ANNA UNIVERSITY CHENNAI:: CHENNAI 600 025

CURRICULUM 2004

B.E. MECHANICAL ENGINEERING

SEMESTER - III

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
MA1201	Mathematics – III	3	1	0	100
ME1206	Applied Engineering Mechanics	3	1	0	100
ME1201	Engineering Thermodynamics	3	1	0	100
ME1202	Fluid Mechanics and Machinery	3	1	0	100
EE1213	Electrical Drives and Controls	3	0	0	100
ME1203	Manufacturing Technology – II	3	0	0	100
PRACTICAL					
ME1204	Fluid Mechanics and Machinery Lab	0	0	3	100
EE1214	Electrical Engineering Lab	0	0	3	100
ME1205	Manufacturing Technology Lab II	0	0	3	100
GE1202	Technical Seminar**	0	0	3	0

SEMESTER - IV

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
MA1253	Probability and Statistics	3	1	0	100
ME1251	Thermal Engineering	3	1	0	100
CE1262	Strength of Materials	3	1	0	100
ME1252	Kinematics of Machinery	3	1	0	100
MH1151	Engineering Materials and Metallurgy	3	0	0	100
EC1264	Electronics and Microprocessors	3	0	0	100
PRACTICAL					
CE1263	Strength of Materials Lab	0	0	3	100
EC1265	Electronics and Microprocessors Lab	0	0	3	100
ME1254	Thermal Engineering Lab – I	0	0	3	100
GE1251	Technical Seminar**	0	0	3	0

SEMESTER – V

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
CY1201	Environmental Science and Engineering	3	0	0	100
ME1301	Dynamics of Machinery	3	1	0	100
ME1302	Design of Machine Elements	3	1	0	100
ME1303	Gas Dynamics and Jet Propulsion	3	1	0	100
ME1304	Engineering Metrology and Measurements	3	0	0	100
ME1305	Applied Hydraulics and Pneumatics	3	0	0	100
PRACTICAL					
ME1306	Dynamics Lab	0	0	3	100
ME1307	Metrology and Measurements Lab	0	0	3	100
ME1308	Computer Aided Machine Drawing Practice	0	0	3	100
GE1303	Communication Skills and Technical Seminars**	0	0	3	0

SEMESTER – VI

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
MG1351	Principles of Management	3	0	0	100
ME1351	Heat and Mass Transfer	3	1	0	100
ME1352	Design of Transmission Systems	3	2	0	100
ME1353	Automobile Engineering	3	0	0	100
ME1354	Power Plant Engineering	3	0	0	100
	Elective – I	3	0	0	100
PRACTICAL					
ME1355	Thermal Engineering Lab – II	0	0	3	100
ME1356	CAD / CAM Lab	0	0	3	100
ME1357	Design and Fabrication Project	0	0	4	100
GE1351	Presentation Skills and Technical Seminar**	0	0	3	0

SEMESTER – VII

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
MG1401	Total Quality Management	3	0	0	100
MH1003	Finite Element Analysis	3	1	0	100
ME1402	Mechatronics	3	0	0	100
ME1403	Computer Integrated Manufacturing	3	0	0	100
	Elective – II	3	0	0	100
	Elective – III	3	0	0	100
PRACTICAL					
ME1404	Computer Aided Simulation and Analysis Lab	0	0	3	100
PR1353	Mechatronics Lab	0	0	3	100
ME1406	Identification of Project Work for next Semester**	0	0	2	0

SEMESTER – VIII

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
MG1452	Engineering Economics and Cost Analysis	3	0	0	100
	Elective – IV	3	0	0	100
	Elective – V	3	0	0	100
PRACTICAL					
ME1451	Comprehension**	0	0	3	0
ME1452	Project Work	0	0	6	200

**** No Examinations**

MA1201 MATHEMATICS III 3 1 0 100

(Common to all branches)

OBJECTIVES

The course objective is to impact analytical skills to the students in the areas of boundary value problems and transform techniques. 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.

1. PARTIAL DIFFERENTIAL EQUATIONS 9

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

2. FOURIER SERIES 9

Drichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's Identity – Harmonic Analysis.

3. BOUNDARY VALUE PROBLEMS 9

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

4. FOURIER TRANSFORM 9

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem .

5. Z -TRANSFORM AND DIFFERENCE EQUATIONS 9

Z-transform - Elementary properties – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

TUTORIALS 15

TOTAL : 60

TEXT BOOKS

Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.

Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.

Wylie C. Ray and Barrett Louis, C., "Advanced Engineering Mathematics", Sixth Edition, McGraw-Hill, Inc., New York, 1995.

REFERENCES

Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians", Macmillen , New York ,1988.

Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.

Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw Hill Book Co., Singapore, 1987.

ME1206 APPLIED ENGINEERING MECHANICS 3 1 0 100

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.

1. BASICS & STATICS OF PARTICLES 12

Introduction - Units and Dimensions - Laws of Mechanics – Parallelogram and triangular Law of forces – Vectorial representation of forces and moments – Vector operations of forces moments and Couples – Moment of a force about a point and aboutan axis – Vectorial representation of moments and couples – Scalar components of a moments – Varignon's theorem - 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

2. EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

3. PROPERTIES OF SURFACES AND SOLIDS 12

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle areas from integration – T section, I section, Angle section, Hollow section from primary simpler sections – second moments of plane area – Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow sections – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia - Mass moment of inertia – Derivation of mass moment of inertia for, prism, cylinder and sphere from first principle – Relation to area moments of inertia.

4. FRICTION AND DYNAMICS OF PARTICLES 12

Surface Friction – Law of dry friction – Sliding friction – Static and Kinetic friction – Rolling resistance – Belt friction – Rectilinear motion of particles - Relative motion – Curvilinear motion – Newton's law – Energy and momentum Equation of particles – Impulse – Impact of elastic bodies – Motion of connected particles.

5. ELEMENTS OF RIGID BODY DYNAMICS 12

Translation and Rotation of Rigid Bodies – Velocity and acceleration – Plane motion of rigid bodies – Forces and acceleration.

L: 45, T: 15, TOTAL: 60

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. Hibbeller, R.C., Engineering Mechanics, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000
2. Ashok Gupta, Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM), Pearson Education Asia Pvt., Ltd., 2002
3. Palanichamy, M.S., Nagan, 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. Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt. Ltd., 2000

CY1201 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 100

(Common to all branches)

OBJECTIVES

To create an awareness on the various environmental pollution aspects and issues.
To give a comprehensive insight into natural resources, ecosystem and biodiversity.
To educate the ways and means to protect the environment from various types of pollution.
To impart some fundamental knowledge on human welfare measures.

1. INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

Definition, scope and importance – need for public awareness – forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their ground water, floods, drought, conflicts over water, dams-benefits and problems – mineral resources: use effects on forests and tribal people – water resources: use and over-utilization of surface and exploitation, environmental effects of extracting and using mineral resources, case studies – food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies – land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

2. ECOSYSTEMS AND BIODIVERSITY 14

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – introduction to biodiversity – definition: genetic, species and ecosystem diversity – biogeographical classification of india – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – biodiversity at global, national and local levels – india as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of india – conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

3. ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards – solid waste management: causes, effects and control measures of urban and industrial wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – urban / rural / industrial / agricultural

4. SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – environmental ethics: issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act – issues involved in enforcement of environmental legislation – public awareness

5. HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – case studies.

TOTAL : 45

TEXT BOOKS

1. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, 2004.
2. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co.
3. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science.
4. Trivedi R.K. And P.K. Goel, Introduction to Air Pollution, Techno-Science Publications.

REFERENCES

Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad, India,
Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media.
Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.

ME1201 ENGINEERING THERMODYNAMICS 3 1 0 100

(Common to Mechanical and Production)

OBJECTIVE

To achieve an understanding of principles of thermodynamics and to be able to use it in accounting for the bulk behaviour of the simple physical systems.
To provide in-depth study of thermodynamic principles, thermodynamics of state, basic thermodynamic relations, Principle of Psychrometry & Properties of pure substances
To enlighten the basic concepts of vapour power cycles.

1. BASIC CONCEPT AND FIRST LAW 9

Basic concepts - concept of continuum, macroscopic approach, thermodynamic systems - closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics – concept of temperature and heat. Concept of ideal and real gases. First law of thermodynamics – application to closed and open systems, internal energy, specific heat capacities, enthalpy, steady flow process with reference to various thermal equipments.

2. SECOND LAW, ENTROPY AND AVAILABILITY 9

Second law of thermodynamics – Kelvin's and Clausius statements of second law. Reversibility and irreversibility. Carnot cycle, reversed carnot cycle, efficiency, COP. Thermodynamic temperature scale, Clausius inequality, concept of entropy, entropy of ideal gas, principle of increase of entropy – Carnot theorem, absolute entropy, availability.

3. PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE 9

Properties of pure substances – Thermodynamic properties of pure substances in solid, liquid and vapour phases, phase rule, P-V, P-T, T-V, T-S, H-S diagrams, PVT surfaces, thermodynamic properties of steam. Calculations of work done and heat transfer in non-flow and flow processes. Standard Rankine cycle, Reheat and regenerative cycle.

4. IDEAL & REAL GASES AND THERMO DYNAMIC RELATIONS 9

Gas mixtures – Properties of ideal and real gases, equation of state, Avagadro's law, Vander Waal's equation of states, compressibility, compressibility chart. Dalton's law of partial pressure, Exact differentials, T-D, relations, Maxwell relations, Clausius Clapeyron equations, Joule Thomson Coefficient.

5. PSYCHROMETRY 9

Psychrometry and psychrometric charts, property calculations of air vapour mixtures. Psychrometric process – Sensible heat exchange processes. Latent heat exchange processes. Adiabatic mixing, evaporative cooling, problems.

