation
   (ii) Pocket milling, slotting, peck drilling and other fixed canned cycles.
3. Given a component drawing to write the manual part programming and execute on CNC Lathe and Milling Machine.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to write manual part programming using G code and M code for simple components
- Ability to operate CNC controlled machine tools

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

1. CNC Lathe with Fanuc control
2. CNC Milling Machine with Fanuc control
3. Master CAM software
4. Computer nodes

MG6851 **PRINCIPLES OF MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES:

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization .

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING **9**

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V CONTROLLING **9**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

1. Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" 7th Edition, Pearson Education, , 2011.
2. Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill,1998.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999

MT6601 MICROCONTROLLER AND PLC **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the basic features, programming methods and applications of Micro controllers .The design of systems using PLC is introduced in detail.

UNIT I INTRODUCTION TO MICROCONTROLLER **9**

8051 Architecture:– Memory map - Addressing modes, I/O Ports –Counters and Timers – Serial data - I/O – Interrupts –Instruction set,, Data transfer instructions, Arithmetic and Logical Instructions, Jump and Call Instructions , Assembly Language Programming tools.

UNIT II MICROCONTROLLER PROGRAMMING **9**

8051 Assembly Language Programming- Block transfer, arithmetic operations, Code conversion, Time delay generation, Interrupt programming, Lookup table techniques

UNIT III MICROCONTROLLER APPLICATIONS **8**

Interfacing of Keyboards – Interfacing of Display Devices – Pulse measurement – Analog to Digital and Digital to Analog Converter – Interfacing Hardware Circuit – Serial Data Communication – Network Configuration.

UNIT IV PROGRAMMABLE LOGIC CONTROLLERS 9

Introduction — Principles of operation – PLC Architecture and specifications – PLC hardware components Analog & digital I/O modules , CPU & memory module – Programming devices – PLC ladder diagram, Converting simple relay ladder diagram in to PLC relay ladder diagram. PLC programming Simple instructions – Manually operated switches – Mechanically operated a Proximity switches - Latching relays,

UNIT V APPLICATIONS OF PROGRAMMABLE LOGIC CONTROLLERS. 9

Timer instructions - On delay, Off delay, Cyclic and Retentive timers, Up /Down Counters, control instructions – Data manipulating instructions, math instructions; Applications of PLC – Simple materials handling applications, Automatic control of warehouse door, Automatic lubrication of supplier Conveyor belt, motor control, Automatic car washing machine, Bottle label detection and process control application.

TOTAL : 45 PERIODS

OUTCOMES:

- The students will learn the theory, programming and application of microcontroller And design of systems using Programmable Logic Controllers

TEXT BOOKS:

1. Muhammad Ali Mazdi ,J.G.Mazdi & R.D.McKinlay “The 8051 Microcontroller& Embedded systems Using assembly & C “ 2nd Edition Pearson Education , Inc ,2006
2. Udayasankara.v & Mallikarjunaswamy .M.S ,’8051 Microcontroller, Hardware, Software & Applications ,Tata McGraw Hill Education Pvt Limited. New Delhi ,2009.
3. Gary Dunning , ‘Introduction to Programmable Logic Controllers‘’ Thomson Learning, 2001.

REFERENCES:

1. Singh. B.P., "Microprocessors and Microcontrollers", Galcotia Publications (P) Ltd, First edition, New Delhi, 1997.
2. Parr, "Programmable Controllers: An Engineers Guide", 3rd Edition, Elsevier, Indian Reprint, 2013
3. Valdes-Perez, Microcontrollers: Fundamentals and Applications with PIC, Taylor & Francis, Indian Reprint, 2013.
4. Bolton , "Programmable Logic Controllers” 5th Edition Newnes, ,2009

MT6602 APPLIED HYDRAULICS AND PNEUMATICS L T P C
3 0 0 3

OBJECTIVES:

- This course will give an appreciation of the fundamental principles, design and operation of hydraulic and pneumatic components and systems and their application in manufacturing and mechanical systems.

UNIT I FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS 9

Introduction to Fluid power- Advantages and Applications- Fluid power systems – Types of fluids- Properties of fluids – Basics of Hydraulics – Pascal’s Law- Principles of flow – Friction loss- Work, Power and Torque. Problems Sources of Hydraulic power: Pumping Theory – Pump Classification- Construction, Working, Design, Advantages, Disadvantages, Performance, Selection criterion of Linear, Rotary- Fixed and Variable displacement pumps-Problems

UNIT II HYDRAULIC ACTUATORS AND VALVES 9

Hydraulic Actuators: Cylinders– Types and construction, Application, Hydraulic cushioning - Hydraulic motors Control Components: Direction control, Flow control and Pressure control valves- Types, Construction and Operation- Servo and Proportional valves - Applications – Types of actuation. Accessories: Reservoirs, Pressure Switches- Applications- Fluid Power ANSI Symbols - Problems

UNIT III HYDRAULIC SYSTEMS 9

Accumulators, Intensifiers, Industrial hydraulic circuits- Regenerative, Pump Unloading, Double-pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-safe, Speed control, Hydrostatic transmission, Electro hydraulic circuits, Mechanical Hydraulic servo systems.

UNIT IV PNEUMATIC SYSTEMS 9

Properties of air– Perfect Gas Laws- Compressors- Filter, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust valves, Pneumatic actuators, Design of pneumatic circuit cascade method- Electro pneumatic circuits, Introduction to Fluidics, Pneumatic logic circuits.

UNIT V TROUBLE SHOOTING AND APPLICATIONS 9

Installation, Selection, Maintenance, Trouble Shooting and Remedies in Hydraulic and Pneumatic systems. Design of hydraulic circuits for Drilling, Planning, Shaping, Surface grinding, Press and Forklift applications. Design of Pneumatic circuits for a Pick and Place application and tool handling in a CNC machine. - Low cost Automation – Hydraulic and Pneumatic power packs- case studies.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be able to operate and maintain various pneumatic and hydraulic systems in industrial environments.

TEXT BOOK:

1. Anthony Esposito, “Fluid Power with Applications”, Prentice Hall, 2009.

REFERENCES:

1. Shanmugasundaram.K, “Hydraulic and Pneumatic Controls”, Chand & Co, 2006.
2. Majumdar, S.R., “Oil Hydraulics Systems- Principles and Maintenance”, Tata McGraw Hill, 2001
3. Majumdar, S.R., “Pneumatic Systems – Principles and Maintenance”, Tata McGraw Hill, 2007.
4. Dudelyt, A Pease and John J Pippenger, “Basic Fluid Power”, Prentice Hall, 1987.
5. Srinivasan.R, “Hydraulic and Pneumatic Controls”, Vijay Nicole Imprints, 2008.
6. Joji.P, “Pneumatic Controls”, Wiley India, 2008

MT6603 DESIGN OF MECHATRONICS SYSTEM L T P C

3 0 0 3

OBJECTIVES:

- The students will be exposed to design mechatronics system in Labview & Vim –Sim Environments

UNIT I INTRODUCTION TO MECHATRONICS SYSTEM 9

Key elements – Mechatronics Design process –Design Parameters – Traditional and Mechatronics designs – Advanced approaches in Mechatronics - Industrial design and ergonomics, safety.

UNIT II SYSTEM MODELLING 9

Introduction-model categories-fields of application-model development-model verification-model validation-model simulation-design of mixed systems-electro mechanics design-model transformation-domain-independent description forms-simulator coupling.

UNIT III REAL TIME INTERFACING 9

Introduction-selection of interfacing standards Elements of Data Acquisition & control Systems- Over view of I/O process, General purpose I/O card and its installation, Data conversion process, Application Software- Lab view Environment and its applications, Vim-Sim Environment & its applications -Man machine interface.

