AFFILIATED INSTITUTIONS

ANNA UNIVERSITY, CHENNAI

R-2008

B.E. MECHATRONICS ENGINEERING

II - VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER II

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	HS2161	Technical English – II*	3	1	0	4
2.	MA2161	Mathematics – II*	3	1	0	4
3.	PH2161	Engineering Physics – II*	3	0	0	3
4.	CY2161	Engineering Chemistry – II*	3	0	0	3
5. a	ME2151	Engineering Mechanics **(For non-circuit branches)**	3	1	0	4
5. b	EE2151	Circuit Theory **(For branches under Electrical Faculty)**	3	1	0	4
5. c	EC2151	Electric Circuits and Electron Devices **(For branches under I & C Faculty)**	3	1	0	4
6. a	GE2151	Basic Electrical & Electronics Engineering **(For non-circuit branches)**	4	0	0	4
6. b	GE2152	Basic Civil & Mechanical Engineering **(For circuit branches)**	4	0	0	4
PRACTICAL						
7.	GE2155	Computer Practice Laboratory-II*	0	1	2	2
8.	GS2165	Physics & Chemistry Laboratory - II*	0	0	3	2
9. a	ME2155	Computer Aided Drafting and Modeling Laboratory **(For non-circuits branches)**	0	1	2	2
9. b	EE2155	Electrical Circuits Laboratory **(For branches under Electrical Faculty)**	0	0	3	2
9. c	EC2155	Circuits and Devices Laboratory **(For branches under I & C Faculty)**	0	0	3	2
					TOTAL : 28 CREDITS	
10.	-	English Language Laboratory [+]	0	0	2	-

* Common to all B.E. / B.Tech. Programmes

+ Offering English Language Laboratory as an additional subject (with no marks) during 2nd semester may be decided by the respective Colleges affiliated to Anna University Chennai.

A. CIRCUIT BRANCHES

I   Faculty of Electrical Engineering

1. B.E. Electrical and Electronics Engineering
2. B.E. Electronics and Instrumentation Engineering
3. B.E. Instrumentation and Control Engineering

II   Faculty of Information and Communication Engineering

1. B.E. Computer Science and Engineering
2. B.E. Electronics and Communication Engineering
3. B.E. Bio Medical Engineering
4. B.Tech. Information Technology

B. NON – CIRCUIT BRANCHES

I   Faculty of Civil Engineering
1. B.E. Civil Engineering

II   Faculty of Mechanical Engineering
1. B.E. Aeronautical Engineering
2. B.E. Automobile Engineering
3. B.E. Marine Engineering
4. B.E. Mechanical Engineering
5. B.E. Production Engineering

III   Faculty of Technology
1. B.Tech. Chemical Engineering
2. B.Tech. Biotechnology
3. B.Tech. Polymer Technology
4. B.Tech. Textile Technology
5. B.Tech. Textile Technology (Fashion Technology)
6. B.Tech. Petroleum Engineering
7. B.Tech. Plastics Technology

SEMESTER III

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
MA 2211	Transforms and Partial Differential Equation	3	1	0	4
CE 3204	Strength of Materials	3	0	0	3
ME 2204	Fluid Mechanics and Machinery	3	1	0	4
EC 3204	Digital Electronics	3	0	0	3
EE 3205	Electrical Machines and Drives	3	0	0	3
ME 3203	Kinematics of Machinery	3	1	0	4
PRACTICALS					
CE 3218	Fluid Mechanics And Machinery Laboratory	0	0	3	2
MT 3208	Electrical Machines And Drives Laboratory	0	0	3	2
MT 3209	Computer Aided Machine Drawing	0	0	3	2
MT 3210	Technical Seminar I	0	0	3	2
	TOTAL	**18**	**3**	**12**	**29**

SEMESTER IV

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
MA 2264	Numerical Methods	3	1	0	4
ME 3212	Dynamics of Machinery	3	1	0	4
EC 3213	Control Systems	3	1	0	4
ME 3214	Manufacturing Technology	3	0	0	3
ME 3221	Engineering Metrology	3	1	0	4
EC 3216	Microprocessors And Applications	3	0	0	3
PRACTICALS					
EC 3217	Microprocessor Laboratory	0	0	3	2
ME 3218	Manufacturing Technology Laboratory	0	0	3	2
MT 3219	Machine Dynamics Laboratory	0	0	3	2
	TOTAL	**18**	**4**	**9**	**28**

SEMESTER V
(Applicable to the students admitted from the Academic year 2008–2009 onwards)

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
ME 3301	Design of Machine Elements	3	0	0	3
EC 3302	Power Electronics	3	0	0	3
EC 3303	Sensors and Signal Processing	3	0	0	3
EC 3304	Modeling and Simulation	3	0	0	3
ME 3310	CNC Technology	3	0	0	3
ME 3306	Thermodynamics Principles and Applications	3	0	0	3
PRACTICALS					
EC 3307	Power Electronics Laboratory	0	0	3	2
EC 3308	Sensors and Signal Processing Laboratory	0	0	3	2
ME 3309	CNC Laboratory	0	0	3	2
GE3318	Communication Skills Laboratory	0	0	4	2
	TOTAL	**18**	**0**	**13**	**26**

SEMESTER VI

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
MG 3310	Principles of Management	3	0	0	3
ME 3311	Micro controller and PLC	3	0	0	3
ME 2305	Applied Hydraulics and Pneumatics	3	0	0	3
MT 3313	Design of Mechatronics system	3	0	0	3
EC 3314	Object Oriented Programming	3	0	0	3
	Elective – I	3	0	0	3
PRACTICALS					
MT 3315	Micro controller and PLC Laboratory	0	0	3	2
EC 3316	Object Oriented Programming Laboratory	0	0	3	2
ME 3317	Applied Hydraulics and Pneumatics Laboratory	0	0	3	2
MT 3318	Technical Seminar II	0	0	3	2
	TOTAL	**18**	**0**	**12**	**26**

SEMESTER VII

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
MT 3401	Medical Mechatronics	3	0	0	3
MF 3402	Computer Integrated Manufacturing	3	0	0	3
ME 3403	Robotics and Machine Vision System	3	0	0	3
ME 3404	Automobile Engineering	3	0	0	3
	Elective – II	3	0	0	3
	Elective - III	3	0	0	3
PRACTICALS					
ME 3405	Computer Aided Design And Computer Aided Manufacturing Laboratory	0	0	3	2
MT 3406	Robotics Laboratory	0	0	3	2
MT 3407	Design and Fabrication Project	0	0	4	2
	TOTAL	**18**	**0**	**10**	**24**

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MT 3408	Automotive Electronics	3	0	0	3
	Elective - IV	3	0	0	3
	Elective – V	3	0	0	3
PRACTICAL					
MT 3409	Project Work	0	0	12	6
	TOTAL	**9**	**0**	**12**	**15**

LIST OF ELECTIVES FOR MECHATRONICS ENGINEERING
ELECTIVE – I

CODE NO	COURSE TITLE	L	T	P	C
MT 3002	Digital Image Processing	3	0	0	3
MT 3004	Diagnostic Techniques	3	0	0	3
ME 3006	Operations Research	3	1	0	4
GE 3008	Professional Ethics and Human values	3	0	0	3

ELECTIVE – II

CODE NO	COURSE TITLE	L	T	P	C
EC 3007	Digital Signal Processing	3	0	0	3
ME 3017	Micro Electro Mechanical Systems	3	0	0	3
ME 3018	Computer Aided Design	3	0	0	3
ME2035	Entrepreneurship Development	3	0	0	3

ELECTIVE – III

CODE NO	COURSE TITLE	L	T	P	C
EC 3014	Computer Networks	3	0	0	3
EC 3015	Virtual Instrumentation	3	0	0	3
EC 3016	Industrial Electronics and Applications	3	0	0	3

ELECTIVE – IV

CODE NO	COURSE TITLE	L	T	P	C
MT 3001	Advanced Manufacturing Technology	3	0	0	3
GE2022	Total Quality Management	3	0	0	3
MG2021	Marketing Management	3	0	0	3
ME 3009	Project Engineering	3	0	0	3
EC 3010	Database Management System	3	0	0	3

ELECTIVE – V

CODE NO.	COURSE TITLE	L	T	P	C
ME 3011	Rapid Prototyping	3	0	0	3
ME 3012	Engineering Economics and Cost Analysis	3	0	0	3
ME 3013	Product Design and Development	3	0	0	3

AIM:

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES:
- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate reading habit and to develop effective reading skills.
- To help students improve their active and passive vocabulary.
- To familiarize students with different rhetorical functions of scientific English.
- To enable students write letters and reports effectively in formal and business situations.

UNIT I   **12**
Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading & predicting content, Reading and interpretation, extended definitions, Process description

Suggested activities:

Exercises on word formation using the prefix 'self' - Gap filling with preposition.
1. Exercises - Using sequence words.
2. Reading comprehension exercise with questions based on inference – Reading headings
3. and predicting the content – Reading advertisements and interpretation.
4. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

UNIT II   **12**
Phrases / Structures indicating use / purpose – Adverbs-Skimming – Non-verbal communication - Listening – correlating verbal and non-verbal communication -Speaking in group discussions – Formal Letter writing – Writing analytical paragraphs.

Suggested activities:

Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
1. Listening comprehension exercises to categorise data in tables.
2. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

UNIT III   **12**
Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations .

Suggested activities:
Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. (Eg: object –verb / object – noun)
1. Speaking exercises involving the use of stress and intonation – Group discussions– analysis of problems and offering solutions.
2. Reading comprehension exercises with critical questions, Multiple choice question.
3. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – Writing recommendations.

UNIT IV   **12**
Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV /   Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

Suggested Activities:
Rewriting exercises using numerical adjectives.
1. Reading comprehension exercises with analytical questions on content – Evaluation of content.
2. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
3. Speaking - Role play – group discussions – Activities giving oral instructions.
4. Writing descriptions, expanding hints – Writing argumentative paragraphs – Writing formal letters – Writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages.

UNIT V   **9**
Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

Suggested Activities:
1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

TOTAL : 60 PERIODS

TEXT BOOK
1. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

REFERENCES
1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication   Skills', Cambridge University Press, India 2007.
2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills',   Macmillan India Ltd., (Reprinted 1994 – 2007).
3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition,   Pearson Education, 2007.