TUTORIALS 15

TOTAL : 60

(Use of standard thermodynamic tables, Mollier diagram, Psychometric chart and Refrigerant property tables are permitted)

TEXT BOOKS

Nag.P.K., “Engineering Thermodynamics”, Tata McGraw-Hill, New Delhi, 1998.
Cengel, “Thermodynamics” An Engineering Approach, Third Edition – 2003, Tata Mc Graw Hill, New Delhi.

REFERENCES

Holman.J.P., “Thermodynamics”, 3rd Ed. McGraw-Hill, 1995.
Venwylen and Sontag, “Classical Thermodynamics”, Wiley Eastern, 1987
Arora C.P, “ Thermodynamics”, Tata McGraw-Hill, New Delhi, 2003.
Merala C, Pother, Craig W, Somerton, “ Thermodynamics for Engineers”, Schaum Outline Series, Tata McGraw-Hill, New Delhi, 2004.
Sri Vastava R.C, Saha S. K, Jan A. K, “ Thermodynamics” Prentice Hall of India, New Delhi, 2004.

ME1202 FLUID MECHANICS AND MACHINERY 3 1 0 100

(Common to Mechanical, Production, Mechatronics, Automobile and Aeronautical)

OBJECTIVE

- To understand the structure and the properties of the fluid.
- To analyse and appreciate the complexities involved in solving the fluid flow problems.
- To study the mathematical techniques already in vogue and apply them to the solutions of practical flow problems.
- To understand the energy exchange process in fluid mechanics handling incompressible fluids.

1. BASIC CONCEPTS AND PROPERTIES 6

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.

2. FLIUD KINEMATICS AND FLUID DYNAMICS 12

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - flow net – fluid dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube - dimensional analysis - Buckingham's π theorem- applications - similarity laws and models.

3. INCOMPRESSIBLE FLUID FLOW 12

Viscous flow - Navier-Stoke's equation (Statement only) - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) - Hydraulic and energy gradient - flow through pipes - Darcy -weisback's equation - pipe roughness -friction factor- Moody's diagram-minor losses - flow through pipes in series and in parallel - power transmission - Boundary layer flows, boundary layer thickness, boundary layer separation - drag and lift coefficients.

4. HYDRAULIC TURBINES 8

Fluid machines: definition and classification - exchange of energy - Euler's equation for turbo machines - Construction of velocity vector diagrams - head and specific work - components of energy transfer - degree of reaction.

Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - propeller turbine - Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies -performance curve for turbines.

5. HYDRAULIC PUMPS 7

Pumps: definition and classifications - Centrifugal pump: classifications, working principle, velocity triangles, specific speed, efficiency and performance curves - Reciprocating pump: classification, working

principle, indicator diagram, work saved by air vessels and performance curves - cavitations in pumps - rotary pumps: working principles of gear and vane pumps

TUTORIALS **15**

TOTAL : 60

TEXT BOOKS

1. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 1983.
2. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd, New Delhi (7^{th} edition), 1995.
3. Vasandani, V.P., "Hydraulic Machines - Theory and Design", Khanna Publishers.1992

REFERENCES

1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5^{th} edition), Laxmi publications (P) Ltd, New Delhi, 1995
2. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5^{th} Edition, New Delhi, 2003.
3. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 1998.
4. Som, S.K., and Biswas, G., "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw-Hill, 2^{nd} Edition, 2004.

EE1213 ELECTRICAL DRIVES AND CONTROLS 3 0 0 100

(Common to Mechanical and Production)

OBJECTIVE

- To understand the basic concepts of different types of electrical machines and their performance.
- To study the different methods of starting D.C motors and induction motors.
- To study the conventional and solid-state drives.

1. INTRODUCTION 8

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors

2. DRIVE MOTOR CHARACTERISTICS 9

Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors.

3. STARTING METHODS 8

Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.

4. CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES 10

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers –applications.

5. CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES 10

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

TOTAL : 45

TEXT BOOKS

1. VEDAM SUBRAHMANIAM, "Electric Drives (concepts and applications)", Tata McGraw-Hill, 2001
2. NAGRATH.I.J. & KOTHARI.D.P, "Electrical Machines", Tata McGraw-Hill, 1998

REFERENCES

1. PILLAI.S.K "A first course on Electric drives", Wiley Eastern Limited, 1998
2. M.D.SINGH, K.B.KHANCHANDANI, "Power Electronics", Tata McGraw-Hill, 1998
H.Partab, "Art and Science and Utilisation of electrical energy", Dhanpat Rai and Sons, 1994

ME1203 MANUFACTURING TECHNOLOGY - II 3 0 0 100

OBJECTIVE

- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching
- To understand the basic concepts of computer numerical control (CNC) machine tool and CNC programming.

1. THEORY OF METAL CUTTING 8

Introduction: material removal processes, types of machine tools – theory of metal cutting: chip formation, orthogonal metal cutting, cutting tool materials, tool wear, tool life, surface finish, cutting fluids.

2. CENTRE LATHE AND SPECIAL PURPOSE LATHES 10

Centre lathe, constructional features, cutting tools, various operations, taper turning methods, thread cutting methods, special attachments, machining time and power estimation.
Capstan and turret lathes – automatic lathes : semi automatic, automats – single spindle : cutting off, swiss type, automatic screw type – multi spindle; cutting off, bar type

3. RECIPROCATING AND MILLING MACHINES 10

Reciprocating machine tools: shaper, planer, slotter ; milling : types, milling cutters, operations ; hole making : drilling, reaming, boring, tapping

4. ABRASIVE PROCESS, SAWING, BROACHING AND GEAR CUTTING 10

Abrasive processes: grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centreless grinding – honing, lapping, super finishing, polishing and buffing, abrasive jet grinding
Sawing machine: hack saw, band saw, circular saw; broaching machines: broach construction – push, pull, surface and continuous broaching machines, gear cutting: forming, generation, shaping, hobbing.

5. CNC MACHINE TOOLS AND PART PROGRAMMING 7

Numerical control(NC) machine tools – CNC: types, constructional details, special features.
Part programming fundamentals – manual programming – computer assisted part programming – apt language.

TOTAL : 45

TEXT BOOKS

Rao, P.N. "Manufacturing Technology", Metal Cutting and Machine Tools, Tata McGraw–Hill, New Delhi, 2003.
Richerd R. Kibbe, John E. Neely, Roland O. Merges and Warren J. White, "Machine Tool Practices", Prentice Hall of India, 2003.

REFERENCES

HMT – "Production Technology", Tata McGraw-Hill, 1998.
P.C. Sharma, "A Text Book of Production Engineering", S. Chand and Co. Ltd, IV edition, 1993.
Hajra Choudry, "Elements of Work Shop Technology – Vol. II", Media Promoters. 2002
Geofrey Boothroyd, "Fundamentals of Metal Machining and Machine Tools", McGraw Hill, 1984.

ME1204 FLUID MECHANICS AND MACHINERY LAB 0 0 3 100

(Common to Mechanical, Mechatronics and Automobile)

LIST OF EXPERIMENTS

Determination of the Coefficient of discharge of given Orifice meter.
Determination of the Coefficient of discharge of given Venturi meter.
Calculation of the rate of flow using Rota meter.
Determination of friction factor for a given set of pipes.
Conducting experiments and drawing the characteristic curves of centrifugal pump / submergible pump
Conducting experiments and drawing the characteristic curves of reciprocating pump.
Conducting experiments and drawing the characteristic curves of Gear pump.
Conducting experiments and drawing the characteristic curves of Pelton wheel.
Conducting experiments and drawing the characteristics curves of Francis turbine.
Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL : 45

LIST OF EQUIPMENT
(for a batch of 30 students)

Orifice meter setup
Venturi meter setup
Rotameter setup
Pipe Flow analysis setup
Centrifugal pump/submergible pump setup
Reciprocating pump setup
Gear pump setup
Pelton wheel setup
Francis turbine setup
Kaplan turbine setup

Quantity: one each.

EE1214 ELECTRICAL ENGINEERING LABORATORY 0 0 3 100

LIST OF EXPERIMENTS

Load test on DC Shunt & DC Series motor
O.C.C & Load characteristics of DC Shunt and DC Series generator
Speed control of DC shunt motor (Armature, Field control)
Load test on single phase transformer
O.C & S.C Test on a single phase transformer
Regulation of an alternator by EMF & MMF methods.
V curves and inverted V curves of synchronous Motor
Load test on three phase squirrel cage Induction motor
Speed control of three phase slip ring Induction Motor
Load test on single phase Induction Motor.
Study of DC & AC Starters

TOTAL : 45

LIST OF EQUIPMENT
(for batch of 30 students)

DC Shunt motor	-	2
DC Series motor	-	1
DC shunt motor-DC Shunt Generator set	-	1
DC Shunt motor-DC Series Generator set	-	1
Single phase transformer	-	2
Three phase alternator	-	2
Three phase synchronous motor	-	1
Three phase Squirrel cage Induction motor	-	1
Three phase Slip ring Induction motor	-	1
Single phase Induction motor	-	1

ME1205 MANUFACTURING TECHNOLOGY LAB II 0 0 3 100

Exercises

Two or More Metal Cutting Experiments
(Example: Shear Angle Measurement, Cutting Force Measurement, Cutting Temperature Measurement, Tool Wear Measurement, Life Measurement etc.)
One or More Exercises in Milling Machines
(Example: Milling Polygon Surfaces, Gear milling, Keyway milling, Helical Groove milling etc.)
Two or More Exercises in Grinding / Abrasive machining
(Example: Surface Grinding, Cylindrical Grinding, Centreless Grinding, Lapping, Honing etc.)
Two or More Exercises in Machining Components for Assembly of different fits.
(Example: Machining using Lathes, Shapers, Drilling, Milling, Grinding Machines etc.)

One or More Exercises in Capstan or Turret Lathes
One or More Exercises in Gear Machining
(Example: Gear Cutting, Gear Shaping, Gear Hobbing etc.)
One or More Exercises in CNC Machines
(Example: CNC Programming, CNC Tooling, CNC Machining etc.)