UNIT IV CASE STUDIES ON MECHATRONIC SYSTEM 9

Introduction –Fuzzy based Washing machine – pH control system – Autofocus Camera, exposure control– Motion control using D.C.Motor& Solenoids – Engine management systems.– Controlling temperature of a hot/cold reservoir using PID- Control of pick and place robot – Part identification and tracking using RFID – Online surface measurement using image processing

UNIT V MICRO MECHATRONIC SYSTEM 9

Introduction- System principle - Component design – System design – Scaling laws – Micro actuation – Micro robot – Micro pump – Applications of micro mechatronic components.

TOTAL : 45 PERIODS

OUTCOMES:

- The students will be able to design systems in mechatronics approach using modern software packages.

TEXT BOOKS:

1. Devdas shetty, Richard A. Kolk, “Mechatronics System Design”, 2nd Edition ,Cengage Learning 2011.
2. Georg pelz, "Mechatronic Systems: Modeling and simulation" with HDL’s, John wiley and sons Ltd, 2003

REFERENCES:

1. Bishop, Robert H, "Mechatronics Hand book", CRC Press, 2002.
2. Bradley, D.Dawson, N.C. Burd and A.J. Loader, "Mechatronics: Electronics in Products and Processes", CRC Press 1991 , First Indian print 2010.
3. De Silva, "Mechatronics: A Foundation Course", Taylor & Francis, Indian Reprint, 2013

MT6604 OBJECT ORIENTED PROGRAMMING IN C++ L T P C
3 0 0 3

OBJECTIVES:

- To introduce the C++ programming and its use in object oriented environment.

UNIT I OOP PARADIGM : 9

Software crisis – Software evolution – A look at procedure oriented programming – Object oriented programming paradigm – Basic concepts of object oriented programming – Benefits of OOP – Reusability – Security – Object oriented programming fundamental – Abstraction – Encapsulation – Derivation – Object oriented languages and packages–Applications of OOP – A simple C++ program – More C++ statements – Structure of C++ Program.

UNIT II INTRODUCTION TO C++: 10

Tokens – Keywords – Identifiers and constants – Basic data types – User defined data types – Derived data types – Symbolic constants – Declaration of variables – Dynamic initialization of variables – Reference variables – Operators in C++ – Scope resolution operator – Manipulators– Type cast operator – Expressions and their types – Special assignment expressions – Control structures - The main function – Function prototyping – Call by reference – Return by reference – Inline functions – Default arguments – Function overloading.

UNIT III CLASSES AND OBJECTS : 9

Specifying a class – Defining member functions – Private member functions –Arrays within a class – Memory allocation for objects – Static data members – Static member functions – Arrays of objects – Objects as function arguments –Friendly functions – Returning objects. Constructors: Parameterized constructors – Multiple constructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copy constructor – Dynamic constructors– Destructors.

UNIT IV OPERATOR OVERLOADING, INHERITANCE AND POLYMORPHISM 10

Defining operator overloading: Overloading unary, binary operators. Manipulation of strings using operators – Rules for overloading operators – Type Conversions - Defining derived classes – Single inheritance – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance – Virtual base classes – Abstract classes - Introduction to pointers to objects: This pointer – Pointers to derived classes – Virtual functions – Pure virtual functions.

UNIT V CASE STUDIES 7

Over view of typical object oriented systems – Case studies- Applications

TOTAL:45 PERIODS

OUTCOMES:

- The students will be able to develop C++ programs for object oriented systems and test the systems

TEXT BOOK:

1. Balagurusamy. E., “Object Oriented Programing wih C++”, Tata McGraw Hill,1997.

REFERENCES:

1. Herbert Schildt,”C++ The Complete Reference”, Tata Mc Graw Hill Edition, 2003
2. Bjanne Stroustrup, “The C++ Programming Language”,3rd Edition, Addison Wesley, 2000
3. Stanley, B.Lippman,JoveLagrie,”C++Primer”,3rd Edition, Addison Wesley,1998
4. Baarkakati. N., ‘Object Oriented Programming in C++’, Prentice Hall of India, 1997.

MT6611 MICRO CONTROLLER AND PLC LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To introduce and train the students to use microcontroller and PLC for actuation, control of speed.

LIST OF EXPERIMENTS

1. Study of Microcontroller Kits.
2. 8051 / 8031 Programming Exercises.
3. Stepper Motor interface.
4. D.C. motor controller interface.
5. Study of interrupt structure of 8051.

6. Interfacing high power devices to microcomputer port lines, LED relays and LCD displays.
7. Linear actuation of hydraulic cylinder with counter and speed control.
8. Hydraulic rotation with timer and speed control.
9. Sequential operation of pneumatic cylinders.
10. Traffic light controller.
11. Speed control of DC motor using PLC.
12. Testing of Relays using PLC.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to use microcontroller and PLC to control different motor/equipment.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Name of the Equipment	Qty
1	Regulated power supply	7
2	Pulse generator	1
3	Function generator	5
4	Cathode ray osalloscope	5
5	8051 MicroController Kit	5
6	stepper Motor	2
7	stepper motor interfacing board	2
8	PLC trainer kit and related software	2
9	Hudraulic cylinder	1
10	Pneumatic cylinder	1
11	LED/LCD interface units	1
12	SCR/Triac/Power MOSFET interface unit	1

MT6612 OBJECT ORIENTED PROGRAMMING LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++ & JAVA.

LIST OF EXPERIMENTS:

C++:

1. program using functions
   - functions with default arguments
   - implementation of call by value, address, reference
2. simple classes for understanding objects, member functions & constructors
   - classes with primitive data members,
   - classes with arrays as data members
   - classes with pointers as data members
   - classes with constant data members
   - classes with static member functions
3. compile time polymorphism

- operator overloading
- function overloading

4. run time polymorphism
   - inheritance
   - virtual functions
   - virtual base classes
   - templates
5. file handling
   - sequential access
   - random access

TOTAL :45 PERIODS

OUTCOMES

- Gain the basic knowledge on Object Oriented concepts.
- Ability to develop applications using Object Oriented Programming Concepts.
- Ability to implement features of object oriented programming to solve real world problems

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Name of the Equipment	Qty
1	Standalone desktops with C++ complier (or) Server with C++ compiler supporting 30 terminals or more.	30 Nos.

MT6613 APPLIED HYDRAULICS AND PNEUMATIC LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- To introduce and provide hand on experience to students to design nd test hydraulic circuit to control press, flow etc.,
- To provide hands on experience to design and test the pneumatic circuit to perform basic operations
- To introduce the MAT Lan/ LABVIEW software to simulate hydraulic, pneumatic and electrical circuit.

LIST OF EXPERIMENTS

1. Design and testing of hydraulic circuits such as

i) Pressure control
ii) Flow control
iii) Direction control
iv) Design of circuit with programmed logic sequence, using an optional PLC in hydraulic
Electro hydraulic Trainer.

2. Design and testing of pneumatic circuits such as

i. Pressure control
ii. Flow control
iii. Direction control
iv. Circuits with logic controls

v. Circuits with timers
vi. Circuits with multiple cylinder sequences in Pneumatic Electro pneumatic Trainer.

Modeling and analysis of basic electrical, hydraulic, and pneumatic systems using

MATLAB/LABVIEW software.