EXTENSIVE READING:
1. Robin Sharma, 'The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

NOTE:
The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

MA2161   **MATHEMATICS – II**   **L T P C**
                                                                                                3 1 0 4

UNIT I   ORDINARY DIFFERENTIAL EQUATIONS   12
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II   VECTOR CALCULUS   12
Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelpipeds.

UNIT III   ANALYTIC FUNCTIONS   12
Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV   COMPLEX INTEGRATION   12
Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

UNIT V   LAPLACE TRANSFORM   12
Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.

Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

                                                                          TOTAL : 60 PERIODS
TEXT BOOKS

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (p) Ltd., (2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).

REFERENCES
1. Ramana B.V, "Higher Engineering Mathematics",Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, "Advanced Engineering Mathematics", 3rd Edition, Pearson Education, (2007).
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 7th Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

PH2161   **ENGINEERING PHYSICS – II**   **L T P C**
                                                                              3 0 0 3

UNIT I   CONDUCTING MATERIALS   9
Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II   SEMICONDUCTING MATERIALS   9
Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect – Determination of Hall coefficient – Applications.

UNIT III   MAGNETIC AND SUPERCONDUCTING MATERIALS   9
Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives. Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV   DIELECTRIC MATERIALS   9
Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V   MODERN ENGINEERING MATERIALS   9
Metallic glasses: preparation, properties and applications.
Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA
Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications.
Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

                                                                TOTAL : 45 PERIODS

TEXT BOOKS

1. Charles Kittel 'Introduction to Solid State Physics', John Wiley & sons, 7th edition, Singapore (2007)
2. Charles P. Poole and Frank J.Ownen, 'Introduction to Nanotechnology', Wiley India(2007) (for Unit V)

REFERENCES

1. Rajendran, V, and Marikani A, 'Materials science'Tata McGraw Hill publications, (2004) New delhi.
2. Jayakumar, S. 'Materials science', R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, 'Materials science', Scitech publications(India) Pvt. LTd., Chennai, second Edition(2007)
4. M. Arumugam, 'Materials Science' Anuradha publications, Kumbakonam, (2006).

CY2161   **ENGINEERING CHEMISTRY – II**   **L T P C**
                                                                       3 0 0 3

AIM

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

OBJECTIVES

• The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
• Principles of corrosion control
• Chemistry of Fuels and combustion
• Industrial importance of Phase rule and alloys
• Analytical techniques and their importance.

UNIT I   **ELECTROCHEMISTRY**   **9**

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe^{2+} vs dichromate and precipitation – Ag^+ vs Cl^- titrations) and conduct metric titrations (acid-base – HCl vs, NaOH) titrations,

UNIT II   **CORROSION AND CORROSION CONTROL**   **9**

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

UNIT III   FUELS AND COMBUSTION   9
Calorific value – classification – Coal – proximate and ultimate analysis metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and fractions – cracking – catalytic cracking and methods-knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

UNIT IV   PHASE RULE AND ALLOYS   9
Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT V   ANALYTICAL TECHNIQUES   9
Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006).

REFERENCES
1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).

ME2151   **ENGINEERING MECHANICS**   **L T P C**
                                                                                   3 1 0 4

OBJECTIVE
At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I   BASICS & STATICS OF PARTICLES   12
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 – Single equivalent force.

UNIT II   EQUILIBRIUM OF RIGID BODIES   12
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   12
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 – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

UNIT IV   DYNAMICS OF PARTICLES   12
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   12
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: 60 PERIODS

TEXT BOOK
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).

REFERENCES
1. Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., (2000).
2. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., (2000).
3. Palanichamy, M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill, (2001).
4. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
5. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).

EE2151	**CIRCUIT THEORY**	**L T P C**
	(Common to EEE, EIE and ICE Branches)	**3 1 0 4**

UNIT I   BASIC CIRCUITS ANALYSIS   12
Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II   NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS: 12
Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III   RESONANCE AND COUPLED CIRCUITS   12
Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV   TRANSIENT RESPONSE FOR DC CIRCUITS   12
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V   ANALYSING THREE PHASE CIRCUITS   12
Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL : 60 PERIODS

TEXT BOOKS
1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis",Tata McGraw Hill publishers, 6th edition, New Delhi, (2002).

2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",Tata McGraw Hill, (2007).

REFERENCES

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996).
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi (2001).
3. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, (1999).
4. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, (2003).

		L T P C
EC2151	**ELECTRIC CIRCUITS AND ELECTRON DEVICES**	**L T P C**
	(For ECE, CSE, IT and Biomedical Engg. Branches)	**3 1 0 4**

UNIT I   CIRCUIT ANALYSIS TECHNIQUES   12

Kirchoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

UNIT II   TRANSIENT RESONANCE IN RLC CIRCUITS   12

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT III   SEMICONDUCTOR DIODES   12

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

UNIT IV   TRANSISTORS   12

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V   SPECIAL SEMICONDUCTOR DEVICES
                 (QUALITATIVE TREATMENT ONLY)   12

Tunnel diodes – PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

TOTAL : 60 PERIODS

TEXT BOOKS
1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series,Tata McGraw

Hill, (2001)

2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits",Tata McGraw Hill, 2nd Edition, (2008).

3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, (2008).

REFERENCES

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education, (2006).

2. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill, 6th Edition, 2002.

3. J. Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits",Tata McGraw Hill, 2nd Edition, 2008.

GE2151	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	**L T P C**
	(Common to branches under Civil, Mechanical and Technology faculty)	**4 0 0 4**

UNIT I   ELECTRICAL CIRCUITS & MEASURMENTS   12
Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II   ELECTRICAL MECHANICS   12
Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III   SEMICONDUCTOR DEVICES AND APPLICATIONS   12
Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV   DIGITAL ELECTRONICS   12
Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V   FUNDAMENTALS OF COMMUNICATION ENGINEERING   12
Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.

Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

                                                                                      TOTAL : 60 PERIODS

TEXT BOOKS

1. V.N. Mittle "Basic Electrical Engineering",Tata McGraw Hill Edition, New Delhi, 1990.
2. R.S. Sedha, "Applied Electronics" S. Chand & Co., 2006.

REFERENCES

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering",Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
3. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, (2002).
5. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers, (2003).

GE2152	BASIC CIVIL & MECHANICAL ENGINEERING	L T P C
	(Common to branches under Electrical and I & C Faculty)	4 0 0 4

A – CIVIL ENGINEERING

UNIT I   SURVEYING AND CIVIL ENGINEERING MATERIALS   15

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

UNIT II   BUILDING COMPONENTS AND STRUCTURES   15

Foundations: Types, Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

TOTAL : 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III   POWER PLANT ENGINEERING   10
Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV   I C ENGINES   10
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V   REFRIGERATION AND AIR CONDITIONING SYSTEM   10

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 30 PERIODS

REFERENCES

1. Shanmugam G and Palanichamy M S, "Basic Civil and MechanicalEngineering",Tata McGraw Hill Publishing Co., New Delhi, (1996).
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. (1999).
3. Seetharaman S. "Basic Civil Engineering", Anuradha Agencies, (2005).
4. Venugopal K and Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, (2000).
5. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2000).

GE2155   COMPUTER PRACTICE LABORATORY – II   L T P C
LIST OF EXPERIMENTS   0 1 2 2

1. UNIX COMMANDS   15

 Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING   15

Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX   15

Dynamic Storage Allocation-Pointers-Functions-File Handling

TOTAL : 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

HARDWARE
          1 UNIX Clone Server
          33 Nodes (thin client or PCs)
          Printer – 3 Nos.

SOFTWARE
          OS – UNIX Clone (33 user license or License free Linux)
          Compiler - C

GS2165   **PHYSICS LABORATORY – II**   **L T P C**
                                                                            0 0 3 2

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.

3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.

4. Determination of viscosity of liquid – Poiseuille's method.

5. Spectrometer dispersive power of a prism.

6. Determination of Young's modulus of the material – uniform bending.

7. Torsional pendulum – Determination of rigidity modulus.

• **A minimum of FIVE experiments shall be offered.**

• **Laboratory classes on alternate weeks for Physics and Chemistry.**

• **The lab examinations will be held only in the second semester.**

GS2165   **CHEMISTRY LABORATORY – II**   **L T P C**
                                                                            0 0 3 2
LIST OF EXPERIMENTS

1. Conduct metric titration (Simple acid base)

2. Conduct metric titration (Mixture of weak and strong acids)

3. Conduct metric titration using $BaCl_2$ vs Na_2SO_4

4. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)

5. PH titration (acid & base)

6. Determination of water of crystallization of a crystalline salt (Copper   sulphate)

7. Estimation of Ferric iron by spectrophotometry.

• **A minimum of FIVE experiments shall be offered.**

• **Laboratory classes on alternate weeks for Physics and Chemistry.**

• **The lab examinations will be held only in the second semester.**

ME2155   COMPUTER AIDED DRAFTING AND MODELING LABORATORY   L T P C
                                                                 0 1 2 2

List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

EE2155   ELECTRICAL CIRCUIT LABORATORY   L T P C
                      (Common to EEE, EIE and ICE)   **0 0 3 2**

LIST OF EXPERIMENTS

1. Verification of ohm's laws and kirchoff's laws.

2. Verification of Thevemin's and Norton's Theorem

3. Verification of superposition Theorem

4. Verification of maximum power transfer theorem.

5. Verification of reciprocity theorem

6. Measurement of self inductance of a coil

7. Verification of mesh and nodal analysis.

8. Transient response of RL and RC circuits for DC input.

9. Frequency response of series and parallel resonance circuits.

10. Frequency response of single tuned coupled circuits.

                                                    TOTAL: 45 PERIODS

EC2155   **CIRCUITS AND DEVICES LABORATORY**   **L T P C**
                                                                           0 0 3 2

1. Verification of KVL and KCL

2. Verification of Thevenin and Norton Theorems.

3. Verification of superposition Theorem.

4. Verification of Maximum power transfer and reciprocity theorems.

5. Frequency response of series and parallel resonance circuits.

6. Characteristics of PN and Zener diode

7. Characteristics of CE configuration

8. Characteristics of CB configuration

9. Characteristics of UJT and SCR

10. Characteristics of JFET and MOSFET

11. Characteristics of Diac and Triac.

12. Characteristics of Photodiode and Phototransistor.

                                                              TOTAL : 45 PERIODS

ENGLISH LANGUAGE LABORATORY (Optional)   **L T P C**
                                                             0 0 2 -

1. LISTENING: **5**
Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

2. SPEAKING: **5**
Pronouncing words & sentences correctly – word stress – Conversation practice.

CLASSROOM SESSION   **20**
1. Speaking: Introducing oneself, Introducing others, Role play, Debate- Presentations: Body language, gestures, postures. Group Discussions etc
2. Goal setting – interviews – stress time management – situational reasons

Evaluation
   (1)   Lab Session   – 40 marks
         Listening   – 10 marks
         Speaking   – 10 marks
         Reading   – 10 marks
         Writing   – 10 marks

   (2)   Classroom Session – 60 marks
         Role play activities giving real life context   – 30 marks

Presentation   – 30 marks

Note on Evaluation
1. Examples for role play situations:
      a. Marketing engineer convincing a customer to buy his product.
      b. Telephone conversation – Fixing an official appointment / Enquiry on
         availability of flight or train tickets / placing an order. etc.
2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics
    or visuals could be provided and students could be asked to talk about it.