TOTAL : 45

LIST OF EQUIPMENT
(for a batch of 30 students)

1.	Centre Lathes	-	15 No (5 Precision Type)
2.	Turret and Capstan Lathes	-	1 No each
3.	Horizontal Milling Machine	-	1 No
4.	Vertical Milling Machine	-	1 No
5.	Surface Grinding Machine	-	1 No
6.	Tool Dynamometer	-	1 No
7.	Gear Hobbing Machine	-	1 No
8.	CNC Lathe (Trainer or Industrial Type)	-	1 No

GE1202 TECHNICAL SEMINAR 0 0 3 0

(Common to all branches)

OBJECTIVE

During the seminar session each student is expected to prepare and present a topic on engineering / technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present 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.

MA1253 PROBABILITY AND STATISTICS 3 1 0 100

(Common to Mechanical, Production and Automobile)

OBJECTIVES

At the end of the course, the students would

- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- Be introduced to the notion of sampling distributions and have acquired knowledge of statistical techniques useful in making rational decision in management problems.
- Be exposed to statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation.

1. PROBABILITY AND RANDOM VARIABLE 9

Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variable - Probability mass function - Probability density functions - Properties- Moments - Moment generating functions and their properties.

2. STANDARD DISTRIBUTIONS 9

Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties - Functions of a random variable.

3. TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

4. TESTING OF HYPOTHESIS 9

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

5. DESIGN OF EXPERIMENTS 9

Analysis of variance – One way classification – CRD - Two – way classification – RBD - Latin square.

TUTORIALS 15

Note : Use of approved statistical table permitted in the examination.

TOTAL : 60

TEXT BOOKS

1. Ross. S., "A first Course in Probability", Fifth Edition, Pearson Education, Delhi 2002. (Chapters 2 to 8)
2. Johnson. R. A., "Miller & Freund's Probability and Statistics for Engineers", Sixth Edition, Pearson Education, Delhi, 2000. (Chapters 7, 8, 9, 12)

REFERENCES

1. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi, 2002.
2. Lipschutz. S and Schiller. J, "Schaum's outlines - Introduction to Probability and Statistics", McGraw-Hill, New Delhi, 1998.
3. Gupta, S.C, and Kapur, J.N., "Fundamentals of Mathematical Statistics", Sultan Chand, Ninth Edition , New Delhi ,1996.

ME1251 THERMAL ENGINEERING 3 1 0 100

OBJECTIVE

- To integrate the concepts, laws and methodologies from the first course in thermodynamics into the analysis of cyclic process.
- To apply the thermodynamic concepts into various thermal application like IC engines Steam turbines, Compressors and Refrigeration and Air conditioning Systems.

1. GAS POWER CYCLES 9

Otto, Diesel, Dual, Brayton cycles, Calculation of mean effective pressure and air standard efficiency, Actual and theoretical PV diagram of Four stroke engines, Actual and theoretical PV diagram of two stroke engines.

2. INTERNAL COMBUSTION ENGINES 9

Classification of IC engine, IC engine components and functions. Valve timing diagram and port timing diagram. Comparison of two stroke and four stroke engines. Fuel supply systems, Ignition Systems, Performance calculation. Comparison of petrol & diesel engine. Fuels, Air-fuel ratio calculation, Knocking and Detonation. Lubrication system and cooling system. Exhaust gas analysis, pollution control norms.

3. STEAM NOZZLES AND TURBINES 9

Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow. Impulse and reaction principles, compounding, velocity diagrams for simple and multistage turbines, speed regulations-governors and nozzle governors.

4. AIR COMPRESSOR 9

Classification and working principle, work of compression with and without clearance. Volumetric efficiency, Isothermal efficiency and isentropic efficiency of reciprocating air compressors. Multistage air compressor and inter cooling – work of multistage air compressor, various types of compressors (Descriptive treatment only).

5. REFRIGERATION AND AIR-CONDITIONING 9

Vapour compression Refrigeration cycle – super heat, sub cooling, performance calculations. Working principle of vapour absorption system. Ammonia – water, Lithium bromide – water systems (Description only), Comparison between vapour compression and absorption systems. Psychrometry, Psychometric chart, Cooling load calculations. Concept of RSHF, GSHF, ESHF, Air conditioning systems.

TUTORIALS 15

TOTAL : 60

(Use of standard thermodynamic tables, Mollier diagram, Psychometric chart and Refrigerant property tables are permitted in the examination)

TEXT BOOKS

1. Rajput, "Thermal Engineering", S. Chand publishers, 2000**.**
2. Rudramoorthy R, "Thermal Engineering", Tata McGraw-Hill, New Delhi, 2003.

REFERENCES

Kothandaraman.C.P., Domkundwar.S. and A.V.Domkundwar., "A course in Thermal Engineering", Dhanpat Rai & Sons, Fifth edition, 2002

2. Holman. J.P., "Thermodynamics", McGraw-Hill, 1985.
3. Rogers, Meyhew, "Engineering Thermodynamics", ELBS, 1992.
4. Arora.C.P., "Refrigeration and Air conditioning", TMH, 1994.
5. Sarkar B.K, " Thermal Engineering", Tata McGraw-Hill, 1998.

CE1262 STRENGTH OF MATERIALS 3 1 0 100

(Common to Mechanical, Production, Mechatronics, Automobile and Metallurgy)

OBJECTIVES

- To gain knowledge of simple stresses, strains and deformation in components due to external loads.
- To assess stresses and deformations through mathematical models of beams, twisting bars or combinations of both.
- Effect of component dimensions and shape on stresses and deformations are to be understood.
- The study would provide knowledge for use in the design courses

1. STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid and Deformable bodies – Strength, Stiffness and Stability – Stresses; Tensile, Compressive and Shear – Deformation of simple and compound bars under axial load – Thermal stress – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxial loads.

2. BEAMS - LOADS AND STRESSES 9

Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever, Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Effect of shape of beam section on stress induced – Shear stresses in beams – Shear flow.

3. TORSION 9

Analysis of torsion of circular bars – Shear stress distribution – Bars of Solid and hollow circular section – Stepped shaft – Twist and torsion stiffness – Compound shafts – Fixed and simply supported shafts – Application to close-coiled helical springs – Maximum shear stress in spring section including Wahl Factor – Deflection of helical coil springs under axial loads – Design of helical coil springs – stresses in helical coil springs under torsion loads

4. BEAM DEFLECTION 9

Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope : Double integration method, Macaulay Method, and Moment-area Method –Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula for columns

5. ANALYSIS OF STRESSES IN TWO DIMENSIONS 9

Biaxial state of stresses – Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point – Stresses on inclined plane – Principal planes and stresses – Mohr's circle for biaxial stresses – Maximum shear stress - Strain energy in bending and torsion.

TUTORIALS 15

TOTAL : 60

TEXT BOOKS

1. Popov E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delhi, 1997.
2. Beer F. P. and Johnston R, "Mechanics of Materials", McGraw-Hill Book Co, Third Edition, 2002.

REFERENCES

1. Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, New York, 1995
2. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co, New Delhi, 1981
3. Ryder G.H, "Strength of Materials", Macmillan India Ltd., Third Edition, 2002

Ray Hulse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Books, 2004.

Singh D.K "Mechanics of Solids" Pearson Education 2002.

6. Timoshenko S.P, "Elements of Strength of Materials", Tata McGraw-Hill, New Delhi 1997.

ME1252 KINEMATICS OF MACHINERY 3 1 0 100

(Common to Mechanical and Mechatronics-III Semester)

OBJECTIVES

- To understand the layout of linkages in the assembly of a system/machine.
- To study the principles involved in assessing the displacement, velocity and acceleration at any point in a link of a mechanism
- To analyse the motion resulting from a specified set of linkages in a mechanism.

1. BASICS 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.

2. KINEMATICS 12

Displacement, velocity and acceleration - 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.

3. 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.

4. 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

5. 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

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, 1988.
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

STANDARDS

1. IS 2458 : 2001, Vocabulary of Gear Terms – Definitions Related to Geometry
2. IS 3756 : 2002, Method of Gear correction – Addendum modification for External Cylindrical Gears with Parallel Axes.
3. IS 5267 : 2002 Vocabulary of Gear Terms – Definitions Related to Worm Gear Geometry.
4. IS 12328 : Part 1: 1988 Bevel Gear Systems Part – 1 Straight Bevel Gears.
5. IS 12328 : Part 2: 1988 Bevel Gear Systems Part – 2 Spiral Bevel Gears.

MH1151 ENGINEERING MATERIALS AND METALLURGY 3 0 0 100

(Common to 4th semester Mechanical, Production, Automobile and 2nd semester Mechatronics)

OBJECTIVE

To Impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

Review (Not for Exam):
Crystal structure – BCC, FCC and HCP structure – unit cell – crystallographic planes and directions, miller indices – crystal imperfections, point, line, planar and volume defects – Grain size, ASTM grain size number.

1. CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS 10

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, peritectic, eutectoid and peritectroid reactions, Iron – Iron carbide equilibrium diagram. Classification of steel and cast Iron microstructure, properties and application.

2. HEAT TREATMENT 11

Definition – Full annealing, stress relief, recrystallisation and spheroidizing –normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR - Hardenability, Jominy end quench test – Austempering, martempering – case hardening, carburising, nitriding, cyaniding, carbonitriding – Flame and Induction hardening.

3. FERROUS AND NON FERROUS METALS 9

Effect of alloying additions on steel (Mn, Si, Cr, Mo, V Ti & W) - stainless and tool steels – HSLA - maraging steels – Gray, White malleable, spheroidal - Graphite - alloy castirons

Copper and Copper alloys – Brass, Bronze and Cupronickel – Aluminum and Al-Cu – precipitation strengthening treatment – Bearing alloys.

4. NON-METALLIC MATERIALS 9

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE Polymers – Urea and Phenol Formaldehydes – Engineering Ceramics – Properties and applications of Al_2O_3, SiC, SiC, Si_3, N_4, PSZ and Sialon – Fibre and particulate reinforced composites.