3. Simulation of basic hydraulic, pneumatic and electrical circuits using Automation studio software.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to design and test hydraulic, pneumatic circuits
- Use of MATLAB/LABVIEW software for simulation of hydraulic, pneumatic and electrical circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	NAME OF THE EQUIPMENT	Qty
Hydraulic equipment		
1	Pressure relief valve	4
2	Pressure reducing valves	2
3	Flow control valves	2
4	Pressure switch	1
5	Limit switches	2
6	Linear actuator	1
7	Rotory actuator	1
8	Double solenoid actuated DCV	2
9	Single solenoid actuated DCV	1
10	Hydraulic power pack with 2 pumps & 2 pressure relief valve	1
11	PLC	1
Pneumatics equipment		
1	Pnumatic trainer kit with FRL Unit, Single acting cylinder, push	
	buttons	1
2	Pneumatic trainer kit with FRL unit, Double acting cylinder,	
	manually actuated DCV	1
3	Pneumatic training kit with FRL unit, Double acting cylinder, pilot	
	actuated DCV	1
4	Pneumatic trainer kit with FRL unit, Double acting cylinder, Double	
	solenoid actuated DCV, DCV with sensos/ magnetic reed switches	1
5	PLC with Interface card	1
6	LABVIEW Software	1
7	Automation studio software	1

MT6701 MEDICAL MECHATRONICS L T P C
3 0 0 3

OBJECTIVES:

- The students will be exposed to sensors and actuators used in biomedical system design

UNIT I INTRODUCTION 9

Cell structure – electrode – electrolyte interface, electrode potential, resting and action potential – electrodes for their measurement, ECG, EEG, EMG – machine description – methods of measurement – three equipment failures and trouble shooting.

MT 3001 ADVANCED MANUFACTURING TECHNOLOGY L T P C
3 0 0 3

UNIT I SHEET METAL WORKING OF METALS 8

Hot and Cold Working- rolling, forging, wire drawing, extrusion-types-forward, backward& tube extrusion. Blanking-blank size calculation, draw ratio, drawing force, piercing, punching, trimming, stretch forming, tube bending, tube forming -embossing & coining-explosive forming-electro hydraulic forming-electro magnetic forming

UNIT II NON TRADITIONAL MACHINING 9

Ultrasonic machining (USM) – process and description of USM-applications and limitations-Electron Beam Machining (EBM)-Process principles of EBM-applications-process principles-Laser Beam Machining (LBM)-Laser beam production-applications-laser beam welding-Plasma Arc Machining (PAM)-Generation of plasma arc-process parameters-applications and limitations.

UNIT III SURFACE FINISHING AND SURFACE HARDENING PROCESS 10

Grinding process, various types of grinding machine-grinding wheel-types-selection of grinding wheel for different applications-selection of cutting speed and work speed- mounting of grinding wheel-galvanizing, electroplating, anodising. Surface hardening- carburizing, carbonitriding, cyaniding, nitriding, ion nitriding, boronizing, laser hardening, thin film coating(PVD, CVD).

UNIT IV EDM AND ECM 10

Electrical Discharge Machining (EDM) - Description of EDM equipment-electrical circuits - electrolyte-metal removal rate-applications-EDWC - process principles – equipments - applications.

Electro Chemical Machining (ECM) - Description of the equipment-electrolyte-metal removal rate -accuracy and surface finish obtained. Electro Chemical grinding (ECG) - Chemical machining-electro chemical grinding equipment-application-electro chemical deburring-honing-applications

UNIT V JIGS AND FIXTURES 8

Jigs-Locating and Clamping devices-principles-elements-mechanical-pneumatic and hydraulic actuation-types of Jigs-general consideration in Jig design-jig bushing, types- methods of construction. Fixtures-types of fixtures- fixture for machine tools –lathe, milling, boring, broaching, grinding-assembly inspection of welding fixture design.

TOTAL = 45 PERIODS

REFERENCES

1. Rao P.N., “Manufacturing Technology, Metal cutting and Machine Tools”, Tata McGraw Hill, 2000.
2. Hajra Choudhary.S.K. and Hajra Choudhary.A.K, “workshop Technology”, Vol-I & Vol-II”-Media Publishers 1986.

3. Donaldson. C. “Tool design”, Tata McGraw Hill Co. Ltd.,1985.
4. H.M.T. Production Technology-Tata McGraw Hill, 2001
5. Sharma .P.C., “A text book of Production Technology- vol I & II ”, S.Chand & Company Ltd, New Delhi, 1996.

GE2022 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Dale H.Besterfiled, et at., “Total Quality Management”, Pearson Education Asia,Third Edition, Indian Reprint (2006).

REFERENCES:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
3. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman,B and Gopal, R.K, “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd., 2006.

ME3013 PRODUCT DESIGN AND DEVELOPMENT L T P C
3 0 0 3

UNIT I CREATIVE THINKING AND PRODUCT INNOVATION 9

The product and process design function. Locating ideas for new products. Selecting the product. Qualifications of the production design engineer, Creative thinking curiosity and imagination.

UNIT II CRITERIA FOR PRODUCT SUCCESS 9

Areas to be studies preparatory to design market research functional design. The value of appearance - Principles and laws of appearance - Incorporating quality and reliability into the design. Man Machine considerations-Designing for case of maintenance.

UNIT III COST AND PRODUCT DEVELOPMENT 9

Sources of funds for development cost - Product costs - Estimating product costs - Kinds of cost procedures - Value Engineering - Cost reduction.

UNIT IV PATENTS 9

Classes of exclusive rights - Patents-Combination versus aggregation - Novelty and Utility - Design patents - patent disclosure - patent application steps - Patent office prosecution - Sales of patent rights - Trade marks - Copy rights.

UNIT V QUALITY CONTROL AND RELIABILITY 9

Quality Control procedure - Inspection and test equipment - Statistical quality control - Manufacturing Reliability - Probability of tool reliability - Reliability operations - Developing a quality-control and reliability programme.

TOTAL: 45 PERIODS

REFERENCES

1. Niebel.B.W. and Draper.A.B., Product Design and Process Engineering, McGraw Hill Book Company, New York, 1974.
2. Ulrich Karl.T., Product design and development, 3rd Edition, Tata McGraw Hill, New Delhi, 2005.
3. Kevin Otto and Kristin Wood, Product design: Techniques in reverse engineering and new product development, Pearson education Inc, New Delhi, 2004.
4. Chitale.A.K., Product design and manufacturing, Prentice-Hall of India, New Delhi, 2005.
5. Zaidi.A., SPC Concepts - Methodologies and Tools, Prentice Hall of India Pvt. Ltd., 2003.

MT3318 **TECHNICAL SEMINAR II** **L T P C**
0 0 3 2

During technical seminar hour students are encouraged to use various teaching aids like O.H.P., PPT and demonstration models. This will enable them to gain confidence in facing the placement interviews.

MT3401 **MEDICAL MECHATRONICS** **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**

Cell structure – electrode – electrolyte interface, electrode potential, resting and action potential – electrodes for their measurement, ECG, EEG, EMG – machine description – methods of measurement – three equipment failures and trouble shooting.

UNIT II TRANSDUCERS FOR BIO-MEDICAL INSTRUMENTATION **9**

Basic transducer principles Types – source of bioelectric potentials – resistive, inductive, capacitive, fiber-optic, photoelectric and chemical transducers – their description and feature applicable for biomedical instrumentation – Bio & Nano sensors & application

UNIT III SIGNAL CONDITIONING, RECORDING AND DISPLAY **9**

Input isolation, DC amplifier, power amplifier, and differential amplifier – feedback, op-Amp-electrometer amplifier, carrier Amplifier – instrument power supply. Oscillagraphic – galvanometric - X-Y, magnetic recorder, storage oscilloscopes – electron microscope – PMMC writing systems – Telemetry principles – Bio telemetry.

UNIT IV MEDICAL SUPPORT **10**

Electrocardiograph measurements – blood pressure measurement: by ultrasonic method – plethysonography – blood flow measurement by electromagnetic flow meter cardiac output measurement by dilution method – phonocardiography – vector cardiography. Heart lung machine – artificial ventilator – Anesthetic machine – Basic ideas of CT scanner – MRI and ultrasonic scanner – Bio-telemetry – laser equipment and application – cardiac pacemaker – DC – defibrillator patient safety - electrical shock hazards. Centralized patent monitoring system.