REFERENCES
1. Hartley, Peter, Group Communication, London: Routledge, (2004).
2. Doff, Adrian and Christopher Jones, Language in Use – (Intermediate level), Cambridge University Press, (1994).
3. Gammidge, Mick, Speaking Extra – A resource book of multi-level skills activities , Cambridge University Press, (2004).
4. Craven, Miles, Listening Extra - A resource book of multi-level skills activities, Cambridge, Cambridge University Press, (2004).
5. Naterop, Jean & Rod Revell, Telephoning in English, Cambridge University Press, (1987).

LAB REQUIREMENTS
1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders.

MA2211   TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATION   L T P C
(Common to all branches)   3 1 0 4

OBJECTIVES
The course objective is to develop the skills of the students in the areas of Transforms and Partial Differtial Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I   FOURIER SERIES   9 + 3
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT II   FOURIER TRANSFORMS   9 + 3
Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III   PARTIAL DIFFERENTIAL EQUATIONS   9 + 3
Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9 + 3
Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS 9 + 3
Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z-transform.

LECTURES: 45 TUTORIALS : 15 TOTAL : 60 PERIODS

TEXT BOOKS

1. Grewal, B.S, 'Higher Engineering Mathematics' 40th Edition, Khanna publishers, Delhi, (2007)

REFERENCES

1 Bali.N.P and Manish Goyal 'A Textbook of Engineering Mathematics', Seventh Edition, Laxmi Publications(P) Ltd. (2007)

2. Ramana.B.V. 'Higher Engineering Mathematics' Tata Mc-GrawHill Publishing Company limited, New Delhi (2007).

3. Glyn James, 'Advanced Modern Engineering Mathematics', Third edition-Pearson Education (2007).

4. Erwin Kreyszig 'Advanced Engineering Mathematics', Eighth edition-Wiley India (2007).

CE3204 STRENGTH OF MATERIALS L T P C
3 0 0 3

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 8
Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic Constants – Volumetric strains – Stresses on inclined planes – Principal stresses and principal planes – Mohr's circle of stress.

UNIT II TRANSEVERSE LOADING ON BEAMS AND STRESSES IN BEAMS 13
Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending - bending formula – bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT III TORSION 6
Stresses and deformation in circular and hollows shafts – Stepped shafts – Shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs.

UNIT IV   DEFLECTION OF BEAMS   10

Double Integration method – Macaulay's method – Area moment theorems for computation of slopes and deflections in beams – Conjugate beam and energy method – Maxwell's reciprocal theorems.

UNIT V   THIN CYLINDERS, SPHERES AND THICK CYLINDERS   9

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses – deformation in thin cylinders –spherical shells subjected to internal pressure – deformations in spherical shells - Lame's theory – application of theories of failure

TOTAL : 45 PERIODS

TEXT BOOKS
1. Rajput.R.K. "Strength of Materials" S.Chand & co Ltd. New Delhi 1996
2. Jindal U.C. "Strength of Materials" Asian Books Pvt Ltd, New Delhi 2007

REFERENCES
1. Egor.P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi 1997
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

ME2204   **FLUID MECHANICS AND MACHINERY**   **L T P C**
            (Common to Aeronautical, Mechanical, Automobile & Production)   **3 1 0 4**

OBJECTIVES

- The student is introduced to the mechanics of fluids through a thorough understanding of the properties of the fluids. The dynamics of fluids is introduced through the control volume approach which gives an integrated under standing of the transport of mass, momentum and energy.
- The applications of the conservation laws to flow though pipes and hydraulics machines are studied

UNIT I   INTRODUCTION   12

Units & Dimensions. Properties of fluids – Specific gravity, specific weight, viscosity, compressibility, vapour pressure and gas laws – capillarity and surface tension. Flow characteristics: concepts of system and control volume. Application of control volume to continuity equiation, energy equation, momentum equation and moment of momentum equation.

UNIT II   FLOW THROUG CIRCULAR CONDUITS   12

Laminar flow though circular conduits and circular annuli. Boundary layer concepts. Boundary layer thickness. Hydraulic and energy gradient. Darcy – Weisbach equation. Friction factor and Moody diagram. Commercial pipes. Minor losses. Flow though pipes in series and in parallel.

UNIT III   DIMENSIONAL ANALYSIS   9

Dimension and units: Buckingham's Π theorem. Discussion on dimensionless parameters. Models and similitude. Applications of dimensionless parameters.

,
UNIT IV   ROTO DYNAMIC MACHINES   16

Homologus units. Specific speed. Elementary cascade theory. Theory of turbo machines. Euler's equation. Hydraulic efficiency. Velocity components at the entry and exit of the rotor. Velocity triangle for single stage radial flow and axial flow machines. Centrifugal pumps, turbines, performance curves for pumps and turbines.

UNIT V   POSITIVE DISPLACEMENT MACHINES   11

Recriprocating pumps, Indicator diagrams, Work saved by air vessels. Rotory pumps. Classification. Working and performance curves.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Streeter. V. L., and Wylie, E.B., Fluid Mechanics, McGraw Hill, 1983.
2. Rathakrishnan. E, Fluid Mechanics, Prentice Hall of India (II Ed.), 2007.

REFERENCES:

1. Ramamritham. S, Fluid Mechanics, Hydraulics and Fluid Machines, Dhanpat Rai & Sons, Delhi, 1988.
2. Kumar. K.L., Engineering Fluid Mechanics (VII Ed.) Eurasia Publishing House (P) Ltd., New Delhi, 1995.
3. Bansal, R.K., Fluid Mechanics and Hydraulics Machines, Laxmi Publications (P) Ltd., New Delhi.

EC 3204   **DIGITAL ELECTRONICS**   **L T P C**
                                                          3 0 0 3

OBJECTIVE

To design Microprocessor / Microcontroller / PLC based Mechatronics system it is essential to have the fundamental knowledge of digital circuits and digital systems. Hence the subject Digital Electronics is offered in which they study the design of Arithmetic circuits, shift registers and counters etc.

UNIT I   NUMBER SYSTEM AND BASIC LOGIC   9

Number systems – Binary, Octal, Hexadecimal, BCD, Excess 3, Complements Conversions and Arithmetic. Boolean theorems, Boolean algebra – AND, OR, NOT, NAND & NOR operation, Sum of Product and Product of Sum forms. Minimization – Kamaugh's map, Tabular Minimization Procedures.

UNIT II   COMBINATIONAL CIRCUITS   9

Design of Logic gates. Design of Adder, Subtractor, Comparators, Code Converters, Encoders, Decoders, Multiplexers and Demultiplexers. Function realization using Gates & Combinational circuits.

UNIT III   SYNCHRONOUS SEQUENTIAL CIRCUITS   9

Flip flops – SR, D, JK and T. Analysis of Synchronous Sequential circuits, Design of Synchronous Sequential circuits, Counters, Shift registers, State diagram, State reduction and State assignment.

UNIT IV   ASYNCHRONOUS SEQUENTIAL CIRCUIT   9

Stable Unstable states, Output Specifications, Cycles and Races, Race free assignments, Reduction of State and Flow tables, Hazards.

UNIT V   MEMEORY, PROGRAMMABLE LOGIC DEVICES AND LOGIC FAMILIES   9

Memories and PLD's: ROM, PROM, EPROM, PLA, PLD, CPLD and FPGA. Digital logic families: TTL, ECL, CMOS.

TOTAL= 45 PERIODS

TEXT BOOK

1. Morris Mano M., "Digital Circuits and Logic Design", Prentice Hall of India, II Edition, 1996.

REFERENCES

1. W.H.Gothmann, "Digital Electronics – Introduction Theory and Practice", PHI, 1992.
2. S.Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 2nd Edition, Vikas Publishing House Pvt. Ltd, New Dehi, 2004.
3. W.H. Gothmann, "Digital Electronics – Introduction Theory and Practice", Prentice Hall of India Pvt. Ltd ., New Delhi, 1992.
4. R.R. Jain, "Modern digital electronics", Third edition, Tata McGraw – Hill, 3rd edition 2003.
5. Leach and Malvino, "Digital Principles of Electronics & Applications", Tata McGraw – Hill, 5th Edition, 2003.

EE3205   **ELECTRICAL MACHINES AND DRIVES**   **L T P C**
                                                                    3 0 0 3

OBJECTIVES
- To study the basic concept of D.C. and A.C. circuits and to learn the concept of transformers and do simple problems.
- To study the performance characteristics of D.C. motors, three phase induction motor and single phase
- induction motor.
- To study the methods of speed control of D.C. and A.C. motors and methods of starting of D.C. and A.C. motors.
- To study the basic of selection of drive for a given application.
- To study the concept of controlling the speed of D.C. and A.C. motors using solid state devices.