5. MECHANICAL PROPERTIES AND TESTING 6

Mechanism of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell) Impact test Izod and charpy, fatigue and creep test.

TOTAL : 45

TEXT BOOK

Kenneth G.Budinski and Michael K.Budinski “Engineering Materials” Prentice-Hall of India Private Limited, 4th Indian Reprint 2002.

REFERENCES

William D Callsber “Material Science and Engineering”, John Wiley and Sons 1997.
Raghavan.V “Materials Science and Engineering”, Prentice Hall of India Pvt., Ltd., 1999.
Sydney H.Avner “Introduction to Physical Metallurgy” McGraw Hill Book Company, 1994.

EC1264 ELECTRONICS AND MICROPROCESSORS 3 0 0 100

(Common to Mechanical, Production, and Automobile)

OBJECTIVE

To enable the students to understand the fundamental concepts of Semi Conductors, Transistors, Rectifiers, Digital Electronics and 8085 Microprocessors

1. SEMICONDUCTORS AND RECTIFIERS 9

Classification of solids based on energy band theory-Intrinsic semiconductors-Extrinsic semiconductors-P type and N type-PN junction-Zenor effect-Zenor diode characteristics-Half wave and full wave rectifiers - Voltage regulation.

2. TRANSISTORS AND AMPLIFIERS 12

Bipolar junction transistor- CB, CE, CC configuration and characteristics-Biasing circuits-Class A, B and C amplifiers- Field effect transistor-Configuration and characteristic of FET amplifier-SCR, Diac, Triac, UJT-Characteristics and simple applications-Switching transistors-Concept of feedback-Negative feedback-Application in temperature and motor speed control.

3. DIGITAL ELECTRONICS 9

Binary number system - AND, OR, NOT, NAND, NOR circuits-Boolean algebra-Exclusive OR gate - Flip flops-Half and full adders-Registers-Counters-A/D and D/A conversion.

4. 8085 MICROPROCESSOR 9

Block diagram of microcomputer-Architecture of 8085-Pin configuration-Instruction set-Addressing modes-Simple programs using arithmetic and logical operations.

5. INTERFACING AND APPLICATIONS OF MICROPROCESSOR 6

Basic interfacing concepts - Interfacing of Input and Output devices-Applications of microprocessor Temperature control, Stepper motor control, traffic light control.

TOTAL : 45

TEXT BOOKS

1. Milman and Halkias, “Integrated Electronics”, Tata McGraw-Hill publishers, 1995.
2. Ramesh Goankar, “Microprocessor Architecture”, Programming and Applications with 8085, Wiley Eastern, 1998.

REFERENCES

1. Malvino and Leach, “Digital Principles and Applications”, Tata McGraw-Hill, 1996
2. Mehta V.K, “Principles of Electronics”, S. Chand and Company Ltd, 1994
3. Dougles V.Hall, “Microprocessor and Interfacing”, Programming and Hardware, Tata McGraw-Hill, 1999.
4. Salivahanan S, Suresh Kumar N, Vallavaraj A, “Electronic Devices and Circuits” First Edition, Tata McGraw-Hill, 1999.

CE1263 STRENGTH OF MATERIALS LAB 0 0 3 100

(Common to Mechanical, Production and Metallurgy)

LIST OF EXPERIMENTS

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
9. Effect of hardening- Improvement in hardness and impact resistance of steels.
10. Tempering- Improvement Mechanical properties Comparison
    (i) Unhardened specimen
    (ii) Quenched Specimen and
    (iii) Quenched and tempered specimen.
11. Microscopic Examination of
    Hardened samples and
    (ii) Hardened and tempered samples.

TOTAL : 45

LIST OF EQUIPMENT
(for a batch of 30 students)

Universal Tensile Testing machine with double shear attachment – 40 Ton Capacity	1
Torsion Testing Machine (60 NM Capacity)	1
Impact Testing Machine (300 J Capacity)	1
Brinell Hardness Testing Machine	1
Rockwell Hardness Testing Machine	1
Spring Testing Machine for tensile and compressive loads (2500 N)	1
Metallurgical Microscopes	3
Muffle Furnace (800 °C)	1

EC1265 ELECTRONICS AND MICROPROCESSORS LAB 0 0 3 100

(Common to Mechanical, Production and Automobile)

LIST OF EXPERIMENTS

ELECTRONICS 30

VI Characteristics of PN Junction Diode
VI Characteristics of Zener Diode
Characteristics of CE Transistor
Characteristics of JFET
Characteristics of Uni Junction Transistor
RC or Wein Bridge Oscillator
Study of Logic Gates (Basic Gates)
Half Adder and Full Adder
Shift Registers and Counters
Operational Amplifier (Adder, Subtractor, Differentiator, Integrator, Inverting and Non - Inverting

MICROPROCESSOR **15**

Block Transfer
8 bit Addition, Subtraction
Multiplication and Division
Maximum and Minimum of block of data
Sorting
Stepper Motor Interfacing

TOTAL : 45

LIST OF EQUIPMENT
(for a batch of 30 students)

Voltmeters	5 No.
Ammeters	5 No.
PN Diode, BJT, JFET, Logic Gates, Shift Registers and Counters	1 set.
Digital Logic Trainer Kits	1 No.
Breadboards	1 No.
Microprocessor Kits – 8085	5 No.
D/A Converter Interface	1 No.
Stepper Motor Interface	1 No.
CRO	1 No.
Wavefarm Generator	1 No.
Multimeter	1 No.

ME1254 THERMAL ENGINEERING LABORATORY- I **0 0 3 100**

LIST OF EXPERIMENTS

I.C ENGINE LAB AND FUELS LAB **30**

Valve Timing and Port Timing Diagrams.
Performance Test on 4-stroke Diesel Engine.
Heat Balance Test on 4-stroke Diesel Engine.
Morse Test on Multicylinder Petrol Engine.
Retardation Test to find Frictional Power of a Diesel Engine.
Determination of Viscosity – Red Wood Viscometer.
Determination of Flash Point and Fire Point.

STEAM LAB **15**

Study of Steam Generators and Turbines.
Performance and Energy Balance Test on a Steam Generator.
Performance and Energy Balance Test on Steam Turbine.

TOTAL : 45

LIST OF EQUIPMENT
(for a batch of 30 students)

I.C Engine – 2 stroke and 4 stroke model	1 set
Red Wood Viscometer	1 No.
Apparatus for Flash and Fire Point	1 No.
4-stroke Diesel Engine with mechanical loading.	1 No.
4-stroke Diesel Engine with hydraulic loading.	1 No.
4-stroke Diesel Engine with electrical loading.	1 No.
Multi-cylinder Petrol Engine	1 No.
Single cylinder Petrol Engine	1 No.
Data Acquisition system with any one of the above engines	1 No.
Steam Boiler with turbine setup	1 No.

GE1251 TECHNICAL SEMINAR 0 0 3 0

(Common to all Branches)

OBJECTIVE

During the seminar session each student is expected to prepare and present a topic on engineering / technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present 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.

GE1301 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 100

(Common to all branches)

OBJECTIVE

To create an awareness on Engineering Ethics and Human Values.
To instill Moral, Social Values and Loyalty
To appreciate the rights of others

1. HUMAN VALUES 10

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

2. 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.

3. ENGINEERING AS SOCIAL EXPERIMENTATION 9

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

4. 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.

5. GLOBAL ISSUES 8

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

TEXT BOOKS

Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES

Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey, 2004 (Indian Reprint)

Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)

John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.

Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

ME1301 DYNAMICS OF MACHINERY 3 1 0 100

(Common to Mechanical and Mechatronics-IV Semester)

OBJECTIVE

- To understand the force-motion relationship in components subjected to External Forces
- To analyse the force-motion characteristics of standard mechanisms
- To study the undesirable effects of unbalances resulting from prescribed motions in mechanism.
- To visualise the effect of Dynamics of Undesirable Vibrations
- To understand the principles in mechanisms used for governing of machines.

1. 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 –Engine shaking Forces - Cam dynamics - Unbalance, Spring, Surge and Windup.

2. 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 - balancing machines

3. FREE VIBRATION 10

Basic features of vibratory systems - idealized models - Basic elements and lumping of parameters - Degrees of freedom - Single degree of 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.

4. FORCED VIBRATION 6

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

5. MECHANISMS 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

TUTORIAL 15

TOTAL : 60

TEXT BOOKS

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 Mechanisms", McGraw-Hill, Inc., 1995.
4. Rao J.S. and Dukkipati R.V., "Mechanism and 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 Machines” Pearson Education, 2002.

ME1302 DESIGN OF MACHINE ELEMENTS 3 1 0 100

OBJECTIVE

To familiarise the various steps involved in the Design Process
To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
To learn to use standard practices and standard data
To learn to use catalogues and standard machine components

1. STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS 9

Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – Design of curved beams – crane hook and ‘C’ frame - Factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations

2. DESIGN OF SHAFTS AND COUPLINGS 9

Design of solid and hollow shafts based on strength, rigidity and critical speed – Design of keys and key ways - Design of rigid and flexible couplings – Introduction to gear and shock absorbing couplings - design of knuckle joints.

3. DESIGN OF FASTNERS AND WELDED JOINTS 9

Threaded fastners - Design of bolted joints including eccentric loading – Design of welded joints for pressure vessels and structures - theory of bonded joints.

4. DESIGN OF SPRINGS AND LEVERS 9

Design of helical, leaf, disc and torsional springs under constant loads and varying loads – Concentric torsion springs - Belleville springs – Design of Levers.

5. DESIGN OF BEARINGS AND FLYWHEELS 9

Design of bearings – sliding contact and rolling contact types. – Cubic mean load – Design of journal bearings – Mckees equation – Lubrication in journal bearings – calculation of bearing dimensions – Design of flywheels involving stresses in rim and arm.