UNIT V BIO-MEDICAL DIAGNOSTIC INSTRUMENTATION **8**

Introduction – computers in medicine – basis of signal conversion and digital filtering data reduction technique – time and frequency domain technique – ECG Analysis.

TOTAL = 45 PERIODS

REFERENCES

1. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TMH, 1989.
2. Arumugam M., “Bio Medical Instrumentation”, Anuradha agencies Pub., 2002.
3. Geddes L.A., and Baker, L.E., “Principles of Applied Bio-medical Instrumentation”, 3rd Edition, John Wiley and Sons, 1995.

4. Cromwell, Weibell and Pfeiffer, "Biomedical Instrumentation and Measurements", 2nd Edition, Prentice Hall of India, 1999.
5. Tompkins W.J., "Biomedical Digital Signal Processing", Prentice Hall of India, 1998.

MF3402 COMPUTER INTEGRATED MANUFACTURING L T P C
3 0 0 3

UNIT I INTRODUCTION 8

Introduction to CIM – External communication – Automation strategies – Fundamental concepts in manufacturing and automation – manufacturing automation protocol- Marketing engineering-production planning.

UNIT II GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING 9

Introduction-part families-parts classification and coding – DCLASS and MCLASS and OPTIZ coding systems - group technology machine cells-benefits of group technology.
Process planning function CAPP - Computer generated time standards.

UNIT III COMPUTER AIDED PLANNING AND CONTROL 8

Production planning and control-cost planning and control-inventory management-Material requirements planning (MRP)-shop floor control-Factory data collection system-Automatic identification system-barcode technology automated data collection system.

UNIT IV COMPUTER MONITORING 10

Types of production monitoring systems-structure model of manufacturing process-process control & strategies direct digital control-supervisory computer control-computer in QC - contact inspection methods-non-contact inspection method - integration of CAQC with CAD/CAM.

UNIT V INTEGRATED MANUFACTURING SYSTEM 10

Definition - application - features - types of manufacturing systems-machine tools-materials handling system computer control system - DNC systems manufacturing cell.
Flexible manufacturing systems (FMS) - the FMS concept-transfer systems - head changing FMS-variable mission manufacturing system - CAD/CAM system-Rapid prototyping - Artificial Intelligence and Expert system in CIM.

TOTAL = 45 PERIODS

REFERENCES

1. Groover, M.P., "Automation, Production System and CIM", Prentice-Hall of India, 1998.
2. David Bedworth, "Computer Integrated Design and Manufacturing", TMH, New Delhi, 1998.
3. Yorem Koren, "Computer Integrated Manufacturing Systems", McGraw Hill, 1983.
4. Ranky, Paul G., "Computer Integrated Manufacturing", Prentice Hall International 1986.
5. R.W. Yeomamas, A. Choudry and P.J.W. Ten Hagen, "Design rules for a CIM system", North Holland Amsterdam, 1985.

ME3403 ROBOTICS AND MACHINE VISION SYSTEM L T P C
3 0 0 3

UNIT I BASICS OF ROBOTICS 9

Introduction- Basic components of robot-Laws of robotics- classification of robot-work space-accuracy-resolution –repeatability of robot. Power transmission system: Rotary to rotary motion, Rotary to linear motion, Harmonics drives

UNIT II ROBOT END EFFECTORS 9

Robot End effectors: Introduction- types of End effectors- Mechanical gripper- types of gripper mechanism- gripper force analysis- other types of gripper- special purpose grippers.

UNIT III ROBOT MECHANICS 10

Robot kinematics: Introduction- Matrix representation- rigid motion & homogeneous transformation- forward & inverse kinematics- trajectory planning. Robot Dynamics: Introduction - Manipulator dynamics – Lagrange - Euler formulation- Newton - Euler formulation

UNIT IV MACHINE VISION FUNDAMENTALS 9

Machine vision: image acquisition, digital images-sampling and quantization-levels of computation Feature extraction-windowing technique- segmentation- Thresholding- edge detection- binary morphology - grey morphology

UNIT V ROBOT PROGRAMMING 8

Robot programming: Robot Languages- Classification of robot language-Computer control and robot software-Val system and Languages- application of robots.

TOTAL = 45 PERIODS

REFERENCES

1. Sathya Ranjan Deb, robotics Technology & flexible Automation Sixth edition, Tata Mcgraw-Hill Publication, 2003.
2. Gorden M.Dair, Industrial Robotics, PHI 1988.
3. K.S.Fu, R.C.Gonzalez, C.S.G.Lee, Robotics: Sensing, Vision& Intelligence, Tata Mcgraw-Hill Publication, 1987.
4. John.J.Craig, Introduction to Robotics: Mechanics & control, Second edition-2002.
5. M.P.Groover, Industrial robotics- Technology, programming and Applications, McGraw-Hill, 1986

ME3404 AUTOMOBILE ENGINEERING

L	T	P	C
3	0	0	3

UNIT I INTRODUCTION **9**

Engine Terminology – Types of engines: Petrol& Diesel - 2 Stroke & 4 Stroke - – Engine components: Cylinder block – Cylinder head – Sump – manifolds – Gaskets – Cylinder - Piston – Rings – Connecting rod – Piston pins – Crank shaft – bearings – valves – Mufflers. Engine cooling and Lubrication.

UNIT II TRANSMISSION SYSTEMS **9**

Clutch – Types and Construction – Clutch operation: Electromagnetic – Mechanical – Hydraulic – Vacuum. Gear Boxes: Manual and Automatic – Simple Floor Mounted Shift Mechanism – Over Drives – Transfer Box - Fluid flywheel - Torque converters – Propeller shaft – Slip Joint – Universal Joints – Differential and Rear Axle – Hotchkiss Drive and Torque Tube Drive.

UNIT III STEERING, BRAKES AND SUSPENSION **9**

Steering: Wheels and Tyres – Wheel Alignment Parameters - Steering Geometry - Types of steering gear box – Davis and Ackermann steering mechanism - Power Steering – Types of Front Axle. Suspension systems: Types of suspension springs – Plastic, Air and Independent suspension system – Shock absorbers. Braking Systems: Types and Construction – Hydraulic brakes - Diagonal Braking System – Antilock Braking System

UNIT IV BATTERY AND LIGHTING SYSTEM **9**

Types of batteries - Construction, Operation and Maintenance. Electrical systems: Lighting – wiring circuit - Head lights – Switches – Indicating lights – trouble shooting. Accessories: Direction indicators – windscreen wiper – Horn – Speedometer – Heaters – Air conditioner.

UNIT V ALTERNATE ENERGY SOURCES **9**

Use of Natural Gas, LPG, Biodiesel, Gasohol and Hydrogen in Automobiles - Electric and Hybrid Vehicles, Fuel Cells.

TOTAL = 45 PERIODS

REFERENCES

1. Kirpal Singh “Automobile Engineering Vol. 1& 2”, Standard Publishers, New Delhi.
2. Sethi H.M, “Automobile Technology”, Tata McGraw-Hill-2003
3. Crouse and Anglin “Automotive Mechanism”, 9th Edition. Tata McGraw-Hill, 2003.
4. Newton, Steeds and Garet, “Motor vehicles”, Butterworth Publishers, 1989.
5. Joseph Heitner, “Automotive Mechanics”, 2nd edition, East-West Press, 1999.