UNIT I   CIRCUITS AND TRANSFORMERS   6

D.C. Voltage, current, power – Ohms law – series, parallel circuits – Kirchoff's laws – mesh analysis – A.C. voltage – sinusoidal waves, hasor representation – power factor – complex power – basic idea 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

TEXT BOOK

1. N.K.De.,P.K.Sen "Electric Drives", Prentice Hall, First edition 1999.

REFERENCES

1. I.J.Nagrath, T.P. Kothari., "Basic Engineering", McGraw – Hill Publishing company Ltd., Second edition, 2002.
2. S.K. Bhattacharya "Electrical Machines", second edition 1999, Tata McGraw – Hill Pvt. Company Ltd., Second edition, 1999.
3. G.K. Dubey "Fundamental Electrical Drives" second edition 2002, Narosa Publications, Second edition, 2002.
4. Pillai, S.K., " A Seish course on Electrical Drives", Wilay Eastern Ltd., New Delhi, 1982.

ME3203   **KINEMATICS OF MACHINERY**   **L T P C**
                                                                                           3 1 0 4

OBJECTIVES
- To understand the layout of linkages in the assembly of a system/machine.
- To understand the principles involved in assessing 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 in a mechanism.

UNIT I   BASIC OF MECHANISMS   7
Terminology and Definitions – Degree of Freedom Mobility – Kutzbach criterion – Grashoff's law – Kinematic Inversions of 4 – bar chain and slider crank chains – Mechanical Advantage – Transmission angle – Description of common Mechanisms – Single, double and offset slider mechanisms – Quick return mechanisms Ratchets and escapements – Indexing Mechanisms – Rocking Mechanisms – Straight line generators – Design of Crank – rocker Mechanisms.

UNIT II   KINEMATICS   12
Displacement, velocity and acceleration and analysis in simple mechanisms – Graphical Method velocity and acceleration polygons – Kinematic analysis by Complex Algebra Methods – Vector Approach, Computer applications in the kinematic analysis of simple mechanisms – Coincident points – Coriolis Acceleration.

UNIT III   KINEMATICS OF CAM   8
Classifications – Displacement diagrams – parabolic Simple harmonic and Cycloidal motions – Layout of plate cam profiles – Derivatives of Follower motion – High speed cams – circular arc and tangent cams – Standard cam motion – Pressure angle and undercutting.

UNIT IV   GEARS   10
Spur gear Terminology and definitions – Fundamental Law of toothed gearing and involute gearing – Inter changeable gears – gear tooth action – Terminology – Interference and undercutting – Non standard gear teeth – Helical, Bevel, Worm, Rack and Pinion gears (Basics only) – Gear trains – Parallel axis gear trains – Epicyclic gear trains – Differentials

UNIT V   FRICTION   8
Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Friction clutches – Belt and rope drives, Friction aspects in Brakes – Friction in vehicle propulsion and braking

TUTORIALS 15: TOTAL: 60 PERIODS

TEXT BOOKS

1. Rattan S.S, "Theory of Machines", Tata McGraw – Hill Publishing Company Ltd., New Delhi, 1998.
2. Shigley J.E and Uicker J.J, "Theory of Machines and Mechanisms", McGraw – Hill, Inc. 1995.

REFERENCES

1. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
2. Ghosh A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East – West Pvt. Ltd., New Delhi, 1998.

3. Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", Wiley – Eastern Ltd., New Delhi, 1992.
4. John Hannah and Stephens R.C, "Mechanics of Machines", Viva Low – Prices Student Edition, 1999.

CE3218   FLUIDS MECHANICS AND MACHINERY LABORATORY   LT P C
                                                                    0 0 3 2

AIM:
To perform experiments an various types of pumps and turbines to understand their characteristics.

OBJECTIVES:
- To understand the concepts flow through different cross sections.
- To understand and draw characteristics of various pumps.
- To understand and draw performance characteristics of different turbines.

UNIT I   FLOW MEASUREMENT
Calibration of Flow Measuring instruments – venturimeter, orificemeter, rotometer, Calibration of flows in open channels – weirs and notches. Estimation of friction factor in flow through pipes.

UNIT II   PUMPS
Determination of performance characteristics of pumps – centrifugal pumps, submersible pumps, turbine pumps and positive displacement pumps – reciprocating and gear pumps.

UNIT III   TURBINES
Determination of performance characteristics of turbines – reaction turbines and impulse turbines.

                                                        TOTAL : 45 PERIODS
REFERENCE
1. CWR, Hydraulics Laboratory Manual,2004

MT3208   ELECTRICAL MACHINES AND DRIVES LABORATORY   L T P C
                                                                    0 0 3 2

OBJECTIVE
To expose the students the operation of electric drives and give them 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

LIST OF EQUIPMENT
(for a batch of 30 students)

S.No	Equipments	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 quto 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	Rheostat 50 ohm/5A	3
22	Tachometer	5

MT 3209 **COMPUTER AIDED MACHINE DRAWING** **L T P C**
                                                0 0 3 2

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-D modeling solid and frame modeling.

                                                                    TOTAL: 45 PERIODS

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

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

LIST OF EQUIPMENT AND SOFTWARE REQUIRED
(for a batch of 30 students)

1. **Computer System**   30
    VGA Color Monitor, Pentium IV Processor, 20 GB HDD, 256 MB RAM
2. Laser Printer   01
3. **Plotter(A2 size)**   01
4. **Software:** AutoCAD or Mechanical Desktop or Pro/E or CATIA or IDEAS 30 Licenses or solidworks
5. Drawing Boards and Tables in Drawing Hall   30
    Nos.

MT 3210   **TECHNICAL SEMINAR I**   **L T P C**
                                                                              0 0 3 2

OBJECTIVE

During the seminar session each student is exposed to prepare and pressure a topic on engineering/technology, for a duration of about 8 to 10 minutes. In a session of three periods per weeks, 15 students are expected to present of the seminar. A faculty guide is to be allotted and he/she will guide and monitor the progress of the student and maintain attendance also.

Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.

MA2264   **NUMERICAL METHODS**   **L T P C**
                                                                              3 1 0 4
AIM
With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

OBJECTIVES
- At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:
- The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.
- When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
- The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

UNIT I   SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   9
Solution of equation –Fixed point iteration: x=g(x) method - Newton's method – Solution of linear system by Gaussian elimination and Gauss-Jordan method– Iterative method - Gauss-Seidel method - Inverse of a matrix by Gauss Jordan method – Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

UNIT II   INTERPOLATION AND APPROXIMATION   9
Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

UNIT III   NUMERICAL DIFFERENTIATION AND INTEGRATION   9
Differentiation using interpolation formulae –Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulae – Double integrals using trapezoidal and Simpsons's rules.

UNIT IV   INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS   **9**

Single step methods: Taylor series method – Euler method for first order equation – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

UNIT V   BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS   **9**

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

L = 45 , T = 15,   TOTAL: 60 PERIODS

TEXT BOOKS

1. Veerarjan, T and Ramachandran, T. 'Numerical methods with programming in 'C' Second Editiion, Tata McGraw-Hill Publishing.Co.Ltd. (2007).
2. Sankara Rao K, 'Numerical Methods for Scientisits and Engineers' – 3rd editiion Printice Hall of India Private Ltd, New Delhi, (2007).

REFERENCES

1. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P.O., "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, New Delhi, 2006.
3. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2004

ME3212   **DYNAMICS OF MACHINERY**   **L T P C**
3 1 0 4

OBJECTIVES
- To understand the force-motion relationship in components subjected to External Forces.
- To understand the force-motion analysis of standard mechanisms.
- To understand the undesirable effects of unbalances resulting from prescribed motions in mechanism.
- To understand the effect of dynamics of Undesirable Vibrations.

- To understand the principles in mechanisms used for governing of machines.

UNIT I   FORCE ANALYSIS   10

Rigid Body dynamics in general plane motion – Equations of motion- Dynamic force analysis – Inertia force and Inertia torque – D. Alemberts principle – The principle of superposition – Dynamic Analysis in Reciprocating Engines – Gas Forces – Equivalent masses – Bearing loads – Crank shaft Torque – Turning moment diagrams – Fly wheels.

UNIT II   BALANCING   9

Static and dynamic balancing – Balancing of rotating masses – Balancing a single cylinder Engine Balancing   Multi – cylinder Engines – Partial balancing in locomotive Engines – Balancing linkages.

UNIT III   FREE VIBRATION   10

Basic features of vibratory systems – Degrees of freedom – Single degree a freedom – Free vibration – Equations of motion – natural frequency – Types of Damping – Damped vibration critical speeds of simple shaft – Torsional systems; Natural frequency of two and three rotor systems.

UNIT IV   FORCE VIBRATION   6

Response to periodic forcing – Harmonic Forcing – Forcing caused by unbalance – Support motion – Force transmissibility and amplitude transmissibility vibration isolation.

UNIT V   MECHANISM FOR CONTROL   10

Governors – Types – Centrifugal governors – Gravity controlled and spring controlled centrifugal governors – Characteristics – Effect of friction – Controlling Force other governor mechanisms. Gyroscopes – Gyroscopic forces and Torques – Gyroscopic stabilization - Gyroscopic effects in Automobiles, ships and airplanes.

TOTAL: 60 PERIODS

TEXT BOOK
1. Rattan S.S., "Theory of Machines", Tata McGraw – Hill Publishing Company Ltd., New Delhi, 1994.

REFERENCES
1. Thomas Bevan, "Theory of Machines", CBS Publishers and distributors, 1984.
2. Ghosh A. and Mallick A.K., "Theory of Mechanisms and Machines", Affiliated East- West Press Pvt. Ltd., New Delhi, 1988.
3. Shigley J.E. and Uicker J.J., "Theory of Machines and Machanisms", McGraw – Hill, Inc., 1995.
4. Rao J.S. and Dukkipati R.V., "Mechanism of Machine Theory", Wiley – Eastern Limited, New Delhi, 1992.
5. John Hannah and Stephens R.C., "Mechanics of Machines", Viva low – Priced Student Edition, 1999.
6. Sadhu Singh "Theory of a Machines", Pearson Education, 2002.

EC3213   **CONTROL SYSTEMS**   **L T P C**
                                                                            3 1 0 4

OBJECTIVE

To study the response and stability of mechanical and electrical systems so as to design for stable operation.