TUTORIAL 15

TOTAL : 60

Note: *(Use of P S G Design Data Book is permitted in the University examination)*

TEXT BOOKS

Juvinall R.C, and Marshek K.M, "Fundamentals of Machine Component Design", John Wiley & Sons, Third Edition, 2002.
2. Bhandari V.B, "Design of Machine Elements", Tata McGraw-Hill Book Co, 2003.

REFERENCES

1. Norton R.L, "Design of Machinery", Tata McGraw-Hill Book Co, 2004.
2. Orthwein W, "Machine Component Design", Jaico Publishing Co, 2003.
3. Ugural A.C, "Mechanical Design – An Integral Approach, McGraw-Hill Book Co, 2004.
4. Spotts M.F., Shoup T.E "Design and Machine Elements" Pearson Education, 2004.

STANDARDS

IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 1 : Construction.
IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 2 : Friction and Wear.
IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 3 : Lubrication.

ME1303 GAS DYNAMICS AND JET PROPULSION 3 1 0 100

OBJECTIVES

To Understand the basic difference between incompressible and compressible flow
To study the phenomenon of shock waves and its effect on flow
To gain basic knowledge about jet propulsion and Rocket Propulsion

1. COMPRESSIBLE FLOW – FUNDAMENTALS 8

Energy and momentum equations for compressible fluid flows, various regions of flows, reference velocities, stagnation state, velocity of sound, critical states, Mach number, critical Mach number, types of waves, Mach cone, Mach angle, effect of Mach number on compressibility

2. FLOW THROUGH VARIABLE AREA DUCTS 9

Isentropic flow through variable area ducts, T-s and h-s diagrams for nozzle and diffuser flows, area ratio as a function of Mach number, mass flow rate through nozzles and diffusers, effect of friction in flow through nozzles.

3. FLOW THROUGH CONSTANT AREA DUCTS 10

Flow in constant area ducts with friction (Fanno flow) – Fanno curves and Fanno flow equation, variation of flow properties, variation of Mach number with duct length.
Isothermal flow with friction in constant area ducts
Flow in constant area ducts with heat transfer (Rayleigh flow), Rayleigh line and Rayleigh flow equation, variation of flow properties, maximum heat transfer.

4. NORMAL SHOCK 8

Governing equations, variation of flow parameters like static pressure, static temperature, density, stagnation pressure and entropy across the normal shock, Prandtl - Meyer equation, impossibility of shock

in subsonic flows, flow in convergent and divergent nozzle with shock, normal shock in Fanno and Rayleigh flows, flow with oblique shock (elementary treatment only).

5. PROPULSION 10

Aircraft propulsion – types of jet engines – energy flow through jet engines, study of turbojet engine components – diffuser, compressor, combustion chamber, turbine and exhaust systems, performance of turbo jet engines – thrust, thrust power, propulsive and overall efficiencies, thrust augmentation in turbo jet engine, ram jet and pulse jet engines

Rocket propulsion – rocket engines thrust equation – effective jet velocity specific impulse – rocket engine performance, solid and liquid propellants, comparison of different propulsion systems.

TUTORIAL 15

TOTAL : 60

Note: *(Use of approved gas tables is permitted in the University examination)*

TEXT BOOKS

1. Yahya. S.M., "Fundamental of compressible flow", New Age International (p) Ltd., New Delhi, 1996.
2. Patrich.H. Oosthvizen, William E.Carscallen, "Compressible fluid flow", McGraw-Hill, 1997

REFERENCES

1. Cohen. H., Rogers R.E.C and Sravanamutoo, "Gas turbine theory", Addison Wesley Ltd., 1987.
2. Ganesan. V., "Gas Turbines", Tata McGraw-Hill, New Delhi, 1999
3. Rathakrishnan.E, "Gas Dynamics", Prentice Hall of India, New Delhi, 2001

ME1304 ENGINEERING METROLOGY AND MEASUREMENTS 3 0 0 100

(Common to Mechanical and Automobile)

OBJECTIVE

To understand the principles of metrology and measurements, methods of measurement and its application in manufacturing industries.

1. CONCEPT OF MEASUREMENT 9

General concept – Generalised measurement system-Units and standards-measuring instruments-sensitivity, readability, range of accuracy, precision-static and dynamic response-repeatability-systematic and random errors-correction, calibration, interchangeability.

2. LINEAR AND ANGULAR MEASUREMENT 9

Definition of metrology-Linear measuring instruments: Vernier, micrometer, interval measurement, Slip gauges and classification, interferometery, optical flats, limit gauges- Comparators: Mechanical, pneumatic and electrical types, applications.

Angular measurements: -Sine bar, optical bevel protractor, angle Decker – Taper measurements.

3. FORM MEASUREMENT 9

Measurement of screw threads-Thread gauges, floating carriage micrometer-measurement of gears-tooth thickness-constant chord and base tangent method-Gleason gear testing machine – radius measurements-surface finish, straightness, flatness and roundness measurements.

4. LASER AND ADVANCES IN METROLOGY 9

Precision instruments based on laser-Principles- laser interferometer-application in linear, angular measurements and machine tool metrology

Coordinate measuring machine (CMM)- Constructional features – types, applications – digital devices-computer aided inspection.

5. MEASUREMENT OF POWER, FLOW AND TEMPERATURE RELATED PROPERTIES 9

Force, torque, power:-mechanical, pneumatic, hydraulic and electrical type-Flow measurement**:** Venturi, orifice, rotameter, pitot tube –Temperature: bimetallic strip, pressure thermometers, thermocouples, electrical resistance thermister.

TOTAL : 45

TEXT BOOKS

Jain R.K., "Engineering Metrology", Khanna Publishers, 1994
Alan S. Morris, "The Essence of Measurement", Prentice Hall of India, 1997

REFERENCES

Gupta S.C, "Engineering Metrology", Dhanpat rai Publications, 1984
Jayal A.K, "Instrumentation and Mechanical Measurements", Galgotia Publications 2000
Beckwith T.G, and N. Lewis Buck, "Mechanical Measurements", Addison Wesley, 1991
4. Donald D Eckman, "Industrial Instrumentation", Wiley Eastern, 1985.

ME1305 APPLIED HYDRAULICS AND PNEUMATICS 3 0 0 100

(Common to Mechanical and Mechatronics - VI Semester)

OBJECTIVE

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.

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.

2. 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.

3. DESIGN OF HYDRAULIC CIRCUITS 9

Construction of Control Components : Director 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.

4. 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.

5. 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.

TOTAL : 45

TEXT BOOKS

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education 2000.
2. Majumdar S.R., "Oil Hydraulics", Tata McGraw-Hill, 2000.

REFERENCES

1. Majumdar S.R., "Pneumatic systems – Principles and maintenance", Tata McGraw Hill, 1995
2 Anthony Lal, "Oil hydraulics in the service of industry", Allied publishers, 1982.
3. Harry L. Stevart D.B, "Practical guide to fluid power", Taraoeala sons and Port Ltd. Broadey, 1976.

Michael J, Prinches and Ashby J. G, "Power Hydraulics", Prentice Hall, 1989.
Dudelyt, A. Pease and John T. Pippenger, "Basic Fluid Power", Prentice Hall, 1987.

ME1306 DYNAMICS LABORATORY 0 0 3 100

LIST OF EXPERIMENTS

1. Governors - 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 laws -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

LIST OF EQUIPMENT
(for a batch of 30 students)

1. Cam analyzer.
2. Motorised gyroscope.
3. Governor apparatus - Watt, Porter, Proell and Hartnell governors.
4. Whirling of shaft apparatus.
5. Dynamic balancing machine.
6. Static and dynamic balancing machine.
7. Vibrating table
8. Vibration test facilities apparatus

ME1307 METROLOGY AND MEASUREMENT LAB 0 0 3 100

LIST OF EXPERIMENTS

Calibration of Vernier / Micrometer / Dial Gauge
Checking Dimensions of part using slip gauges
Measurements of Gear Tooth Dimensions
Measurement of Taper Angle using sine bar / tool makers microscope
Measurement of straightness and flatness

Measurement of thread parameters

Checking the limits of dimensional tolerances using comparators (Mechanical / Pneumatic / Electrical)

Measurement of Temperature using Thermocouple / Pyrometer
Measurement of Displacement (Strain Gauge / LVDT / Wheatstone Bridge)
Measurement of Force
Measurement of Torque
Measurement of Vibration / Shock

TOTAL : 45

LIST OF EQUIPMENT
(for a batch of 30 students)

1.	Micrometer	-	5
2.	Vernier Caliper	-	5
3.	Vernier Height Gauge	-	2
4.	Vernier Depth Gauge	-	2
5.	Slip Gauge Set	-	1
6.	Gear Tooth Vernier	-	1
7.	Sine Bar	-	2
8.	Bevel Protractor	-	1
9.	Floating Carriage Micrometer	-	1
10.	Profile Projector	-	1
11.	Mechanical / Electrical / Pneumatic Comparator	-	1
12.	Temperature Measuring Setup	-	1
13.	Displacement Measuring Setup	-	1
14.	Force Measuring Setup	-	1
15.	Torque Measuring Setup	-	1
16.	Vibration / Shock Measuring Setup	-	1

Optional Equipments

17.	Autocollimator	-	1
18.	Coordinate Measuring Machine	-	1
19.	Tool Makers Microscope	-	1
20.	Dial Gauge Calibration	-	1

ME1308 COMPUTER AIDED MACHINE DRAWING PRACTICE 0 0 3 100

OBJECTIVE

- To understand and practice the drawings for machine components and simple assemblies using standard CAD packages
- To know – how on specifications of Indian Standards on drawing practices and standard components.

1. DRAWING STANDARDS 6

Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc.

2. INTRODUCTION TO DRAFTING SOFTWARE 6

Drawing, Editing, Dimensioning, Plotting Commands, Layering concepts, Limits, Fits and Tolerances.