ME3405	COMPUTER AIDED DESIGN AND COMPUTER AIDED MANUFACTURING LABORATORY	L T P C 0 0 3 2

LIST OF EXPERIMENTS

1. Modelling of a part using Pro-E / CATIA / UNIGRAPHICS.
2. Modelling of a component using Pro-E / CATIA / UNIGRAPHICS.
3. Modelling and assembling of the mechanical assembly using Pro-E / CATIA / UNIGRAPHICS.
4. Structural analysis using FEA software – ANSYS / SOLIDWORKS / CATIA.
5. Beam deflection analysis using FEA software – ANSYS / SOLIDWORKS / CATIA.
6. Thermal analysis using FEA software – ANSYS / SOLIDWORKS / CATIA.
7. Vibration or modal analysis using FEA software – ANSYS / SOLIDWORKS / CATIA.
8. Modelling and tool path simulation using Master CAM (MILL) or any CAM package.
9. Modelling and tool path simulation using Master CAM (Lathe) or any CAM package.
10. NC code generation for milling using Master CAM (MILL) or any CAM package.
11. NC code generation for turning using Master CAM (Lathe) or any CAM package.

TOTAL = 45 PERIODS

NOTE - Any solid modelling or suitable software packages can be used for exercise.

MT3406	ROBOTICS LABORATORY	L T P C 0 0 3 2

LIST OF EXPERIMENTS

1. **Study of different types of robots based on** configuration and application.
2. Study of different type of links and joints used in robots
3. Study of components of robots with drive system and end effectors.
4. Determination of maximum and minimum position of links.
5. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
5. Estimation of accuracy, repeatability and resolution.
6. Robot programming exercises

(Point-to-point and continuous path programming)

TOTAL = 45 PERIODS

MT3407	DESIGN AND FABRICATION PROJECT	L	T	P	C
		0	0	4	2

The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to practical problems.
The students in convenient groups of not more than 4 members have to take one small item for design and fabrication. Every project work shall have a guide who is the member of the faculty of the institution and if possible with an industry guide also.

The item chosen may be small machine elements (Example-screw jack, coupling, machine vice, cam and follower, governor etc), attachment to machine tools, tooling (jigs, fixtures etc), small gear box, automotive appliances, agricultural implements, simple heat exchangers, small pumps, hydraulic /pneumatic devices etc.

The students are required to design and fabricate the chosen item in the college and demonstrate its working apart from submitting the project report. The report should contain assembly drawing, parts drawings, process charts relating to fabrication.

TOTAL: 60 PERIODS

MT 3408	AUTOMOTIVE ELECTRONICS	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION **8**

Evolution of electronics in automobiles – emission laws – introduction to Euro I, Euro II, Euro III, Euro IV, Euro V standards – Equivalent Bharat Standards. Charging systems: Working and design of charging circuit diagram – Alternators – Requirements of starting system - Starter motors and starter circuits.

UNIT II IGNITION AND INJECTION. SYSTEMS **10**

Ignition systems: Ignition fundamentals - Electronic ignition systems - Programmed Ignition – Distribution less ignition - Direct ignition – Spark Plugs. Electronic fuel Control: Basics of combustion – Engine fuelling and exhaust emissions – Electronic control of carburetion – Petrol fuel injection – Diesel fuel injection.

UNIT III SENSOR AND ACTUATORS **7**

Working principle and characteristics of Airflow rate, Engine crankshaft angular position, Hall effect, Throttle angle, temperature, exhaust gas oxygen sensors – study of fuel injector, exhaust gas recirculation actuators, stepper motor actuator, vacuum operated actuator.

UNIT IV ENGINE CONTROL SYSTEMS 10

Control modes for fuel control-engine control subsystems – ignition control methodologies – different ECU's used in the engine management – block diagram of the engine management system. In vehicle networks: CAN standard, format of CAN standard – diagnostics systems in modern automobiles.

UNIT V CHASSIS AND SAFETY SYSTEMS 10

Traction control system – Cruise control system – electronic control of automatic transmission – antilock braking system – electronic suspension system – working of airbag and role of MEMS in airbag systems – centralized door locking system – climate control of cars.

TOTAL = 45 PERIODS

REFERENCES

1. Tom Denton, "Automobile Electrical and Electronics Systems", Edward Arnold Publishers, 2000.
2. William B. Ribbens, "Understanding Automotive Electronics", 5th edition, Newnes Publishing, 2000.
3. Barry Hollembeak, "Automotive Electricity, Electronics & Computer Controls", Delmar Publishers, 2001.
4. "Fuel System and Emission controls", Check Chart Publication, 2000.
5. Ronald. K. Jurgon, "Automotive Electronics Handbook", McGraw-Hill, 1999.

MT 3002 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Introduction – Examples of fields that use Digital image processing, Fundamental steps in Digital Image Processing systems, Components of an image processing systems, Light and EM spectrum, Image sensing and acquisition, Image sampling and quantization- Concepts, image representation, Spatial and gray level resolution, Aliasing and Morie patterns, Some basic relationships between pixels

UNIT II IMAGE ENHANCEMENT IN SPATIAL DOMAIN 9

Background, Gray level transformation- Image negatives, Log transformations, Power law transformations, Piecewise-Linear transformation functions, Histogram processing- Histogram equalization, Histogram matching(Specifications), Enhancement using ALU

UNIT III IMAGE ENHANCEMENT IN FREQUENCY DOMAIN 9

Introduction to the Fourier transform and the frequency domain – 1-D Fourier transform and its inverse, 2-D Fourier transform and its inverse, Smoothing frequency domain filters- Ideal, Butterworth, Gaussian low pass filters, Sharpening frequency domain filters- Ideal, Butterworth, Gaussian high pass filters

REFERENCES
1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York, 1996.
2. Govindarajan M, Natarajan S, and Senthil Kumar V. S, "Engineering Ethics", Prentice
3. Hall of India, New Delhi, 2004.
4. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available)
5. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
6. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.

EC3007 DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

UNIT I SIGNALS AND SYSTEMS 9

Basic elements of Digital Signal Processing - Concept of frequency in Continuous time and Discrete time signals - Sampling theorem – Discrete time signals. Discrete time systems – Analysis of Linear time invariant systems – Z transform – Convolution and Correlation.

UNIT II FAST FOURIER TRANSFORMS 9

Introduction to Radix 2 FFT 's – Decimation in time FFT algorithm - Decimation in frequency FFT algorithm – Computing inverse DFT using FFT – Mixed radix FFT algorithm – Periodogram technique

UNIT III IIR FILTER DESIGN 9

Structure of IIR – System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives

UNIT IV FIR FILTER DESIGN 9

Symmetric & Antisymteric FIR filters – Linear phase filter – Windowing technique – Rectangular, Kaiser Windows – Frequency sampling techniques – Structure for FIR systems

UNIT V FINITE WORD LENGTH EFFECTS 9

Effect of Number representation on Quantization – Overflow – Need for scaling – truncation error – coefficient Quantization error – limit cycle oscillations. Multichannel – Multi – dimensional – typical applications of DSP – Introduction to Programmable DSP – Instruction set of TMS 320C50.

TOTAL : 45 PERIODS

REFERENCES
1. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing,
2. Algorithms and Application", PHI., New Delhi 3rd Edition 2000.
3. S.Salivahanan, A.Vallavaraj and Gnanapriya, "Digital Signal Processing", McGraw-Hill, 2000
4. Sanjith K. Mitra "Digital Signal Processing, A Computer Based approach", Tata McGraw–Hill, New Delhi, 1998.
5. Allan V.Oppenheim & Donald W. Schafer, "Digital Signal Processing", PHI 1989.

6. B.Venkataramani and M.Bhaskar, "Digital Signal Processor"- Architecture Programming and applications, TMH, New Delhi 2002.

ME3017 MICRO ELECTRO MECHANICAL SYSTEMS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Overview-Microsystems and microelectronics -definition-MEMS materials-scaling laws-scaling in geomentry-scaling in rigid body dynamics- scaling in electrostatic forces- scaling in electricity-scaling in fluid mechanics- scaling in heat transfer.