UNIT I   BASIC CONCEPTS AND SYSTEM REPRESENTATION   12

Basic elements in control systems – Open and closed loop systems with example – Mathematical model of Translational, Rotational & Electrical systems – Transfer function – Block diagram reduction techniques – Signal flow graph.

UNIT II   TIME RESPONSE ANALYSIS   12

Introduction – Time domain specifications – Types of test inputs –I and II order system response – Steady state error – Error coefficients – Generalized error series – P, PI, PD, PID Controlled characteristics.

UNIT III   FREQUENCY RESPONSE ANALYSIS AND DESIGN   12

Introduction – Frequency domain specifications – Bode plots and polar plots – Constant M and N circles and Nichols chart – Correlation between frequency domain and time domain specifications.

UNIT IV   STABILITY OF CONTROL SYSTEMS   12

Characteristics equation – Location of roots in s-plane for stability – Routh Hurwitz criterion – Root locus construction – Gain margin and phase margin – Nyquist stability criterion.

UNIT V   COMPENSATION DESGIN   12

Realization of basis compensation – Lag, Lead and Lag – lead networks – Compensator design using Bode plots.

MATLAB applications: Partial Fraction expansion, Transformation of a Mathematical models, Transient response analysis, Root locus, Bode diagrams, Nyquist plots, analysis of compensator design problems.

TOTAL= 60 PERIODS

REFERENCES

1. Katsuhiko Ogata, "Modern Control Engineering", 4th Edition, Pearson Education 2003.
2. I.J.Nagrath & M. Gopal, "Control Systems Engineering", New Age International Publishers, 2003.
3. B.C.Kuo, "Automatic control systems", Prentice Hall of India ltd, New Delhi 1995.
4. Dorf R.C. and Bishop R.H., "Modern Control systems", Addison – Wesley, 1995 (MATLAB reference).
5. Leonard N.E. and William Levine, "Using MATLAB to Analyze and Design Control Systems," Addision Wesley, 1995.

ME3214   **MANUFACTURING TECHNOLOGY**   **L T P C**

3 0 0 3
OBJECTIVE
This course aims to impart the knowledge about various production processes. It deals with
Metal Casting. Metal Forming, Metal Machining and Metal joining Processes. After this course,
a Mechatronics student will have a good exposure about the manufacturing processes and
various operations and machinery. This also gives the recent trends in these processes also.

UNIT I   FOUNDRY TECHNOLOGY   9
Pattern and Core making – Moulding sand – Melting furnaces Cupola and Induction furnaces –
Special casting processes – Shell, Investment, Die casting – Defects in casting.

UNIT II   FORMING – PROCESSES   9
Hot and Cold Working
Rolling: Introduction – Rolling Mills – Rolling Operations – Production of Seamless Tubing and
Pipe.
Forging: Introduction – Related Forging Operations – Drop forging.
Extrusion and Drawing: Extrusion Practice – Hot, Cold, Impact and Hydrostatic extrusion.
Drawing Process – Defects and Residual Stresses – Drawing Equipment. Sheet metal
operations – Blanking, Punching and Piercing.

UNIT III   MATERIAL – REMOVAL PROCESSES   9
Lathes and Lathe Operations, Drilling and Drilling Machines, Reaming and Reamers, Tapping
and Tapes- Tool nomenclature, cutting speed, feed, machining Time calculations.

UNIT IV   SPECIAL MACHINES   9
Milling Machines and Operations, Planning and Sharping, Broaching, Gear Hobbing and
Sharping.
Grinding Process – Abrasives – Finishing operations –lapping, Honing Powder coating.

UNIT V   PRINCIPLES & APPLICATIONS OF JOINING PROCESSES   9
Gas welding, Basic Arc Welding Processes, Thermit Welding, Electron – Beam Welding, Laser
– Beam Welding.
Solid State Welding: Cold Welding , Ultrasonic Welding, Friction Welding, Resistance Principles
and application of Brazing and Soldering.
                                                        TOTAL= 45 PERIODS
TEXT BOOK
1. KALPAKJIAN, S., "Manufacturing Engineering and Technology", Pearson education India,
   4th edition, 2001(ISBN 81 78081 571)

REFERENCES
1. Hajra Choudhury, S.K., and Haqjra Choudhury, A.K., "Elements of Workshop Techonology",
   Volume I and II, Media Promoters and Publishers Private Limited, Mumbai, 1997.
2. Paul Degarma E, Black J.T. and Ronald A. Kosher, Eighth edition, Materials and Processes
   in Manufacturing Prentice – Hall of India, 1997.
3. Sharma P.C. A Textbook of Production Technology, S. Chand and Co., Ltd., 1999.

ME3221   **ENGINEERING METROLOGY**   **L T P C**
                                                                               3 1 0 4

OBJECTIVE

For understanding the principle of Dimensional metrology and applying principles, techniques and devices used for quality control in modern Industrial environment.

UNIT I   BASIC CONCEPTS AND COMPARATORS   12

Basic concept – Legal metrology – Precision – Accuracy – Types of errors – standards of measurement – traceability – interchangeability and selective assembly, gauge blocks, limit gauges – tailors principle of gauge design. Comparators: Mechanical, Electronic, optical and Pneumatic – Automatic gauging.

UNIT II   ANGULAR MEASUREMENT AND SURFACE FINISH MEASUREMENT   12

Angular measurement : sine bar – Autocollimator, optical projectors: profile projectors – toolmakers microscope, measurement of surface finish: Terminology – roughness – waviness – analysis of surface finish – stylus probe instrument –Talysurf.

UNIT III   SCREW THREAD AND GEAR METROLOGY   12

Screw thread metrology: errors in thread – pitch error – drunkenness – measurement of various elements thread – two and three wire method – best wire size – Thread gauges – floating carriage micrometer. Measurement of gears – Terminology – measurement of various elements of gear – tooth thickness – constant chord and base tangent method – Parkinson Gear Tester.

UNIT IV   LASER METROLOGY   12

Laser Metrology: LASER interferometer – constructional features, sources of error, measurement of positional error, straightness and flatness of machine tools – LASER Alignment Telescope – LASER Micrometer – LASER Triangulation technique – in process and on line measurement.

UNIT V   ADVANCES IN METROLOGY   12

Coordinate measuring machine (CMM): Constructional features – types, applications, Applications of Image Processing in measurement – computer aided inspection.

                                                              TOTAL= 60 PERIODS

REFERENCES

1. Jain R.K., "Engineering Metrology", Khanna Publishers, 1994.
2. Gupta I.C , "Engineering Metrology", Dhanpat rai Publications, fifth edition, 1998.
3. Connie Dotson, et al., "Fundamentals of Dimensional Metrology", Thomas Asia, Singapore, First print, 2003.
4. Doeblin E.O., "measurement system applications and design" First Edition, 1990.
5. Groover M.P., "Automation, production system and computer integrated manufacturing ", Prentice – Hall, New Delhi, 2003.

EC3216   **MICROPROCESSORS AND APPLICATIONS**   **L T P C**
                                                                             3 0 0 3

OBJECTIVE
Most of the Mechatronics systems control is based on Microprocessor or Microcontroller. So it is necessary to include this subject in the syllabus so that students will be exposed to the knowledge of Microprocessor based systems and design of these systems.

UNIT I   INTRODUCTION   10
Organization of Micro Computers – Organization of 8085: Architecture, Internal Register Organization and Pin Configuration – Instruction Set of 8085 – addressing modes – instruction and machine cycles with states and timing diagram. Methods of 8085 programs and 8085 assembly language.

UNIT II   INTERFACING AND I/O DEVICES   9
Need for Interfacing - /Memory Interfacing: address space partitioning – address map – Address decoding – Designing decoders circuit for the given address map – Bus connection and Z – line Control – Access Time Computations.
I/O Interfacing: Data transfer schemes – programmed Synchronous and asynchronous – Interrupt driven Transfer – Multiple devices and multiple interrupt levels – enabling disabiling 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 – programmable interval timer (8253) – Programmable communication interface (USART) – Programmable interrupt controller – Programmable DMA Controller (8257)- Programmable Keyboard/display controllers.

UNIT IV   DESIGN USING PERIPHERAL DEVICES   9
Interfacing A/D and D/A converters – Matrix Keyboard design using 8255 using 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

TEXT BOOK
1. Introduction to Microprocessor – Third Edition – Aditya P Mathur Tata McGraw – Hill Publishing Company Ltd., New Delhi 3rd Edition 2003.

REFERENCES
1. Microprocessor Architecture. Programming and Applications with the 8085 Ramesh Goankar, fifth edition – Penram International Publishing (India) Private Limited.

2. "Microprocessors and Interfacing, Programming and Hardware" Douglas V. Hall.Tata McGraw – Hill Publishing Company Ltd., New Delhi, 1997.

EC3217   **MICROPROCESSOR LABORATORY**   **L T P C**
                                                          0 0 3 2

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 number 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

LIST OF EQUIPMENTS
(for a batch of 30 students)

S.No	Equipments	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 like	3

	thermocouple		

ME3218   **MANUFACTURING TECHNOLOGY LABORATORY**   **L T P C**
                                                       0 0 3 2

OBJECTIVE
Demonstration and study of the following machines. The Main emphasis will be on a acomplete 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

LIST OF EQUIPMENT
(for a batch of 30 students)
     1.   Lathe   -15 Nos.
     2.   Drilling Machine   -1 Nos.
     3.   Milling Machine   -2 Nos.
     4.   Planning Machine   -1 Nos.

5. Shaping Machine   -2 Nos.

MT3219   **MACHINE DYNAMICS LABORATORY**   **L T P C**
                                                                            0 0 3 2

LIST OF EXPERIMENTS
1. Governor – Determination of sensitivity, effort, etc. for watt, porter, proell, Hartnell governors.
2. Cam – Study of jump phenomenon and drawing profile of the cam.
3. Motorised Gyroscope – Verification of law's – Determination of gyroscopic couple.
4. Whirling of shaft – Determination of critical speed of shaft with concentrated loads.
5. Balancing of reciprocating masses.
6. Balancing of rotating masses.
7. Determination of Moment of inertia by oscillation method for connecting rod and flywheel.
8. Vibrating system Spring mass – system – Determination of damping co – efficient of single degree of freedom system.
9. Determination of influence co – efficients for multidegree freedom suspension system.
10. Determination of transmissibility ratio – vibrating table.
11. Determination of torsional frequencies for compound pendulum and flywheel – system with lumped Moment of inertia.
12. Transverse vibration – free – Beam. Determination of natural frequency and deflection of beam.

