

**AFFILIATED INSTITUTIONS
ANNA UNIVERSITY, CHENNAI**

R - 2008

**B.E. INDUSTRIAL ENGINEERING AND MANAGEMENT
II TO VIII SEMESTERS CURRICULUM AND SYLLABI**

SEMESTER II

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

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

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

A. CIRCUIT BRANCHES

I Faculty of Electrical Engineering

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

II Faculty of Information and Communication Engineering

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

B. NON – CIRCUIT BRANCHES

I Faculty of Civil Engineering

1. B.E. Civil Engineering

II Faculty of Mechanical Engineering

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

III Faculty of Technology

1. B.Tech. Chemical Engineering
2. B.Tech. Biotechnology
3. B.Tech. Polymer Technology
4. B.Tech. Textile Technology
5. B.Tech. Textile Technology (Fashion Technology)
6. B.Tech. Petroleum Engineering

SEMESTER III

CODE	COURSE TITLE	L	T	P	C
THEORY					
IM3201	<u>Work System Design</u>	3	0	0	3
MA3201	<u>Transforms and Partial Differential Equations</u>	3	1	0	4
ME2201	<u>Manufacturing Technology -I</u>	3	0	0	3
ME3205	<u>Mechanics of Machines</u>	3	1	0	4
CE3204	<u>Strength of Materials</u>	3	0	0	3
IM3202	<u>Operations Research - I</u>	3	1	0	4
PRACTICAL					
ME2207	<u>Manufacturing Technology Laboratory I</u>	0	0	3	2
IM3203	<u>Work System Design Laboratory</u>	0	0	2	1
CE3207	<u>Strength of Materials laboratory</u>	0	0	3	2
GE3322	<u>Communication Skills and Technical Seminar- I</u>	0	0	3	2
TOTAL		18	3	11	28

IV SEMESTER

CODE	COURSE TITLE	L	T	P	C
THEORY					
MA3211	<u>Probability and Statistics</u>	3	1	0	4
CE3213	<u>Fluid Mechanics and Machinery</u>	3	1	0	4
ME2303	<u>Design of Machine Elements</u>	3	1	0	4
ME2252	<u>Manufacturing Technology -II</u>	3	0	0	3
ME3215	<u>Thermodynamics</u>	4	0	0	4
IM3251	<u>Engineering Economy, Costing and accounting</u>	3	1	0	4
PRACTICAL					
CE3218	<u>Fluid Mechanics and Machinery Laboratory</u>	0	0	3	2
ME2258	<u>Manufacturing Technology Laboratory II</u>	0	0	3	2
GE3323	<u>Communication Skills and Technical Seminar- II</u>	0	0	3	2
TOTAL		19	4	9	29

V SEMESTER

CODE	COURSE TITLE	L	T	P	C
THEORY					
IM3301	Management and Entrepreneurship	3	0	0	3
IM3302	Operations Research - II	3	1	0	4
IM3303	Statistical Quality Control	4	0	0	4
IM3304	Industrial Engineering	3	0	0	3
IM3305	Manufacturing Automation	3	0	0	3
	Elective I	3	0	0	3
PRACTICAL					
IM3307	Automation Laboratory	0	0	3	2
IM3308	Industrial Engineering Lab	0	0	2	1
IM3309	Technical Seminar I	0	0	2	1
	TOTAL	19	1	7	24

VI SEMESTER

CODE	COURSE TITLE	L	T	P	C
THEORY					
IM3311	Multi-Variate Statistical Analysis	3	0	0	3
IM3312	Principles of Computer Integrated Manufacturing Systems	3	0	0	3
IM3313	Reliability Engineering	3	0	0	3
IM3314	Supply Chain Management	3	0	0	3
IM3315	Operations Management	3	0	0	3
	Elective - II	3	0	0	3
PRACTICAL					
IM3316	Production System Design Project	0	0	6	3
IM3317	Statistical Applications and Optimization	0	0	3	2
GE3318	Communication skills and Soft Skills lab	0	0	2	1
	TOTAL	18	0	11	24

VII SEMESTER

CODE	COURSE TITLE	L	T	P	C
THEORY					
IM3401	Design of Experiments	3	1	0	4
GE3403	Total Quality Management	3	0	0	3
IM3402	Simulation Modeling and Analysis	3	0	0	3
IM3403	Management Information Systems	3	0	0	3
	Elective -III	3	0	0	3
	Elective - IV	3	0	0	3
PRACTICAL					
IM3404	Discrete Simulation Laboratory	0	0	3	2
IM3405	Comprehension	0	0	2	1
	TOTAL	18	1	5	22