UNIT II MICRO SENSORS & ACTUATORS 9

Working principle of Microsystems - micro actuation techniques - micro sensors-types - Microactuators – types – micropump – micromotors – micro – valves – microgrippers -micro accelerometers

UNIT III FABRICATION PROCESS 9

Substrates-single crystal silicon wafer formation-Photolithography-Ion implantation-Diffusion – Oxidation-CVD-Physical vapor deposition-Deposition by epitaxy-etching process

UNIT IV MICRO SYSTEM MANUFACTURING 9

Bulk Micro manufacturing- surface micro machining –LIGA-SLIGA-Micro system packaging-materials-die level-device level-system level-packaging techniques-die preparation-surface bonding-wire bonding-sealing

UNIT V MICRO SYSTEM DESIGN 9

Design considerations-process design-mask layout design- mechanical design-applications of micro system in -automotive industry-bio medical –aero space-telecommunications.

TOTAL :45 PERIODS

REFERENCES

1. Mohamed Gad-el-Hak, The MEMS Hand book, CRC press 2002.
2. Julian W.Gardner,Vijay K.Varadan,Osama O.Awadel Karim,Microsensors MEMS and Smart Devices, John Wiby & sons Ltd.,2001.
3. S.Fatikow,U.Rembold,Microsystem Technology and Microrobotics,Springer-Verlag Berlin Heidelberg ,1997.
4. Tai-Ran Hsu,MEMS & Microsystems Design and Manufacture,Tata McGraw-Hill,2006.
5. Francis E.H Tay and W.O Choong, Microfludics and BioMEMS Applications, Springer, 2002.

ME3018 **COMPUTER AIDED DESIGN** **L T P C**
3 0 0 3

UNIT I DESIGN PROCESS **9**

The design process Morphology of design - Product cycle - Sequential and concurrent engineering - Role of computers - Computer Aided Engineering - Computer Aided Design - Computer Aided Manufacturing - Benefits of CAD.

UNIT II INTERACTIVE COMPUTER GRAPHICS **9**

Creation of Graphic Primitives - Graphical input techniques - Display transformation in 2-D and 3-D – Viewing transformation - Clipping - hidden line elimination - Mathematical formulation for graphics - Curve generation techniques.

UNIT III DATA STRUCTURE AND STORAGE **9**

Model storages and Data structure - Data structure organisation - Engineering Data Management System. Hierarchical data structure - Network data structure - Relational data structure. Data storage and search methods.

UNIT IV SOLID MODELING **9**

Geometric Modeling - Wire frame, Surface and Solid models - CSG and B-REP Techniques - Features of Solid Modeling Packages - Parametric and features.

UNIT V DESIGN ANALYSIS USING FINITE ELEMENT METHOD **9**

Introduction - Procedures - Element types - Nodal approximation - Element matrices, vectors and equations - Global connectivity - Assembly - Boundary conditions - Solution techniques - Interfaces to CAD – Introduction to CAD packages.

TOTAL = 45 PERIODS

REFERENCES

1. Ibrahim Zeid, CAD - CAM Theory and Practice, Tata McGraw Hill, New Delhi, 2003.
2. Radhakrishnan. P.and Kothandaraman. C.P., Computer Graphics and Design, Dhanpat Rai and Sons, New Delhi, 1998.
3. Dieter.G. E., Engineering Design, Tata McGraw-Hill, New Delhi, 2000.
4. Sadhu Singh, Computer Aided Design and Manufacturing, Khanna Publishers, New Delhi, 2002.
5. Rogers.D.F. and Adams.J.A., Mathematical Elements in Computer Graphics, 2nd Edition, Tata McGraw-Hill, New Delhi, 2003.

ME2035 ENTREPRENEURSHIP DEVELOPMENT L T P C
3 0 0 3

OBJECTIVE:

- Study of this subject provides an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.

UNIT I ENTREPRENEURSHIP 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurical Growth.

UNIT II MOTIVATION 9

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM – Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS 9

Sickness in small Business – Concept, Magnitude, causes and consequences, Corrective Measures – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S.S.Khanka "Entrepreneurial Development" S.Chand & Co. Ltd. Ram Nagar New Delhi, 1999.
2. Kuratko & Hodgetts, "Enterprenuership – Theory, process and practices", Thomson learning 6th edition.

REFERENCES:

1. Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw-Hill, 2002.
2. Mathew J Manimala," Enterprenuership theory at cross roads: paradigms and praxis" Dream tech 2nd edition 2006.

3. Rabindra N. Kanungo “Entrepreneurship and innovation”, Sage Publications, New Delhi, 1998.
4. EDII “ Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development” Institute of India, Ahmadabad, 1986.

EC3014 COMPUTER NETWORKS L T P C
3 0 0 3

UNIT I DATA COMMUNICATION CONCEPTS 9

Digital & Analog, Parallel &serial, Synchronous & Asynchronous, Simplex, Half duplex & Full duplex. Computer Networks- introduction, Network topology, wired network Vs wireless network. Classification of computer N/w’s- LAN, MAN, WAN.

UNIT II N/W REFERENCE MODELS AND PROTOCOL SUITS 9

Need of protocols & their significance in networking, OSI reference model, TCP/IP reference Model, comparison of OSI & TCP/IP Reference models. Networking Hardware: Ethernet cabling The NIC, Repeater, Router, Bridges, Switches, Transceivers, hubs, Cable modems.

UNIT III SWITCHING TECHNOLOLOGIES AND LAN STANDARDS 9

Circuit switching, message & packet switching, Channel allocation methods – ALOHA protocols – Pure ALOHA – Slotted ALOHA, IEEE standard 802 for LANS Ethernet, CSMA/CD, Token Ring, Token Bus, & their frame format. FDDI.

UNIT IV DATA LINK & NW LAYER 9

Services provided by N/W layer, Framing, Data link control: Flow control, Error detection, HDLC & SDLC, Concept of Routing & congestion control. Transport layer Protocols like TCP, UDP, connection oriented transport protocol, TCP services.

UNIT V N/W PROTOCOLS & TRADITIONAL APPLICATION 9

The IP layers and functions – addressing and routing – Internet user services – E-Mail – w.w.w. Telnet, FTP, HTTP. **Broad Band Networks:** ISDN Evolution – structures – Limitation Broad-band ISDN, Asynchronous transfer mode (ATM), SONET.

TOTAL = 45 PERIODS

REFERENCES

1. Forouzan, “Introduction to Data communications and Networking”, Tata McGraw-Hill, 3rd Edition.
2. William Stallings, “Data and Computer communications”, Maxwell Macmillan International Editions, 2nd Edition.
3. Andrew S. Tanenbaum, “Computer Networks”, Prentice Hall of India, 3rd edition, 1998.
4. Balaji Kumar, “Broad band Communication”, McGraw-Hill, 1996.
5. Larry L.Peterson and Bruce S.Davie, “ Computer Networks A system approach”, Elsevier publications, 3rd Edition.

EC3015	VIRTUAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

UNIT I REVIEW OF VIRTUAL INSTRUMENTATION 9

Historical perspectives, advantages, block diagram and architecture of a virtual instrument, data -flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II VI PROGRAMMING TECHNIQUES 9

VIS and sub-VIS loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O.

UNIT III DATA ACQUISTION BASICS 9

AOC. OAC. 010. Counters & timers. PC Hardware structure, timing. Interrupts OMA, software and hardware installation.

UNIT IV COMMON INSTRUMENT INTERFACES 9

Current loop, RS.232C/RS.485, GPIB, System buses, interface buses: USB, PCMCIA, VXI, SCXI, PXI, etc., networking basics for office &.Industrial applications, Visa and IVI, image acquisition and processing. Motion control.

UNIT V USE OF ANALYSIS TOOLS 9

Fourier transforms, power spectrum correlation methods, windowing & filtering, VI application in various fields.