TOTAL:45 PERIODS

LIST OF EQUIPMENT
(for a batch of 30 students)

1.	Cam analyzer	-1 Nos.
2.	Motorised gyroscope	-1 Nos.
3.	Governor apparatus – watt, porter, proell and hartnell governor.	-1 Nos.
4.	Whirling of shaft apparatus.	-1 NoS.
5.	Dynamic balancing machine.	-1 Nos.
6.	Static dynamic balancing machine.	-1 Nos.
7.	Vibration test facilities apparatus.	-1 Nos.

ME3301   **DESIGN OF MACHINE ELEMENTS**   **L   T   P   C**
                    (Note: Approved Design Data Book is permitted in the
                    examination)   **3   0   0   3**

UNIT I   DESIGN FUNDAMENTALS   9

Design Process - Computer aided design - Optimum design - Mechanical properties of materials - Types of loads - Stresses - Static, varying, thermal, impact and residual - Factors of safety - Theories of failure – Stress concentration factors.

UNIT II   DESIGN OF SHAFTS,KEYS AND COUPLINGS   9

Design of Solid and Hollow shafts – Based on strength, rigidity and deflection- Torsional rigidity – Lateral rigidity- Material constants - Design of Keys – Types – Keyways – Design of rigid and flexible couplings

UNIT III   GEARS   9

Principles of gear tooth action - Gear correction - Gear tooth failure modes - Stresses and loads – Component design of spur, helical, bevel and worm gears. Design of speed reducers

UNIT IV   BRAKES AND CLUTCHES   9

Dynamic and thermal aspects of braking – Design of brakes - Design of clutches- Single plate – Multi plate – Conical clutch

UNIT V   BEARINGS AND SPRINGS   9

Design of Bearings – Sliding contact – Rolling contact – Design of Journal Bearings – Calculation of Bearing dimensions – Design of helical and leaf springs.

TOTAL = 45 PERIODS

REFERENCES
1. Joseph Edward Shigley and Charles R.Mischke, Mechanical Engineering Design, 6th Edition, McGraw-Hill International Edition, 2004.
2. Kulkarni.S.G., Machine Design - Solved Problems, Tata McGraw-Hill, New Delhi, 2003.
3. William Orthwein, Machine Component Design (Vol. I & II), M/s. Jaico Publishing house, Mumbai, 2003.
4. Maitra.G.M., and Prasad.LN., Hand Book of Mechanical Design, 2nd Edition, Tata McGraw Hill, New Delhi, 2005.

EC3302   **POWER ELECTRONICS**   **L T P C**
                                                                        3 0 0 3

UNIT I   POWER SEMI CONDUCTOR DEVICES   9
Principle of operation – Characteristics of power diodes, SCR, TRIAC, GTO, Power BJT, Power MOSFET and IGBT – Thyristor protection circuits.

UNIT II   PHASE CONTROLLED CONVERTERS   9
Uncontrolled and controlled converters – Single phase semi and full converters, 3 phase half converter and 3 phase full converter – effect of source inductance – Thyristor triggering circuits.

UNIT III   DC TO DC CHOPPERS   9
DC Chopper – control strategies – Principle of operation – step up and step down chopper – quadrant operation – Forced commutation – different techniques – voltage, current and load commutated choppers – triggering circuits.

UNIT IV   INVERTERS   9
Voltage source inverters – series, parallel and bridge inverters – PWM techniques – sinusoidal PWM , modified sinusoidal PWM, multiple PWM – current source inverters.

UNIT V   AC VOLTAGE CONTROLLERS AND CYCLOCONVERTERS   9
Single phase AC voltage controller – on - off control and phase control – multistage sequence control – step up and step down cycloconverters – three phase to single phase and three phase cycloconverters.

                                                                                          TOTAL = 45 PERIODS

REFERENCES
1. Reshid, M.H., "Power Electronics – Circuits Devices and Application" Prentice Hall International, New Delhi, 3rd Edition, 2004.
2. Lander, W., "Power Electronics" McGraw-Hill and Company, 3rd Edition, 1993.
3. Singh, M.D., Khanchandani, K.B., "Power Electronics", Tata McGraw-Hill, 1998.
4. Dubey, G.K., Doradia, S.R., Joshi, A. and Singh, R.M., "Thyristorised Power Controllers", Wiley Eastern Limited, 1986.
5. Mohan Undeland and Robbins, "Power Electronics", John Wilry and Sons, New York, 1995.

EC3303   **SENSORS AND SIGNAL PROCESSING**   **L T P C**
                                                                              3 0 0 3

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
REFERENCES
1. E. O. Doebelin, 'Measurement Systems – Applications and Design ', Tata
    McGraw Hill, edition 1992.
2. A. K. Sawhney, ' A course in Electrical and Electronic Measurement and
    Instrumentation', Dhanpat Rai and Co (P) Ltd, 2004.
3. Beckwith, Marangoni and Lienhard, 'Mechanical Measurements', Addison – Wesley,
    5th Edition, 2000.
4. D. Roy Choudry, Sheil Jain, ' Linear Integrated Circuits', New Age International Pvt.
    Ltd., 2000.
5. Patranabis. D, "Sensors and Transducers", 2nd edition PHI, New Delhi, 2003.

EC3304   **MODELLING AND SIMULATION**   **L T P C**
                                                                         3 0 0 3

OBJECTIVE
To provide an exposure on how to simulate a system or a process or an activity for detailed analysis, optimization and decision making which is essential to reduce the product design and development cost and time.

UNIT I   **9**
System and System Environment: Component of a System – Continuous and discrete systems – Types of model; Steps in Simulation study; Simulation of an event occurrence using random number table – Single server queue –two server queues – inventory system.

UNIT II   **9**
Random number generation: Properties of random numbers – Generation of Pseudo – random numbers – techniques of generating pseudo random numbers; Test for random numbers: the Chisquare test-the kolmogrov Smirnov test – Runs test – Gap test – poker test.

UNIT III   **9**
Random – Variate Generation: Inverse transform technique for Exponential, Uniform, triangular, weibull, empirical, uniform and discrete distribution, Acceptance rejection method for Poisson and gamma distribution; Direct Transformation for normal distribution.

UNIT IV   **9**
Analysis of simulated Data – Data collection, identifying the distribution, Parameter estimation, goodness of fit tests, verification and validation of simulation models.

UNIT V   **9**
Concepts of System Identification – Identification using normal operating records (Integration method) – Identifiability conditions – System order determination

                                                                TOTAL : 45 PERIODS

TEXT BOOK
1.   Banks J., Carson J.S. and Nelson B.L., "Discrete – Event System Simulation", 3rd
     Edition, Pearson Education, Inc 2004 (ISBN 81-7808-505-4).

REFERENCES
1.   Geoffrey Gorden, "System Simulation", Prentice Hall of India, 2003.
2.   Narsingh Deo., "System Simulation with Digital Computer", Prentice Hall of India, 2003.

WEB SITES REFERENCES
1.   www.arenasimulation.com
2.   www.gpss.co.uk
3.   www.caciasl.com
4.   Other useful sites can be found in the text book recommended for this course.

ME3310   **CNC TECHNOLOGY**   **L T P C**

3 0 0 3

OBJECTIVE
Now a day's industries are having lot of changes because of technological developments and the same creates better environment to manufacture components. CNC machining is one of the widely accepted machining methods, which provides lesser manufacturing lead-time and accuracy to the components. Therefore studying the fundamentals, construction details and other controls are very much essential for the Mechatronics engineering students.

UNIT I   FUNDAMENTALS OF CNC MACHINES   9
Introduction to Computer Numerical Control: CNC Systems – An Overview of Fundamental aspects of machine control, Different types of CNC machines – Advantages and disadvantages of CNC machines.

UNIT II   CONSTRUCTIONAL FEATURES OF CNC MACHINES
**   AND RETROFITTING   10**
Features of CNC Machines: Structure, Drive Mechanism, gearbox, Main drive, feed drive, Spindle Motors, Axes motors. Timing belts and pulleys, Spindle bearing – Arrangement and installation. Slide ways. Re - circulating ball screws – Backlash measurement and compensation, linear motion guide ways. Tool magazines, ATC, APC, Chip conveyors. Retrofitting of Conventional Machine Tools: Modification to be carried out on conventional machines for retrofitting.

UNIT III   CONTROL SYSTEMS, FEED BACK DEVICES AND TOOLING   10
Description of a simple CNC control system. Interpolation systems. Features available in a CNC system – introduction to some widely used CNC control systems. Types of measuring systems in CNC machines – Incremental and absolute rotary encoders, linear scale – resolver – Linear inductosyn – Magnetic Sensors for Spindle Orientation. Qualified and pre-set tooling – Principles of location – Principles of clamping – Work holding devices.

UNIT IV   CNC PART PROGRAMMING   9
Part Program Terminology-G and M Codes – Types of interpolation Methods of CNC part programming – Manual part programming – Computer Assisted part programming – APT language – CNC part programming using CAD/CAM-Introduction to Computer Automated Part Programming.

UNIT V   ECONOMICS AND MAINTENANCE   7
Factors influencing selection of CNC Machines – Cost of operation of CNC Machines – Practical aspects of introducing CNC machines in industries – Maintenance features of CNC Machines – Preventive Maintenance, Other maintenance requirements.

                                                            TOTAL : 45 PERIODS

TEXT BOOK
1. Yoreur Koren, "Computer Control of Manufacturing Systems", Pitman, London, 1987.

REFERENCES:
1. Radhakrishnan P., Computer Numerical Control Machines, New Central Book Agency, 1992.
2. BERRY LEATHAM – JONES, Computer Numerical Control, Pitman, London, 1987.
3. STEAVE KRAR and ARTHUR GILL, CNC Technology and Programming, McGraw–Hill Publishing Company, 1990.