VIII SEMESTER

CODE	COURSE TITLE	L	T	P	C
THEORY					
IM3411	Advanced Ergonomics	3	0	0	3
	Elective - V	3	0	0	3
	Elective - VI	3	0	0	3
PRACTICAL					
IM3412	Project work	0	0	12	6
	TOTAL	6	0	12	15

LIST OF ELECTIVES FOR B.E. INDUSTRIAL ENGINEERING AND MANAGEMENT

CODE	COURSE TITLE	L	T	P	C
ME3021	<u>Energy Conservation & Management</u>	3	0	0	3
IM3001	<u>Productivity Management and Re-engineering</u>	3	0	0	3
IM3002	<u>Safety Engineering and Management</u>	3	0	0	3
IM3003	<u>Human Resources Management</u>	3	0	0	3
IM3004	<u>Industrial Engineering Applications in Service Sector</u>	3	0	0	3
IM3005	<u>Advanced Optimization Techniques</u>	3	0	0	3
IM3006	<u>Value Engineering and Project Management</u>	3	0	0	3
IM3007	<u>Technology Management</u>	3	0	0	3
IM3008	<u>Modeling of Manufacturing Systems</u>	3	0	0	3
IM3009	<u>Computational Methods and Algorithms</u>	3	0	0	3
IM3010	<u>Decision Support and Intelligent Systems</u>	3	0	0	3
IM3011	<u>Evolutionary Optimization</u>	3	0	0	3
IM3012	<u>Systems Engineering</u>	3	0	0	3
IM3013	<u>Maintenance Engineering & Management</u>	3	0	0	3
IM3014	<u>Industrial Laws</u>	3	0	0	3
ME2029	<u>Design of Jigs, Fixtures and Press tools</u>	3	0	0	3
ME2353	<u>Finite Element Analysis</u>	3	0	0	3
MF3001	<u>Product Design and development</u>	3	0	0	3
ME2028	<u>Robotics</u>	3	0	0	3
IM3015	<u>World Class Manufacturing</u>	3	0	0	3
MF3404	<u>Flexible Manufacturing Systems</u>	3	0	0	3
MG2021	<u>Marketing Management</u>	3	0	0	3
ME2035	<u>Entrepreneurship Development</u>	3	0	0	3
MA3021	<u>Numerical Methods</u>	3	1	0	4
PT3024	<u>Packaging Materials and Technology</u>	3	0	0	3
GE3022	<u>Professional Ethics in Engineering</u>	3	0	0	3

AIM:

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

OBJECTIVES:

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

UNIT I**12**

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

Suggested activities:

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

UNIT II**12**

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

Suggested activities:

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

UNIT III**12**

Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, -

Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations .

Suggested activities:

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

UNIT IV

12

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

Suggested Activities:

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

UNIT V

9

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

Suggested Activities:

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

TOTAL: 60 PERIODS

TEXT BOOK:

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

REFERENCES:

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

EXTENSIVE READING:

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

NOTE:

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

MA2161**MATHEMATICS – II****L T P C
3 1 0 4****UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS 12

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT III ANALYTIC FUNCTIONS 12

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

UNIT IV COMPLEX INTEGRATION 12

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

UNIT V LAPLACE TRANSFORM 12

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

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

TOTAL: 60 PERIODS**TEXT BOOKS**

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

REFERENCES

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2007).

2. Glyn James, "Advanced Engineering Mathematics", 3rd Edition, Pearson Education, (2007).
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 7th Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

PH2161

ENGINEERING PHYSICS – II

L T P C

3 0 0 3

UNIT I CONDUCTING MATERIALS 9

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

UNIT II SEMICONDUCTING MATERIALS 9

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

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives.

Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High T_c superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

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

UNIT V MODERN ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications.

Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA

Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications.

Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

TOTAL: 45 PERIODS

TEXT BOOKS

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

REFERENCES

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

CY2161

ENGINEERING CHEMISTRY – II

L T P C
3 0 0 3

AIM

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

OBJECTIVES

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

UNIT I ELECTROCHEMISTRY 9

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

UNIT II CORROSION AND CORROSION CONTROL 9

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

UNIT III FUELS AND COMBUSTION 9

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

UNIT IV PHASE RULE AND ALLOYS 9

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

UNIT V ANALYTICAL TECHNIQUES 9

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

TOTAL: 45 PERIODS

TEXT BOOKS

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

REFERENCES

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

ME2151

ENGINEERING MECHANICS

L T P C

3 1 0 4

OBJECTIVE

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

UNIT I BASICS & STATICS OF PARTICLES

12

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

UNIT II EQUILIBRIUM OF RIGID BODIES

12

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

UNIT III PROPERTIES OF SURFACES AND SOLIDS

12

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

inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 12

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

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction.

Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS

TEXT BOOK

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, (1997).

REFERENCES

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

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

UNIT I BASIC CIRCUITS ANALYSIS 12

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

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS: 12

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V ANALYSING THREE PHASE CIRCUITS 12

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

TOTAL: 60 PERIODS

TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, Tata McGraw Hill publishers, 6th edition, New Delhi, (2002).
2. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, Tata McGraw Hill, (2007).

REFERENCES

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

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

UNIT I CIRCUIT ANALYSIS TECHNIQUES 12

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

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS 12

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

UNIT III SEMICONDUCTOR DIODES 12

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

UNIT IV TRANSISTORS 12

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

UNIT V SPECIAL SEMICONDUCTOR DEVICES**(Qualitative Treatment only)****12**

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

TOTAL: 60 PERIODS**TEXT BOOKS**

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series, Tata McGraw Hill, (2001)
2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits", Tata McGraw Hill, 2nd Edition, (2008).
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, (2008).

REFERENCES

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Edition, (2006).
2. William H. Hayt, J.V. Jack, E. Kemmely and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 6th Edition, 2002.
3. J. Millman & Halkins, Satyabranta Jit, "Electronic Devices & Circuits", Tata McGraw Hill, 2nd Edition, 2008.

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

UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS 12

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.

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

UNIT II ELECTRICAL MECHANICS 12

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

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

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

UNIT IV DIGITAL ELECTRONICS 12

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

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

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

TOTAL: 60 PERIODS

TEXT BOOKS

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

REFERENCES

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

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

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15

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

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

UNIT II BUILDING COMPONENTS AND STRUCTURES 15

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

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

TOTAL: 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 10

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

UNIT IV IC ENGINES 10

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

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10

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

TOTAL: 30 PERIODS

REFERENCES:

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

**GE2155 COMPUTER PRACTICE LABORATORY – II L T P C
0 1 2 2**

LIST OF EXPERIMENTS

- | | |
|---|-----------|
| 1. UNIX COMMANDS | 15 |
| Study of Unix OS - Basic Shell Commands - Unix Editor | |
| 2. SHELL PROGRAMMING | 15 |
| Simple Shell program - Conditional Statements - Testing and Loops | |
| 3. C PROGRAMMING ON UNIX | 15 |
| Dynamic Storage Allocation-Pointers-Functions-File Handling | |

TOTAL: 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware

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

Software

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

GS2165

PHYSICS LABORATORY – II

L T P C
0 0 3 2

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer dispersive power of a prism.
6. Determination of Young's modulus of the material – uniform bending.
7. Torsional pendulum – Determination of rigidity modulus.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

GS2165

CHEMISTRY LABORATORY – II

L T P C
0 0 3 2

LIST OF EXPERIMENTS

1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using BaCl_2 vs Na_2SO_4
4. Potentiometric Titration (Fe^{2+} / KMnO_4 or $\text{K}_2\text{Cr}_2\text{O}_7$)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

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

List of Exercises using software capable of Drafting and Modeling

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

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

List of Equipments for a batch of 30 students:

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

TOTAL: 45 PERIODS

EE2155

ELECTRICAL CIRCUIT LABORATORY
(Common to EEE, EIE and ICE)

L T P C
0 0 3 2

LIST OF EXPERIMENTS

1. Verification of ohm's laws and kirchoff's laws.
2. Verification of Thevemin's and Norton's Theorem
3. Verification of superposition Theorem
4. Verification of maximum power transfer theorem.
5. Verification of reciprocity theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis.
8. Transient response of RL and RC circuits for DC input.
9. Frequency response of series and parallel resonance circuits.
10. Frequency response of single tuned coupled circuits.

TOTAL: 45 PERIODS

EC2155

CIRCUITS AND DEVICES LABORATORY

L T P C
0 0 3 2

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.
5. Frequency response of series and parallel resonance circuits.
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET
11. Characteristics of Diac and Triac.
12. Characteristics of Photodiode and Phototransistor.

TOTAL: 45 PERIODS

ENGLISH LANGUAGE LABORATORY (Optional)

L T P C
0 0 2 -

1. Listening:

Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

5

2. Speaking:

5

Pronouncing words & sentences correctly – word stress – Conversation practice.

Classroom Session

20

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

Evaluation

(1) Lab Session – 40 marks

- Listening – 10 marks
- Speaking – 10 marks
- Reading – 10 marks
- Writing – 10 marks

(2) Classroom Session – 60 marks

- Role play activities giving real life context – 30 marks
- Presentation – 30 marks

Note on Evaluation

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

REFERENCES:

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

LAB REQUIREMENTS

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

IM3201

WORK SYSTEM DESIGN

**L T P C
3 0 0 3**

OBJECTIVE

To impart knowledge in the area of Method study and Time study so that students can implement these principles and techniques to improve productivity in manufacturing and Service sectors.