3. PREPARATION OF 2-D DRAWINGS 9

Orthographic views of standard machine components: Brackets, V Blocks, Stop Block, Screw threads and Threaded fasteners.

4. ASSEMBLY DRAWING (Preparation of assembled view) **24**

Flange coupling
Plummer block bearing
Lathe Tailstock
Universal Joint.
Machine vice
Stuffing box
Piston and connecting rod

TOTAL : 45

REFERENCES

BHATT.N.D. and PANCHAL.V.M., "Machine Drawing", Charotar Publishing House, 388001, 38th Edition, 2003.

P.S.G. Design Data Book

Ellen Finkelstein, "AutoCAD 2004 Bible", Wiley Publishing Inc, 2003.

Sham Tikoo, " AutoCAD 2002 with Applications", Tata McGraw-Hill Publishing Company, NewDelhi, 2002.

"CollabCAD Software", National Informatics Centre (CAD Group), Govt. of India, A-Block, C.G.O. Complex, Lodhi Road, New Delhi 110003, 2003" www.collabcad.com

WEB SITES:

www.autodesk.com
www.ptc.com
www.solidworks.com
www.autodeskpress.com

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

Software

AutoCAD or Mechanical Desktop or Pro / E or CATIA or IDEAS **30 Licenses** or Solidworks

GE1303 COMMUNICATION SKILLS AND TECHNICAL SEMINAR 0 0 3 0

(Common to all Branches)

OBJECTIVE

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present 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.

MG1351 PRINCIPLES OF MANAGEMENT 3 0 0 100

(Common to all Branches)

OBJECTIVE

Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge on international aspect of management.

1. HISTORICAL DEVELOPMENT 9

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

2. PLANNING 9

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

3. 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.

4. DIRECTING 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.

5. 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

TEXT BOOKS

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.

REFERENCES

1 Tripathy PC And Reddy PN, " Principles of Management", Tata McGraw-Hill, 1999.
2. Decenzo David, Robbin Stephen A, "Personnel and Human Resources Management", Prentice Hall of India, 1996
3. JAF Stomer, Freeman R. E and Daniel R Gilbert, "Management", Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, "Engineering Management", Addison Wesley,-2000.

ME1351 HEAT AND MASS TRANSFER 3 1 0 100

OBJECTIVE

The course is intended to build up necessary background for understanding the physical behavior of various modes of heat transfer, like, conduction, convection and radiation.
To understand the application of various experimental heat transfer correlations in engineering calculations.
To learn the thermal analysis and sizing of heat exchangers.
To understand the basic concepts of mass transfer.

1. CONDUCTION 11

Basic Concepts – Mechanism of Heat Transfer – Conduction, Convection and Radiation – General Differential equation of Heat Conduction – Fourier Law of Conduction – Cartesian and Cylindrical Coordinates – One Dimensional Steady State Heat Conduction – Conduction through Plane Wall, Cylinders and Spherical systems – Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – Use of Heislers Chart.

2. CONVECTION 10

Basic Concepts – Convective Heat Transfer Coefficients – Boundary Layer Concept – Types of Convection – Forced Convection – Dimensional Analysis – External Flow – Flow over Plates, Cylinders and Spheres – Internal Flow – Laminar and Turbulent Flow – Combined Laminar and Turbulent – Flow over Bank of tubes – Free Convection – Dimensional Analysis – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres.

3. PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS 9

Nusselts theory of condensation-pool boiling, flow boiling, correlations in boiling and condensation. Types of Heat Exchangers – LMTD Method of heat Exchanger Analysis – Effectiveness – NTU method of Heat Exchanger Analysis – Overall Heat Transfer Coefficient – Fouling Factors.

4. RADIATION 8

Basic Concepts, Laws of Radiation – Stefan Boltzman Law, Kirchoff Law –Black Body Radiation –Grey body radiation Shape Factor Algebra – Electrical Analogy – Radiation Shields –Introduction to Gas Radiation.

5. MASS TRANSFER 7

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations

TUTORIAL 15

TOTAL : 60

Note: *(Use of standard* heat and mass transfer data book is permitted in the University *examination)*

TEXT BOOKS

Sachdeva R C, "Fundamentals of Engineering Heat and Mass Transfer" New Age International, 1995.
Yadav R "Heat and Mass Transfer" Central Publishing House, 1995.

REFERENCES

Ozisik M.N, "Heat Transfer", McGraw-Hill Book Co., 1994.
Nag P.K, " Heat Transfer", Tata McGraw-Hill, New Delhi, 2002
Holman J.P "Heat and Mass Transfer" Tata McGraw-Hill, 2000.
Kothandaraman C.P "Fundamentals of Heat and Mass Transfer" New Age International, New Delhi, 1998
5. Frank P. Incropera and David P. DeWitt, "Fundamentals of Heat and Mass Transfer", John Wiley and Sons, 1998.
6. Velraj R, "Heat & Mass Transfer", Ane Books, New Delhi, 2004

ME1352 DESIGN OF TRANSMISSION SYSTEMS 3 2 0 100

OBJECTIVE

To gain knowledge on the principles and procedure for the design of power Transmission components.
To understand the standard procedure available for Design of Transmission sip terms
To learn to use standard data and catalogues

1. DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS 9

Selection of V belts and pulleys – selection of Flat belts and pulleys - Wire ropes and pulleys – Selection of Transmission chains and Sprockets. Design of pulleys and sprockets.

2. SPUR GEARS AND PARALLEL AXIS HELICAL GEARS 9

Gear Terminology-Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Module and Face width-power rating calculations based on strength and wear considerations - Parallel axis Helical Gears – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces and stresses. Estimating the size of the helical gears.

3. BEVEL, WORM AND CROSS HELICAL GEARS 9

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears.
Worm Gear: Merits and demerits- terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair.
Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

4. DESIGN OF GEAR BOXES 9

Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box -Constant mesh gear box. – Design of multi speed gear box.

5. DESIGN OF CAM, CLUTCHES AND BRAKES 9

Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches-internal and external shoe brakes.

TUTORIALS 30

TOTAL : 75

Note: (*Usage of P.S.G Design Data Book is permitted in the University examination*)

TEXT BOOKS

Juvinall R. C., Marshek K.M., "Fundamentals of Machine component Design", – John Wiley & Sons Third Edition, 2002.
Bhandari, V.B., "Design of Machine Elements", Tata McGraw-Hill Publishing Company Ltd., 1994.

REFERENCES

Maitra G.M., Prasad L.V., "Hand book of Mechanical Design", II Edition, Tata McGraw-Hill, 1985.
Shigley J.E and Mischke C. R., "Mechanical Engineering Design", McGraw-Hill International Editions, 1989.
Prabhu. T.J., "Design of Transmission Elements", Mani Offset, Chennai, 2000,
Norton R.L, "Design of Machinery", McGraw-Hill Book co, 2004.
Hamrock B.J., Jacobson B., Schmid S.R., "Fundamentals of Machine Elements", McGraw-Hill Book Co., 1999.

STANDARDS

IS 4460 : Parts 1 to 3 : 1995, Gears – Spur and Helical Gears – Calculation of Load Capacity.
IS 7443 : 2002, Methods of Load Rating of Worm Gears
IS 15151: 2002, Belt Drives – Pulleys and V-Ribbed belts for Industrial applications – PH, PJ, PK, Pl and PM Profiles : Dimensions
IS 2122 : Part 1: 1973, Code of practice for selection, storage, installation and maintenance of belting for power transmission : Part 1 Flat Belt Drives.
IS 2122: Part 2: 1991, Code of practice for selection, storage, installation and maintenance of belting for power transmission : Part 2 V-Belt Drives.

ME1353 AUTOMOBILE ENGINEERING 3 0 0 100

(Common to Mechanical and Production-Elective)

OBJECTIVE

To impact knowledge to students in various systems of Automobile Engineering and to have the practice for Assembling and Dismantling of Engine Parts.

VEHICLE STRUCTURE AND ENGINES **10**

Types of Automobiles - Vehicle Construction – Chassis – Frame and Body –aerodynamics. Components of Engine – Their forms, Functions and Materials - Review of Cooling and Lubrication systems in Engine – Turbo Chargers – Engine Emission Control by 3–Way Catalytic Controller – Electronic Engine Management System.

2. ENGINE AUXILIARY SYSTEMS **10**

Carburetor–working principle- Electronic fuel injection system – Mono-point and Multi - Point Injection Systems – Construction, Operation and Maintenance of Lead Acid Battery - Electrical systems – Battery generator – Starting Motor and Drives – Lighting and Ignition (Battery, Magneto Coil and Electronic Type)-Regulators-cut outs.

TRANSMISSION SYSTEMS **10**

Clutch – Types and Construction – Gear Boxes, Manual and Automatic – Simple Floor Mounted Shift Mechanism – Over Drives – Transfer Box Fluid flywheel-Torque convertors– Propeller shaft – Slip Joint – Universal Joints – Differential and Rear Axle – Hotchkiss Drive and Torque Tube Drive.

STEERING, BRAKES AND SUSPENSION **10**

Wheels and Tyres – Wheel Alignment Parameters - Steering Geometry and Types of steering gear box– Power Steering – Types of Front Axle – Suspension systems – Braking Systems – Types and Construction – Diagonal Braking System – Antilock Braking System.

5. ALTERNATIVE ENERGY SOURCES **5**

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

Note: Practical training in dismantling and assembling of Engine parts Transmission System should be given to the students

TOTAL : 45

TEXT BOOKS

1. Sethi H.M, “Automobile Technology”, Tata McGraw-Hill-2003
2. Kirpal Singh “Automobile Engineering Vol. 1& 2”, Standard Publishers, New Delhi.

REFERENCES

Crouse and Anglin “Automotive Mechanism”, 9th Edition. Tata McGraw-Hill, 2003.
Newton, Steeds and Garet, “Motor vehicles”, Butterworth Publishers, 1989.
Srinivasan.S , “ Automotive Mechanics” 2nd edition, 2003, Tata McGraw-Hill.
Joseph Heitner, “Automotive Mechanics”, 2nd edition, East-West Press, 1999.