4. HANS B.KIEF and T.FREDERICK WATERS, Computer Numerical Control Macmillan/McGraw-Hill, 1992.
5. G.E.THYER, Computer Numerical Control of Machine Tools. Second Edition, B/H NEWNES, 1993.
6. GROOVER, M.P., Automation, Production Systems and Computer Integrated Manufacturing, Prentice Hall, 1998.
7. MIKE MATTSON, "CNC Programming Thomson Learning, 2003.

ME3306   THERMODYNAMICS PRINCIPLES AND APPLICATIONS   L T P C
(Approved Heat and Mass Transfer Data Book is Allowed)   **3 0 0 3**

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 C_V and C_P – 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   11
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)   10
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

REFERENCES
1. Nag P. K, 'Engineering Thermodynamics' Tata McGraw-Hill, 2005.
2. Michael A. Boles, Yunus A. Cengel, Yunus Cengel, "Thermodynamics", 2nd Edition, McGraw-Hill India, 2006.
3. Dr. C.P. Kothandaraman, S.Domkundwar & A.V.Domkundwar, "A course in Thermal

Engineering" DHANPATRAI & CO (P) LTD, Fifth edition, 2000.
4. Dr. C.P.Kothandaraman, "Heat and Mass Transfer", New Age International (P) Publishers, 2002.
5. Holman.J.P., "Thermodynamics", 3rd Ed. McGraw-Hill, 2000.

EC 3307   **POWER ELECTRONICS LABORATORY**   **L T P C**
                                                                   0 0 3 2

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

LIST OF EQUIPMENT
(for a batch of 30 students)

S.No	Equipments	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	
14	Voltmeter (0-300V) MC, (0-600V) MC,	

S.NO	EQUIPMENT	QTY
15	(0-300V) MI, (0-600V) MI, Multimeter	Each 3
15	CRO	6
16	Transformer 1KVA, 1:1, 230V	5

EC3308   **SENSORS AND SIGNAL PROCESSING LABORATORY**   **L T P C**
                                                                   0 0 3 2

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

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.NO	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 Motor using photo electric pickup kit	1
9	RTD module	1
10	Thermistor module	1
11	Thermocouple module	1
12	Absolute encoder	1
13	Potentiometer trainer pickup	1
14	Strain gauge module	1
15	Loadcell module	1

ME3309   **CNC LABORATORY**   **L T P C**

OBJECTIVE

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.

LIST OF FACILITIES REQUIRED

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

TOTAL = 45 PERIODS

GE3318   **COMMUNICATION SKILLS LABORATORY**   **L T P C**
                                                                  0 0 4 2

Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students' overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

OBJECTIVES:

▪ To equip students of engineering and technology with effective speaking and listening skills in English.
▪ To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
▪ To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

I. PC based session	(Weightage 40%)	24 periods

A. ENGLISH LANGUAGE LAB (18 Periods)

1. LISTENING COMPREHENSION: (6)
Listening and typing – Listening and sequencing of sentences – Filling in the blanks -Listening and answering questions.

2. READING COMPREHENSION: (6)
Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. SPEAKING: (6)
Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English.

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

B. DISCUSSION OF AUDIO-VISUAL MATERIALS (6 PERIODS)

(Samples are available to learn and practice)

1. RESUME / REPORT PREPARATION / LETTER WRITING (1)

Structuring the resume / report - Letter writing / Email Communication - Samples.

2. PRESENTATION SKILLS: (1)
Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. SOFT SKILLS: (2)
Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

4. GROUP DISCUSSION: (1)
Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video samples

5. INTERVIEW SKILLS: (1)
Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video samples.

II. Practice Session	**(Weightage – 60%)**	**24 periods**

1. **Resume / Report Preparation / Letter writing**: Students prepare their own resume and report. (2)

2. **Presentation Skills:** Students make presentations on given topics. (8)

3. **Group Discussion**: Students participate in group discussions**.** (6)

4. **Interview Skills**: Students participate in Mock Interviews   **(8)**

TEXT BOOKS

1. Anderson, P.V, **Technical Communication**, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash, P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., Second Edition, New Delhi, 2004.

REFERENCES
1. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi, 2004.
2. Evans, D, **Decisionmaker**, Cambridge University Press, 1997.
3. Thorpe, E, and Thorpe, S, **Objective English**, Pearson Education, Second Edition, New Delhi, 2007.
4. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addison Wesley Longman Ltd., Indian reprint 1998.

LAB REQUIREMENT

1.   Teacher console and systems for students.
2.   English Language Lab Software
3.   Career Lab Software

Requirement for a batch of 60 students

Sl.No.	Description of Equipment	Quantity required
1.	**Server**	1 No.
	o PIV system	
	o 1 GB RAM / 40 GB HDD	
	o OS: Win 2000 server	
	o Audio card with headphones (with mike)	
	o JRE 1.3	
2.	**Client Systems**	60 No.
	o PIII or above	
	o 256 or 512 MB RAM / 40 GB HDD	
	o OS: Win 2000	
	o Audio card with headphones (with mike)	
	o JRE 1.3	
3.	Handicam Video Camera (with video lights and mic input)	1 No.

4.	Television - 29"	1 No.
5.	Collar mike	1 No.
6.	Cordless mikes	1 No.
7.	Audio Mixer	1 No.
8.	DVD Recorder / Player	1 No.
9.	LCD Projector with MP3 /CD /DVD provision for audio / video facility - **Desirable**	1 No.

MG3310   **PRINCIPLES OF MANAGEMENT**   **L T P C**
                                                                                                                       3 0 0 3

UNIT I   BASICS OF GLOBAL MANAGEMENT   9
Definition of Management – Science or Art – Management thought and Patterns of management analysis – System approach to the Management process – Functions of Manager – Responsibilities of Manager – Ethics in managing – International management and multinational corporations.

UNIT II   PLANNING   9
Types of Plans – Steps involved in Planning – Objectives – Setting Objectives – Benefits and weaknesses of Management by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

UNIT III   ORGANISING   9
Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV   LEADING   9
Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

UNIT V   CONTROLLING   9
System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL = 45 PERIODS

REFERENCES
1.   Harold Kooritz & Heinz Weihrich "Essentials of Management", Tata McGraw-Hill, 1998

2. Joseph L Massie "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.
3. Tripathy PC And Reddy PN, "Principles of Management", Tata McGraw-Hill, 1999.
4. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
5. Fraidoon Mazda, "Engineering Management", Addison Wesley, 2000.

ME3311	MICRO CONTROLLER AND PLC	L T P C
		3 0 0 3

UNIT I 9

8051 Architecture: Microcontroller Hardware – I/O Pins, Ports – External memory – Counters and Timers – Serial data I/O – Interrupts – 8051 Assembly Language Programming: Instruction set of 8051, Addressing modes, Data transfer instructions, Arithmetic and Logical Instructions, Jump and Call Instructions, interrupts and returns interrupts and returns interrupt handling.

UNIT II 9

8051 Microcontroller Design: 8051 Microcontroller Specification 8051 – Microcontroller System Design – Testing the Design, Timing Subroutines, Look up Tables – Serial Data Transmission.

UNIT III 9

8051 Microcontroller Applications: Interfacing of Keyboards – Interfacing of Display Devices – Pulse measurement – Analog to Digital and Digital to Analog Converter – Interfacing Hardware Circuit – Multiple interrupts – Serial Data Communication – Network Configuration.

UNIT IV 9

Programmable Logic Controllers: Introduction – Parts of PLC – Principles of operation – PLC sizes – PLC hardware components – I/O section Analog I/O Section Analog I/O modules – digital I/O modules CPU processor memory module – Programming devices – PLC programming Simple instructions – Manually operated switches – Mechanically operated and Proximity switches - Output control devices - Latching relays PLC ladder diagram, Converting simple relay ladder diagram in to PLC relay ladder diagram.

UNIT V 9

Timer instructions ON DELAY, OFF DELAY and RETENTIVE Timers, UP COUNTER, DOWN COUNTER and 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

TEXT BOOKS

1. Kennath J. Ayala.The 8051 Microcontroller Architecture, Programming and Applications, Penram International Publishing (India), Second Edition, Mumbai.
2. Frank D. Petruzella. "Programmable Logic Controllers", McGraw–Hill Book, Company, 1989.

REFERENCES

1. B.P. Singh, Microprocessors and Microcontrollers, Galcotia Publications (P) Ltd, First edition, New Delhi, 1997.
2. Embedded Controller Hand book, Intel Corporation, USA.
3. Microcontroller Hand Book, INTEL, 1984.

ME2305   **APPLIED HYDRAULICS AND PNEUMATICS**   **L T P C**
                                                                   3 0 0 3

OBJECTIVES:
• To know the advantages and applications of Fluid Power Engineering and Power Transmission System.
• To learn the Applications of Fluid Power System in automation of Machine Tools and others Equipments.

UNIT I   FLUID POWER SYSTEMS AND FUNDAMENTALS   9
Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids – General types of fluids – Fluid power symbols. Basics of Hydraulics-Applications of Pascals Law- Laminar and Turbulent flow – Reynold's number – Darcy's equation – Losses in pipe, valves and fittings.

UNIT II   HYDRAULIC SYSTEM & COMPONENTS   9
Sources of Hydraulic Power: Pumping theory – Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump performance – Variable displacement pumps. Fluid Power Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tanden, Rodless, Telescopic, Cushioning mechanism, Construction of double acting cylinder, Rotary actuators – Fluid motors, Gear, Vane and Piston motors.

UNIT III   DESIGN OF HYDRAULIC CIRCUITS   9
Construction of Control Components : Directional control valve – 3/2 way valve – 4/2 way valve – Shuttle valve – check valve – pressure control valve – pressure reducing valve, sequence valve, Flow control valve – Fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram. Accumulators and Intensifiers: Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications of Intensifier – Intensifier circuit.

UNIT IV   PNEUMATIC SYSTEMS AND COMPONENTS   9
Pneumatic Components: Properties of air – Compressors – Filter, Regulator, Lubricator Unit – Air control valves, Quick exhaust valves, pneumatic actuators. Fluid Power Circuit Design, Speed control circuits, synchronizing circuit, Penumo hydraulic circuit, Sequential circuit design for simple applications using cascade method.