TOTAL = 45 PERIODS

REFERENCES

1. Gary Jonson, Labview Graphical Programming, Second Edition, McGraw Hill, New
2. York, 1997
3. Sokoloff; Basic concepts of Labview 4, Prentice Hall Inc., New Jersey 1998.
4. S. Gupta, J.P: Gu.pta, PC interfacing for Data Acquisition & Process Control, Second Edition, Instrument Society of America, 1994.
5. Lis K. wells & Jeffrey Travis, Labview for everyone, Prentice Hall Inc., New Jersey; 1997
6. Labview user manual first and second edition.

EC3016 INDUSTRIAL ELECTRONICS AND APPLICATIONS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Industrial control classification- motion and process control- feed forward control-interfacing devices- Operational Amplifier-review of thyristor- SCR- TRIAC-Phototransistor

UNIT II CONVERTERS AND INVERTERS 8

Analysis of controlled and fully controlled converters-Dual converters-Analysis of voltage source and current source- current source and series converters

UNIT III INDUSTRIAL MOTOR CONTROL 10

Method of controlling speed- Basic control circuit-DC motor control- AC motor control- Servo motor control- Stepper motor control- micro controller based speed control – solid state motor control-PLL control of a DC motor control

UNIT IV RELAYS, HEATING & WELDING CONTROL 9

Introduction- principle of relays- electromechanical relay- solid state relays- Latching relays- timing relays- Induction heating- dielectric heating- resistance welding.

UNIT V PROCESS AND MOTION CONTROL 9

Elements of process control- temperature control- Flow control- Level control- Methods of motion control- feed back control- Direct digital control

TOTAL = 45 PERIODS

REFERENCES:

1. Terry Baltelt- Industrial electronics, devices, systems and applications- Delmar publishers-1997
2. Frank D. Petruzella- Industrial electronics- McGraw Hill-1996
3. Stephan L.Herman, Walter N.Alerich- Industrial motor control- Delmar publishers- fourth edition-1998
4. Biswanath Paul- Industrial electronics and control- prentice Hall India publisher-2001.
5. P.Harrott- process control- Tata McGraw Hill-1991

MT 3001 ADVANCED MANUFACTURING TECHNOLOGY L T P C
3 0 0 3

UNIT I SHEET METAL WORKING OF METALS 8

Hot and Cold Working- rolling, forging, wire drawing, extrusion-types-forward, backward& tube extrusion. Blanking-blank size calculation, draw ratio, drawing force, piercing, punching, trimming, stretch forming, tube bending, tube forming -embossing & coining-explosive forming-electro hydraulic forming-electro magnetic forming

UNIT II NON TRADITIONAL MACHINING 9

Ultrasonic machining (USM) – process and description of USM-applications and limitations-Electron Beam Machining (EBM)-Process principles of EBM-applications-process principles-Laser Beam Machining (LBM)-Laser beam production-applications-laser beam welding-Plasma Arc Machining (PAM)-Generation of plasma arc-process parameters-applications and limitations.

UNIT III SURFACE FINISHING AND SURFACE HARDENING PROCESS 10

Grinding process, various types of grinding machine-grinding wheel-types-selection of grinding wheel for different applications-selection of cutting speed and work speed- mounting of grinding wheel-galvanizing, electroplating, anodising. Surface hardening- carburizing, carbonitriding, cyaniding, nitriding, ion nitriding, boronizing, laser hardening, thin film coating(PVD, CVD).

UNIT IV EDM AND ECM 10

Electrical Discharge Machining (EDM) - Description of EDM equipment-electrical circuits - electrolyte-metal removal rate-applications-EDWC - process principles – equipments - applications.

Electro Chemical Machining (ECM) - Description of the equipment-electrolyte-metal removal rate -accuracy and surface finish obtained. Electro Chemical grinding (ECG) - Chemical machining-electro chemical grinding equipment-application-electro chemical deburring-honing-applications

UNIT V JIGS AND FIXTURES 8

Jigs-Locating and Clamping devices-principles-elements-mechanical-pneumatic and hydraulic actuation-types of Jigs-general consideration in Jig design-jig bushing, types- methods of construction. Fixtures-types of fixtures- fixture for machine tools –lathe, milling, boring, broaching, grinding-assembly inspection of welding fixture design.

TOTAL = 45 PERIODS

REFERENCES

1. Rao P.N., “Manufacturing Technology, Metal cutting and Machine Tools”, Tata McGraw Hill, 2000.
2. Hajra Choudhary.S.K. and Hajra Choudhary.A.K, “workshop Technology”, Vol-I & Vol-II”-Media Publishers 1986.

3. Donaldson. C. “Tool design”, Tata McGraw Hill Co. Ltd.,1985.
4. H.M.T. Production Technology-Tata McGraw Hill, 2001
5. Sharma .P.C., “A text book of Production Technology- vol I & II ”, S.Chand & Company Ltd, New Delhi, 1996.

GE2022 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Dale H.Besterfiled, et at., “Total Quality Management”, Pearson Education Asia,Third Edition, Indian Reprint (2006).

REFERENCES:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
3. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman,B and Gopal, R.K, “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd., 2006.

MG2021 **MARKETING MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the various processes involved in Marketing and its Philosophy.
- To learn the Psychology of consumers.
- To formulate strategies for advertising, pricing and selling

UNIT I MARKETING PROCESS **9**

Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION **9**

Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic -Psycho graphic and geographic segmentation, process, patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH **9**

Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION **9**

Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION **9**

Characteristics, impact, goals, types, and sales promotions- point of purchase- unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Govindarajan. M, “Marketing management – concepts, cases, challenges and trends”, Prentice hall of India, second edition 2007.
2. Philip Kolter,Koshy Jha “Marketing Management”, Pearson Education ,Indian adapted edition.2007

REFERENCES:

1. Ramasamy and Nama kumari, “Marketing Environment: Planning, implementation and control the Indian context”, 1990.
2. Czinkota&Kotabe, “Marketing management”, Thomson learning, Indian edition 2007
3. Adrain palmer, “ Introduction to marketing theory and practice”, Oxford university press IE 2004.
4. Donald S. Tull and Hawkins, “Marketing Reasearch”, Prentice Hall of Inida-1997.
5. Philip Kotler and Gary Armstrong “Principles of Marketing” Prentice Hall of India, 2000.
6. Steven J.Skinner, “Marketing”, All India Publishers and Distributes Ltd. 1998.
7. Graeme Drummond and John Ensor, Introduction to marketing concepts, Elsevier, Indian Reprint, 2007.

ME3009 **PROJECT ENGINEERING** **L T P C**
3 0 0 3

UNIT I FEASIBILITY ANALYSIS **9**

Project Feasibility analysis: Marketing, Technical and financial feasibility, case studies, report preparation.

UNIT II PROJECT PLANNING **9**

Project management: nature, scope, PERT, CPM techniques, principles, applications

UNIT III TIME VALUE OF MONEY **9**

Internal and time value of money: simple interest, compound interest, present worth uniform series payments, use of interest tables, nominal and effective interest rates, continuous compounding, uniform continuous payment, uniform gradient.

UNIT IV EVALUATION OF ALTERNATIVES **9**

Methods of tangible evaluation of alternatives: Equivalent annual worth comparisons, present worth comparisons rate of return comparisons.

Methods of forecasting: Need for forecast – statistical method, time series analysis, method of least squares, moving average method, curvilinear trend, correlation analysis

UNIT V REPLACEMENT AND RISK ANALYSIS **9**

Replacement policy: item deteriorating with time and items that fail completely (not accounting for time value of money), accounting time value of money, replacement policy for new and old machine with infinite horizon.

Risk analysis: Risk in economic analysis, measuring risk investment, risk profiles, decision trees, formulation of discounted tree.