ME1354 POWER PLANT ENGINEERING **3 0 0 100**

OBJECTIVE

To understand the various components, operations and applications of different types of power plants.

1. INTRODUCTION TO POWER PLANTS & BOILERS **9**

Layout of Steam, Hydel, Diesel, MHD, Nuclear and Gas Turbine Power Plants - Combined Power Cycles – Comparison and Selection, Load Duration Curves.
Steam Boilers and Cycles – High Pressure and Super Critical Boilers – Fluidised Bed Boilers

2. STEAM POWER PLANT 9

Fuel and Ash Handling, Combustion Equipment for burning coal, Mechanical Stokers, Pulveriser, Electrostatic Precipitator, Draught – different types, Surface Condenser Types, Cooling Towers

3. NUCLEAR AND HYDEL POWER PLANTS 9

Nuclear Energy – Fission, Fusion Reaction, Types of Reactors, pressurized water reactor, Boiling Water Reactor, Waste Disposal and safety.
Hydel Power Plant – Essential Elements, Selection of Turbines, Governing of Turbines- Micro Hydel developments.

4. DIESEL AND GAS TURBINE POWER PLANT 9

Types of Diesel Plants, Components, Selection of Engine Type, Applications Gas Turbine Power Plant – Fuels - Gas Turbine Material – Open and Closed Cycles – Reheating – Regeneration and Intercooling – Combined Cycle.

5. OTHER POWER PLANTS AND ECONOMICS OF POWER PLANTS 9

Geo thermal –OTEC – Tidel - Pumped storage - Solar thermal central receiver system.
Cost of Electric Energy – Fixed and operating Costs – Energy Rates – Types of Tariffs – Economics of load sharing, comparison of economics of various power plants.

TOTAL : 45

TEXT BOOKS

1. EI- Wakil M.M, "Power Plant Technology", McGraw-Hill 1984.
2. Arora S.C and Domkundwar S, "A course in Power Plant Engineering", Dhanpatrai, 2001.
3. Nag P.K, "Power plant Engineering", Tata McGraw-Hill, 1998.

REFERENCES

G.R. Nagpal, "Power Plant Engineering", Hanna Publishers, 1998.
K.K.Ramalingam, "Power Plant Engineering", Scitech Publications, 2002.
G.D.Rai, "Introduction to Power Plant Technology", Khanna Publishers, 1995.
R.K.Rajput, "Power Plant Engineering", Laxmi Publications, 1995.
Frank D.Graham "Power Plant Engineers Guide", D.B. Taraporevala Sons & Co, New Delhi, 1993.
T.Morse Frederick, "Power Plant Engineering", Prentice Hall of India, 1998

ME1355 THERMAL ENGINEERING LABORATORY II 0 0 3 100

LIST OF EXPERIMENTS

HEAT TRANSFER 30

Thermal conductivity measurement by guarded plate method
Thermal conductivity of pipe insulation using lagged pipe apparatus
Natural convection heat transfer from a vertical cylinder
Forced convection inside tube
Heat transfer from pin-fin (natural & forced convection modes)
Determination of Stefan-Boltzmann constant
Determination of emissivity of a grey surface
Effectiveness of Parallel/counter flow heat exchanger

REFRIGERATION AND AIR CONDITIONING **15**

Determination of COP of a refrigeration system
Experiments on air-conditioning system
Performance test on single/two stage reciprocating air compressor.

TOTAL : 45

LIST OF EQUIPMENT
(for a batch of 30 students)

Guarded plate apparatus	– 1 No.	
Lagged pipe apparatus	– 1 No.	
Natural convection-vertical cylinder apparatus	– 1 No.	
Forced convection inside tube apparatus	– 1 No.	
Pin-fin apparatus	– 1 No.	
Stefan-Boltzmann apparatus	– 1 No.	
Emissivity measurement apparatus	– 1 No.	
Parallel/counter flow heat exchanger apparatus	– 1 No.	
9. Single/two stage reciprocating air compressor.		- 1 No.
10. Refrigeration test rig		- 1 No.
11. Air-conditioning test rig		- 1 No.

ME1356 CAD/CAM LAB **0 0 3 100**

LIST OF EXPERIMENTS

A) COMPUTER AIDED DESIGN (CAD) **15**

3D Part modeling – protrusion, cut, sweep, draft, loft, blend, rib

Editing – Move, Pattern, Mirror, Round, Chamfer

Assembly – creating assembly from parts – assembly constraints

Conversion of 3D solid model to 2D drawing - different views, sections, isometric view and dimensioning

Introduction to Surface Modeling

Introduction to File Import, Export – DXF, IGES, STL, STEP
7. 3D modeling of machine elements like Flanged coupling, screw jack etc.

Note: *Any one of the 3D MODELING softwares like Pro/E, IDEAS, CATIA, UNIGRAPHICS, AutoCAD to be used*.

B) COMPUTER AIDED MANUFACTURING (CAM) **21**

1. MANUAL PART PROGRAMMING (Using G and M Codes) in CNC lathe

1.1 Part programming for Linear and Circular interpolation, Chamfering and Grooving
1.2 Part programming using standard canned cycles for Turning, Facing, Taper turning and Thread cutting

2. MANUAL PART PROGRAMMING (using G and M codes) in CNC milling

2.1 Part programming for Linear and Circular interpolation and Contour motions.
2.2 Part programming involving canned cycles for Drilling, Peck drilling, and Boring.

C) SIMULATION AND NC CODE GENERATION 9

NC code generation using CAD / CAM softwares - Post processing for standard CNC Controls like FANUC, Hiedenhain etc.

TOTAL : 45

LIST OF EQUIPMENT FOR CAD /CAM LAB
(for a batch of 30 students)

I . HARDWARES

1.	Computer server	1 No.
2.	Computer nodes or systems (Pentium IV with 256MB Ram) networked to the server	30 Nos.
3.	A3 size plotter	2 Nos.
4.	Laser Printer	2 Nos.
5.	Trainer CNC lathe	2 Nos.
6.	Trainer CNC milling	2 Nos.

II. SOFTWARES

1.	CAD/CAM Software (Pro –E or IDEAS or Unigraphics or CATIA)	– 15 licenses
2.	CAM Software (CNC programming and tool path simulation for FANUC, Sinumeric and Heiden controller)	– 15 licenses

ME1357 DESIGN AND FABRICATION PROJECT 0 0 4 100
(Common to Mechanical and Production)

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.

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.

GE1351 PRESENTATION SKILLS AND TECHNICAL SEMINAR 0 0 3 0
(Common to all Branches)

OBJECTIVE

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present 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.

MG1401 TOTAL QUALITY MANAGEMENT 3 0 0 100

(Common to all branches)

OBJECTIVE

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.

INTRODUCTION 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

TQM PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

STATISTICAL PROCESS CONTROL (SPC) 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45

TEXT BOOK

Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCES

James R.Evans & William M.Lidsay, “The Management and Control of Quality”, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).

Feigenbaum.A.V. “Total Quality Management”, McGraw Hill, 1991.

Oakland.J.S. “Total Quality Management”, Butterworth – Hcinemann Ltd., Oxford. 1989.

Narayana V. and Sreenivasan, N.S. “Quality Management – Concepts and Tasks”, New Age International 1996.

Zeiri. “Total Quality Management for Engineers”, Wood Head Publishers, 1991.

MH1003 FINITE ELEMENT ANALYSIS 3 1 0 100

(Common to Mechanical, Automobile, Mechatronics (Elective) and Metallurgical Engineering (Elective))

OBJECTIVES

- To understand the principles involved in discretization and finite element approach
- To learn to form stiffness matrices and force vectors for simple elements

1. INTRODUCTION 9

Historical background – Matrix approach – Application to the continuum – Discretisation – Matrix algebra – Gaussian elimination – Governing equations for continuum – Classical Techniques in FEM – Weighted residual method – Ritz method

2. ONE DIMENSIONAL PROBLEMS 9

Finite element modeling – Coordinates and shape functions- Potential energy approach – Galarkin approach – Assembly of stiffness matrix and load vector – Finite element equations – Quadratic shape functions – Applications to plane trusses

3. TWO DIMENSIONAL CONTINUUM 9

Introduction – Finite element modelling – Scalar valued problem – Poisson equation –Laplace equation – Triangular elements – Element stiffness matrix – Force vector – Galarkin approach - Stress calculation – Temperature effects

4. AXISYMMETRIC CONTINUUM 9

Axisymmetric formulation – Element stiffness matrix and force vector – Galarkin approach – Body forces and temperature effects – Stress calculations – Boundary conditions – Applications to cylinders under internal or external pressures – Rotating discs

5. ISOPARAMETRIC ELEMENTS FOR TWO DIMENSIONAL CONTINUUM 9

The four node quadrilateral – Shape functions – Element stiffness matrix and force vector – Numerical integration - Stiffness integration – Stress calculations – Four node quadrilateral for axisymmetric problems.

TUTORIAL 15

TOTAL : 45

TEXT BOOKS

Chandrupatla T.R., and Belegundu A.D., "Introduction to Finite Elements in Engineering", Pearson Education 2002, 3rd Edition.

David V Hutton "Fundamentals of Finite Element Analysis"2004. McGraw-Hill Int. Ed.

REFERENCES

1. Rao S.S., "The Finite Element Method in Engineering", Pergammon Press, 1989

Logan D.L., "A First course in the Finite Element Method", Third Edition, Thomson Learning, 2002.

Robert D.Cook., David.S, Malkucs Michael E Plesha, "Concepts and Applications of Finite Element Analysis" 4 Ed. Wiley, 2003.

Reddy J.N., "An Introduction to Finite Element Method", McGraw-Hill International Student Edition, 1985

O.C.Zienkiewicz and R.L.Taylor, "The Finite Element Methods, Vol.1", "The basic formulation and linear problems, Vol.1", Butterworth Heineman, 5th Edition, 2000.