UNIT V   DESIGN OF PNEUMATIC CIRCUITS   9
Servo systems – Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves. Fluidics – Introduction to fluidic devices, simple circuits, Introduction to Electro Hydraulic Pneumatic logic circuits, ladder diagrams, PLC applications in fluid power control. Fluid power circuits; failure and troubleshooting.

TEXT BOOKS:

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education 2005.
2. Majumdar S.R., "Oil Hydraulics Systems- Principles and Maintenance", Tata McGraw-Hill, 2001.

REFERENCES:
1. Srinivasan.R, "Hydraulic and Pneumatic controls", Vijay Nicole, 2006.
2. Shanmugasundaram.K, "Hydraulic and Pneumatic controls", Chand & Co, 2006.
3. Majumdar S.R., "Pneumatic systems – Principles and maintenance", Tata McGraw Hill, 1995
4. Anthony Lal, "Oil hydraulics in the service of industry", Allied publishers, 1982.
5. Harry L. Stevart D.B, "Practical guide to fluid power", Taraoeala sons and Port Ltd. Broadey,
6. 1976.
7. Michael J, Prinches and Ashby J. G, "Power Hydraulics", Prentice Hall, 1989.
8. Dudelyt, A. Pease and John T. Pippenger, "Basic Fluid Power", Prentice Hall, 1987.

MT3313	DESIGN OF MECHATRONICS SYSTEM	L T P C
		3 0 0 3

UNIT I   FUNDAMENTALS   9
Introduction to Mechatronics system – Key elements – Mechatronics Design process – Types of Design –Design Parameter– 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   SYSTEM INTERFACING   9
Introduction-selection of interface cards-DAQ card-single channel-multichannal-RS232/422/485 communication- IEEE 488 standard interface-GUI card-GPIB-Ethernet switch -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
REFERENCES

1. Georg pelz, Mechatronic Systems: Modeling and simulation with HDL's, John wiley and sons Ltd, 2003
2. Devdas shetty, Richard A. Kolk, "Mechatronics System Design", Thomson Learning Publishing Company, Vikas publishing house, 2001.
3. Bolton, -Mechatronics - Electronic Control systems in Mechanical and Electrical Engineering-, 2nd Edition, Addison Wesley Longman Ltd., 1999.
4. Bishop, Robert H, Mechatronics Hand book, CRC Press, 2002.
5. Bradley, D.Dawson, N.C. Burd and A.J. Loader, Mechatronics: Electronics in Products and Processes, Chapman and Hall, London, 1991.

EC3314   **OBJECT ORIENTED PROGRAMMING**   **L T P C**
                                                                                     3 0 0 3

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 - What is C++? – 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

REFERENCES
1. E.Balagurusamy, "Object Oriented Programing wih C++", Tata McGraw Hill,1997.
2. Herbert Schildt,"C++ The Complete Reference", Tata McGrawHill Edition, 2003
3. Bjanne Stroustrup,"The C++ Programming Language",3rd Edition, Addison Wesley, 2000

4. Stanley, B.Lippman,Jove Lagrie,"C++Primer",3rd Edition, Addison Wesley,1998
5. Baarkakati. N., 'Object Oriented Programming in C++', Prentice Hall of India, 1997.

MT3315   **MICRO CONTROLLER AND PLC LABORATORY**   **L T P C**
                                                                    0 0 3 2

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

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Equipments	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

EC3316   **OBJECT ORIENTED PROGRAMMING LABORATORY**   **L T P C**
                          LIST OF EXPERIMENTS   **0 0 3 2**

1.   Programs Using Functions
-    Functions with default arguments
-    Implementation of Call by Value, Call by Address and Call by Reference
2.   Simple Classes for understanding objects, member functions and Constructors
-    Classes with primitive data members
-    Classes with arrays as data members
-    Classes with pointers as data members – String Class
-    Classes with constant data members
-    Classes with static member functions
3.   Compile time Polymorphism
-    Operator Overloading including Unary and Binary Operators.
-    Function Overloading
4.   Runtime Polymorphism
-    Inheritance
-    Virtual functions
-    Virtual Base Classes
-    Templates
5.   File Handling
-    Sequential access
-    Random access

                                                            TOTAL : 45 PERIODS

ME3317   **APPLIED HYDRAULICS AND PNEUMATIC LABORATORY**   **L T P C**
                                                                                   0 0 3 2

                          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.

3.   Modeling and analysis of basic electrical, hydraulic, and pneumatic systems using
        MATLAB/LABVIEW software.

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

TOTAL : 45 PERIODS

LIST OF EQUIPMENT

(for a batch of 30 students)

S.No	Equipments	Qty
	Hydraulic equipments	
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	Rotary 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

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**   **L T P C**
                MANUFACTURING LABORATORY   **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

UNIT IV   COLOR IMAGE PROCESSING AND WAVELETS   9
Color fundamentals, Color models- RGB color model, CMY and CMYK color model, HIS color model.

Wavelets- Background- Image pyramids, sub band coding, Haar transform, Wavelet transform in 1-D- Wavelet series expansion, discrete wavelet transform, Continuous wavelet transform.

UNIT V   IMAGE COMPRESSION AND SEGMENTATION   9
Fundamentals – Image compression models, Error-free compression – Lossy compression-Lossy predictive coding, Transform coding, JPEG 2000 – Detection of discontinuities – Edge linking and boundary detection

TOTAL = 45 PERIODS

REFERENCES
1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education Asia / Addison Wesley publishing company, Sixth Indian Reprint 2001.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice-Hall of India, New Delhi, 2001.
3. Maher A. Sid-Ahmed, "Image Processing Theory, Algorithms and architectures", McGraw-Hill, 1995.
4. William K. Pratt, "Digital Image Processing", Wiley-Inter Science Publication, 2nd Edition, 1991.
5. Arthur K Wreeks, "Fundamentals of Electronics Image Processing", Prentice-Hall of India, New Delhi, 2001

MT3004	DIAGNOSTIC TECHNIQUES	L T P C
		3 0 0 3

UNIT I   DEFECTS AND FAILURE ANALYSIS   9
Maintenance Concept, Maintenance objective, Challenges in maintenance. Defect generation - Types of failures - Defect reporting and recording - Defect analysis -Failure analysis - Equipment down time analysis - Breakdown analysis - FTA - FMEA - FMECA.

UNIT II   MAINTENANCE SYSTEMS   9
Planned and unplanned maintenance - Breakdown maintenance - corrective maintenance-Opportunistic maintenance - Routine maintenance - Preventive maintenance - Predictive Maintenance - Condition based maintenance system - Design out maintenance – Maintenance by objectives – Selection of maintenance system

UNIT III   SYSTEMATIC MAINTENANCE   9
Codification and Cataloguing - instruction manual and operating manual - Maintenance manual and departmental manual - Maintenance time standard - Maintenance work order and work

permit - job monitoring – Feedback and control – Maintenance records and documentation. Introduction to Total Productive Maintenance (TPM).

UNIT IV   COMPUTER MANAGED MAINTENANCE SYSTEM   9
Selection and scope of computerization – Equipment classification – Codification of breakdown, material and facilities - Job sequencing - Material management module – Captive engineering module. Decision making in maintenance. Economic aspects of maintenance.

UNIT V   CONDITION MONITORING   9
Condition monitoring techniques – Visual monitoring – Temperature monitoring – Vibration monitoring – Lubricant monitoring – Cracks monitoring – Thickness monitoring - Noise and sound monitoring – Condition monitoring of hydraulic system. Machine diagnostics – Objectives - Monitoring strategies – Examples of monitoring and diagnostics - Control structures for machine diagnosis.

TOTAL = 45 PERIODS

REFERENCES
1. Sushil Kumar Srivastava, "Industrial Maintenance Management", S.Chand &
   Company Ltd, New Delhi, 1998.
2. Manfred, H. Bibring, Handbook of Machine Tools, Vol.3, John Wiley & Sons
3. Mishra R.C., Pathak K. Maintenance Engineering and Management, Prentice Hall of
   India Private Ltd., New Delhi, 2002

ME3006   **OPERATIONS RESEARCH**   **L T P C**
                                                               3 1 0 4
UNIT I   LINEAR MODELS   12
The phases of operations research study- Linear programming - Graphical method - Simplex algorithm – Dual Simplex - Transportation problems- Traveling salesmen problems - Assignment models - Applications to problems with discrete variables.

UNIT II   NETWORK MODELS   6
Network models - Shortest route - Minimal spanning tree - Maximum flow models - Project network - CPM and PERT networks - Critical path scheduling - Sequencing models.

UNIT III   INVENTORY MODELS   6
Inventory models - Economic order quantity models - Quantity discount models - Stochastic Inventory models - Multi product models - Inventory control models in practice.

UNIT IV   QUEUING THEORY   9
Queuing models - Queueing systems and structures - Notation - parameter - Single Server and multi server models - Poisson input - Exponential service - Constant rate service - Infinite population - Simulation.

UNIT V DECISION MODELS 12

Decision models - Game theory - Two person zero sum games - Graphical solution - Algebric solution – Linear programming solution - Models based on service life - Economic life. Replacement models - Replacement of items that deteriorate with time - value of money changing with time –not charging with time – optimum replacement policy – individual and group replacement. Sequencing problem: models with n jobs with 2 machines – problem with n jobs with 3 machines.

TUTORIALS 15 TOTAL = 60 PERIODS

REFERENCES
1. H.A.Taha, " Operations Research ", Prentice Hall of India, 1999, Sixth Edition.
2. Hira and Gupta "Introduction to Operations Research", S.Chand and Co.2002
3. M.J. Bazara, Jarvis, H. Sherali, " Linear Programming and Network Flows ", John Wiley,1990.
4. Philip and Ravindran, " Operational Research ", John Wiley, 1992.
5. Shennoy, Srivastava, " Operation Research for Management ", Wiley Eastern, 1994.

GE3008   **PROFESSIONAL ETHICS AND HUMAN VALUES**   **L T P C**
                                                            3 0 0 3

UNIT I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies.
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL= 45 PERIODS

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.