TOTAL = 45 PERIODS

REFERENCES

1. Prasanna Chandra, “Projects”, Tata McGraw Hill, 2003
2. Patel Bhavesh . M, Project Management, Strategic Financial Planning Evaluation and Control, Vikas Publishing House, New Delhi, 2000
3. James, L. Riggs, “Engineering Economics”, Tata Mc Graw Hill, 1998.
4. Willium G. Sullivan, James A. Bontadelli, Elin M Wicks, Engineering Economy Pearson Education Asia, 2001.
5. Pannirselvam. R, Engineering Economics, PHI, 2006s

EC3010 DATABASE MANAGEMENT SYSTEM L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Introduction to data file and database environment – Database administration – Data dictionary – Basic data modeling concepts.

UNIT II PHYSICAL STORAGE ORGANIZATION 9

Database design – Conceptual model – Logical model – Data storage and access methods – Physical Organization – Physical database design – Searching and reporting.

UNIT III PROGRAMMING 9

Programming in the database environment – Programming languages – programming language interfaces – Front-end tools – Querying languages – Security and Integrity factors.

UNIT IV RECORD BASE MODELS 9

Relational Model: system R architecture, data structure – external level, data manipulation – Hierarchical model: IMS architecture, data structure, external and internal levels – data manipulation – Network model: DBTG architecture, data structure, external level, data manipulation.

UNIT V RECENT TRENDS 9

Introduction to distributed databases – Recent trends in database systems – case studies using existing systems – Comparative study of existing commercial systems.

TOTAL = 45 PERIODS

REFERENCES

1. Abraham Silberschatz, Henry F Korth, S.Sudharshan, “Database System Concepts”, McGraw- Hill 1997.
2. Date C.J., “An Introduction to Database Systems”, III edition, Vol. I, Narosa Publishing House, 1995.
3. James Martin, “Computer Database Organization” PHI Pvt. Ltd., 2002
4. Gerry M Litton, “Introduction to Database Management – A Practical Approach”, S. Chand & Co Ltd., New Delhi, 1992
5. Atre S., “Database: Structured Techniques for design, performance and management”, Wiley Interscience Publication, John Wiley and Sons, 1991

ME3011 **RAPID PROTOTYPING** **L T P C**
3 0 0 3

UNIT I OVERVIEW OF RAPID PROTOTYPING **9**

Definitions, evolution, CAD for RPT, Product design and rapid product development, conceptual design, detail design, prototyping, Fundamentals of RP systems, 3D solid modeling software and their role in RPT, creation of STL file

UNIT II LIQUID BASED RP PROCESSES **9**

Liquid based RP systems: Stereo lithography (SLA)-principle-process parameters-process details-machine details- applications Solid Ground Curing - Principle- process parameters-process details-machine details, Applications

UNIT III SOLID BASED RP PROCESSES **9**

Fusion Deposition Modeling - Principle- process parameters-process details-machine details, Applications. Laminated Object Manufacturing - Principle- process parameters-process details-machine details, Applications.

UNIT IV POWDER BASED RP PROCESSES **9**

Powder based RP systems: Selective Laser Sintering (SLS)- Principle- process parameters-process details-machine details- Applications. 3-Dimensional Printers - Principle- process parameters-process details-machine details, Applications, and other Concept Modelers like Thermo jet printers, Sander's model maker

UNIT V RAPID TOOLING **10**

Principles and typical process for quick batch production of plastic and metal parts through quick tooling.

Reverse Engineering – 3D scanning-3D digitizing and Data fitting

TOTAL : 45 PERIODS

REFERENCES:

1. Chua C.K. et al., " Rapid Prototyping: principles and applications" Wiley,2003
2. Pham D.T & Dimov.S.S, "Rapid manufacturing" , Springer-Verlag, London, 2001
3. Jacobs P.F., " Stereolithography and other Rapid Prototyping & Manufacturing Technologies", McGrawHill ,New york,1996
4. Hilton P.D., " Rapid Tooling" Marcel Dekkar, 2000
5. Zeid I., " CAD/CAM : Theory & Practice", McGrawHill,Singapore,1991

ME3012 ENGINEERING ECONOMICS AND COST ANALYSIS L T P C
3 0 0 3

UNIT I DEMAND AND SUPPLY ANALYSIS 9

Nature and scope of engineering economics – definition and scope of study- importance of economic analysis in business. Demand and supply analysis – demand determinants-Law of demand – elasticity of demand – demand forecasting. Law of supply – elasticity of supply – market price

UNIT II COST ANALYSIS 9

Types of cost - Fixed cost, variable cost, marginal cost. Cost output relationship in short and long run. Pricing decisions – situations demanding pricing decisions, pricing techniques in practice – full cost pricing, marginal cost pricing, going rate pricing, bid pricing, price fixing for a rate of return. Statutory requirements.

UNIT III MONEY AND BANKING 9

Value of money – inflation – deflation, banking- commercial bank and its functions, central bank and its functions. New economic environment – globalisation, liberalisation and privatisation.

UNIT IV CAPITAL BUDGETING 9

Need for capital budgeting – method of apprising project profitability – rate of return method, payback period method, present value comparisons method, cost benefit analysis. Preparation of feasibility report, appraisal process, economic and commercial feasibility, financial feasibility, technical feasibility.

UNIT V DEPRECIATION AND COST ANALYSIS 9

Causes of depreciation, objectives, methods of computing depreciation, simple problems. Breakeven analysis, break even point – assumptions, breakeven chart, uses of breakeven analysis, simple problems. Financial statements – cash flow statement, profit and loss account, balance sheet and evaluation of projected financial statements.

TOTAL: 45 PERIODS

REFERENCES:

1. Varshney R L nd Maheswari K L, Managerial Economics, S.Chand & Co, 1993
2. Samuelson P A and Nordhaus W D, Economics, Tata McGraw Hill, 2001
3. Prasanna Chandra, “Projects”, Tata McGraw Hill, 2003
4. James L Riggs, David D. Bedworth, Engineering Economics, Tata McGraw Hill, 1998
5. Patel Bhavesh . M, Project Management, Strategic Financial Planning Evaluation and Control, Vikas Publishing House, New Delhi, 2000

ME3013 PRODUCT DESIGN AND DEVELOPMENT L T P C
3 0 0 3

UNIT I CREATIVE THINKING AND PRODUCT INNOVATION 9

The product and process design function. Locating ideas for new products. Selecting the product. Qualifications of the production design engineer, Creative thinking curiosity and imagination.

UNIT II CRITERIA FOR PRODUCT SUCCESS 9

Areas to be studies preparatory to design market research functional design. The value of appearance - Principles and laws of appearance - Incorporating quality and reliability into the design. Man Machine considerations-Designing for case of maintenance.

UNIT III COST AND PRODUCT DEVELOPMENT 9

Sources of funds for development cost - Product costs - Estimating product costs - Kinds of cost procedures - Value Engineering - Cost reduction.

UNIT IV PATENTS 9

Classes of exclusive rights - Patents-Combination versus aggregation - Novelty and Utility - Design patents - patent disclosure - patent application steps - Patent office prosecution - Sales of patent rights - Trade marks - Copy rights.

UNIT V QUALITY CONTROL AND RELIABILITY 9

Quality Control procedure - Inspection and test equipment - Statistical quality control - Manufacturing Reliability - Probability of tool reliability - Reliability operations - Developing a quality-control and reliability programme.

TOTAL: 45 PERIODS

REFERENCES

1. Niebel.B.W. and Draper.A.B., Product Design and Process Engineering, McGraw Hill Book Company, New York, 1974.
2. Ulrich Karl.T., Product design and development, 3rd Edition, Tata McGraw Hill, New Delhi, 2005.
3. Kevin Otto and Kristin Wood, Product design: Techniques in reverse engineering and new product development, Pearson education Inc, New Delhi, 2004.
4. Chitale.A.K., Product design and manufacturing, Prentice-Hall of India, New Delhi, 2005.
5. Zaidi.A., SPC Concepts - Methodologies and Tools, Prentice Hall of India Pvt. Ltd., 2003.