ME1402 MECHATRONICS 3 0 0 100

(Common to Mechanical and Production- VI Semester)

OBJECTIVE

- To understand the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical and Electronic Systems.

1. MECHATRONICS, SENSORS AND TRANSDUCERS 9

Introduction to Mechatronics Systems – Measurement Systems – Control Systems – Microprocessor based Controllers.
Sensors and Transducers – Performance Terminology – Sensors for Displacement, Position and Proximity; Velocity, Motion, Force, Fluid Pressure, Liquid Flow, Liquid Level, Temperature, Light Sensors – Selection of Sensors

2. ACTUATION SYSTEMS 9

Pneumatic and Hydraulic Systems – Directional Control Valves – Rotary Actuators.
Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and pawl – Belt and Chain Drives – Bearings.

Electrical Actuation Systems – Mechanical Switches – Solid State Switches – Solenoids – D.C Motors – A.C Motors – Stepper Motors.

3. SYSTEM MODELS AND CONTROLLERS 9

Building blocks of Mechanical, Electrical, Fluid and Thermal Systems, Rotational – Transnational Systems, Electromechanical Systems – Hydraulic – Mechanical Systems.
Continuous and discrete process Controllers – Control Mode – Two – Step mode – Proportional Mode – Derivative Mode – Integral Mode – PID Controllers – Digital Controllers – Velocity Control – Adaptive Control – Digital Logic Control – Micro Processors Control.

4. PROGRAMMING LOGIC CONTROLLERS 9

Programmable Logic Controllers – Basic Structure – Input / Output Processing – Programming – Mnemonics – Timers, Internal relays and counters – Shift Registers – Master and Jump Controls – Data Handling – Analogs Input / Output – Selection of a PLC Problem.

5. DESIGN OF MECHATRONICS SYSTEM 9

Stages in designing Mechatronics Systems – Traditional and Mechatronic Design - Possible Design Solutions
Case Studies of Mechatronics Systems, Pick and place robot – automatic Car Park Systems – Engine Management Systems.

TOTAL : 45

TEXT BOOKS

W. Bolton, “Mechatronics”, Pearson Education, Second Edition, 1999.

REFERENCES

Michael B. Histand and David G. Alciatore, “ Introduction to Mechatronics and Measurement Systems”, McGraw-Hill International Editions, 2000.
Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, “Mechatronics”, Chapman and Hall, 1993.
Dan Necsulesu, “Mechatronics”, Pearson Education Asia, 2002 (Indian Reprint).
Lawrence J. Kamm, “Understanding Electro – Mechanical Engineering”, An Introduction to Mechatronics, Prentice – Hall of India Pvt., Ltd., 2000.
Nitaigour Premchand Mahadik, “Mechatronics”, Tata McGraw-Hill publishing Company Ltd, 2003

ME1403 COMPUTER INTEGRATED MANUFACTURING 3 0 0 100

(Common to Mechanical, Production, Mechatronics and Aeronautical)

OBJECTIVE

This course will enable the student

- To gain knowledge on how computers are integrated at various levels of planning and manufacturing.
- To understand the flexible manufacturing system and to handle the product data and various software used for manufacturing

1. INTRODUCTION 8

The meaning and origin of CIM- the changing manufacturing and management scene - External communication - islands of automation and software-dedicated and open systems-manufacturing automation protocol - product related activities of a company- marketing engineering - production planning - plant operations - physical distribution- business and financial management.

2. GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING 10

History of group technology- role of G.T. in CAD/CAM integration - part families - classification and coding - DCLASS and MICLASS and OPITZ coding systems-facility design using G.T. -benefits of G.T. - cellular manufacturing.
Process planning - role of process planning in CAD/CAM integration - approaches to computer aided process planning -variant approach and generative approaches - CAPP and CMPP process planning systems.

3. SHOP FLOOR CONTROL AND INTRODUCTION OF FMS 9

Shop floor control-phases -factory data collection system -automatic identification methods- Bar code technology-automated data collection system.
FMS-components of FMS - types -FMS workstation -material handling and storage systems- FMS layout - computer control systems-application and benefits.

4. CIM IMPLEMENTATION AND DATA COMMUNICATION 10

CIM and company strategy - system modeling tools -IDEF models - activity cycle diagram - CIM open system architecture (CIMOSA)- manufacturing enterprise wheel-CIM architecture - Product data management-CIM implementation software.
Communication fundamentals- local area networks -topology - LAN implementations - network management and installations.

5. OPEN SYSTEM AND DATABASE FOR CIM 8

Open systems-open system inter connection - manufacturing automations protocol and technical office protocol (MAP /TOP)

Development of databases -database terminology- architecture of database systems-data modeling and data associations -relational data bases - database operators - advantages of data base and relational database.

TOTAL : 45

TEXT BOOK

Mikell.P.Groover “Automation, Production Systems and computer integrated manufacturing”, Pearson Education 2001.

REFERENCES

1. Yorem koren, “Computer Integrated Manufacturing system”, McGraw-Hill, 1983.

2. Ranky, Paul G., "Computer Integrated Manufacturing", Prentice Hall International 1986.
3. David D.Bedworth, Mark R.Hendersan, Phillip M.Wolfe "Computer Integrated Design and Manufacturing", McGraw-Hill Inc.
4. Roger Hanman "Computer Intergrated Manufacturing", Addison –Wesley, 1997.
Mikell.P.Groover and Emory Zimmers Jr., "CAD/CAM", Prentice hall of India Pvt. Ltd., New Delhi-1.1998.
Kant Vajpayee S, "Principles of computer integrated manufacturing", Prentice Hall India, 2003.
Radhakrishnan P, Subramanyan S.and Raju V., "CAD/CAM/CIM", 2nd Edition New Age International (P) Ltd, New Delhi. 2000.

ME1404 COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY 0 0 3 100

LIST OF EXPERIMENTS

A. Simulation 15

Simulation of Air conditioning system with condenser temperature and evaporator temperatures as input to get COP using C /MAT Lab.
Simulation of Hydraulic / Pneumatic cylinder using C / MAT Lab.
Simulation of cam and follower mechanism using C / MAT Lab.

Analysis (Simple Treatment only) 30

Stress analysis of a plate with a circular hole.
Stress analysis of rectangular L bracket
Stress analysis of an axi-symmetric component
Stress analysis of beams (Cantilever, Simply supported, Fixed ends)
Mode frequency analysis of a 2 D component
Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
Harmonic analysis of a 2D component
Thermal stress analysis of a 2D component
Conductive heat transfer analysis of a 2D component
Convective heat transfer analysis of a 2D component

TOTAL : 45

LIST OF EQUIPMENTS
(for a batch of 30 students)

Computer System 30

17" VGA Color Monitor
Pentium IV Processor
40 GB HDD
256 MB RAM

Color Desk Jet Printer 01

Software

ANSYS Version 7 or latest	15 licenses
C / MATLAB	15 licenses

PR1353 MECHATRONICS LABORATORY 0 0 3 100
(Common to Mechanical and Production VI Semester)

LIST OF EXPERIMENTS

Design and testing of fluid power circuits to control
(i) velocity (ii) direction and (iii) force of single and double acting actuators
Design of circuits with logic sequence using Electro pneumatic trainer kits.
Simulation of basic Hydraulic, Pneumatic and Electric circuits using software.
Circuits with multiple cylinder sequences in Electro pneumatic using PLC.
Servo controller interfacing for open loop

Servo controller interfacing for closed loop
PID controller interfacing
Stepper motor interfacing with 8051 Micro controller
(i) full step resolution (ii) half step resolution
Modeling and analysis of basic electrical, hydraulic and pneumatic systems using LAB VIEW
Computerized data logging system with control for process variables like pressure flow and temperature.

TOTAL : 45

LIST OF EQUIPMENT
(for a batch of 30 students)

Basic Pneumatic Trainer Kit with manual and electrical controls	- 1 each
Basic Pneumatic Trainer Kit with PLC control	- 1 No.
HYDROSIM & PNEUMOSIM Software / Automation studio	- 10 sets.
8051 - Microcontroller kit with stepper motor and drive circuit LABVIEW software	- 2 sets
LAB VIEW software with Sensors to measure Pressure, Flow rate, direction, speed, velocity and force.	- 2 sets

ME1406 IDENTIFICATION OF PROJECT WORK 0 0 2 0
(Common to all branches-No examination)

MG1452 ENGINEERING ECONOMICS AND COST ANALYSIS 3 0 0 100
(Common to Mechanical, Production, Automobile, Metallurgy, Mechatronics - VIII Semester Elective)

OBJECTIVES

To learn about the basics of economics and cost analysis related to engineering so as to take economically sound decisions.

UNIT I INTRODUCTION TO ECONOMICS 8

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis- V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT II VALUE ENGINEERING 10

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor-Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW 9

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V DEPRECIATION 9

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation- Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

TOTAL : 45

TEXT BOOKS

Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.

REFERENCES

Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2002.
Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2002
Degarmo, E.P., Sullivan, W.G and Canada, J.R, "Engineering Economy", Macmillan, New York, 1984
Grant.E.L., Ireson.W.G., and Leavenworth, R.S, "Principles of Engineering Economy", Ronald Press, New York,1976.
Smith, G.W., "Engineering Economy", Lowa State Press, Iowa, 1973.

ME1451 COMPREHENSION 0 0 3 0

(Common to all branches)

OBJECTIVE

The objective of comprehension is to provide opportunity for the student to apply the knowledge acquired during the earlier semesters to real life problems which he / she may have to face in future as an engineer. While learning as how to solve the real life problems, student will receive guidance from the faculty and also review various courses learnt earlier.

ME1452 PROJECT WORK 0 0 6 200

(Common to all Branches)

OBJECTIVE

The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines.

The continuous assessment shall be made as prescribed in the regulations (vide clause 10.3 of Regulations 2004 for B.E., B.Tech. programmes)