UNIT I	PRODUCTIVITY	9
Total time for a job or operation, total work content and ineffective time, – Production and Productivity - Productivity and standard of living, Factors affecting Productivity, Productivity measurement Models.		
UNIT II	METHODS ENGINEERING	9
Methods Engineering-Steps -Tools and techniques, Motion study.		
UNIT III	WORK MEASUREMENT	9
Stop watch time study, performance rating, allowances, Development of Standard data, learning effect. Work measurement in Automated Processes. Computerised Labour standards.		
UNIT IV	APPLIED WORK MEASUREMENT	9
Work sampling, Group Timing Technique (GTT), predetermined time systems, types, Methods Time Measurement (MTM), Wage incentive plans.		
UNIT V	WORK DESIGN FOR OFFICE WORK	9
Organization and methods (O & M), Work measurement of office work, Work Analysis techniques applied to support staff, Form design and control.		

TOTAL: 45 PERIODS

TEXT BOOK

1. Barnes, R.M. Motion and Time Study, Design and measurement of work, John Wiley sons(Asia), Seventh edition,2002.

REFERENCES

1. Benjamin W.Niebel, Andris Freivalds, Methods, standards & Work Design, McGraw hill, Eleventh edition, 2002.
2. ILO, Introduction to Work Study, Oxford and IBH publishing , 2001
3. Maynard H.B, Industrial Engineering Hand book,McGraw-Hill,2001

MA3201	MATHEMATICS III	LT P C
	(Common to all branches of B.E. / B.Tech Programmes)	3 1 0 4

AIM:

To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

OBJECTIVES:

- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic

UNIT I METAL CASTING PROCESSES 9

Sand casting – Sand moulds - Type of patterns – Pattern materials – Pattern allowances – Types of Moulding sand – Properties – Core making – Methods of Sand testing – Moulding machines – Types of moulding machines - Melting furnaces – Working principle of Special casting processes – Shell, investment casting – Ceramic mould – Lost Wax process – Pressure die casting – Centrifugal casting – CO₂ process – Sand Casting defects – Inspection methods

UNIT II JOINING PROCESSES 9

Fusion welding processes – Types of Gas welding – Equipments used – Flame characteristics – Filler and Flux materials - Arc welding equipments - Electrodes – Coating and specifications – Principles of Resistance welding – Spot/butt, seam welding – Percussion welding - Gas metal arc welding – Flux cored – Submerged arc welding – Electro slag welding – TIG welding – Principle and application of special welding processes - Plasma arc welding – Thermit welding – Electron beam welding – Friction welding – Diffusion welding – Weld defects – Brazing and soldering process – Methods and process capabilities – Filler materials and fluxes – Types of Adhesive bonding.

UNIT III BULK DEFORMATION PROCESSES 9

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – Characteristics of the process – Types of Forging Machines – Typical forging operations – Rolling of metals – Types of Rolling mills - Flat strip rolling – Shape rolling operations – Defects in rolled parts - Principle of rod and wire drawing - Tube drawing — Principles of Extrusion – Types of Extrusion – Hot and Cold extrusion — Equipments used.

UNIT IV SHEET METAL PROCESSES 9

Sheet metal characteristics - Typical shearing operations, bending and drawing operations – Stretch forming operations — Formability of sheet metal – Test methods – Working principle and application of special forming processes - Hydro forming – Rubber pad forming – Metal spinning – Introduction to Explosive forming, Magnetic pulse forming, Peen forming, Super plastic forming.

UNIT V MANUFACTURING OF PLASTIC COMPONENTS 9

Types of plastics - Characteristics of the forming and shaping processes – Moulding of Thermoplastics – Working principles and typical applications of - Injection moulding – Plunger and screw machines – Compression moulding, Transfer moulding - Typical industrial applications – Introduction to Blow moulding – Rotational moulding – Film blowing – Extrusion - Thermoforming, - Bonding of Thermoplastics.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Hajra Choudhury, “Elements of Workshop Technology, Vol. I and II”, Media Promoters Pvt Ltd., Mumbai, 2001
2. S.Gowri, P.Hariharan, and A.Suresh Babu, “Manufacturing Technology 1”, Pearson Education , 2008.

REFERENCES

1. B.S. Magendran Parashar & R.K. Mittal, “Elements of Manufacturing Processes”, Prentice Hall of India, 2003.
2. P.N. Rao, “Manufacturing Technology”, Tata McGraw-Hill Publishing Limited, II Edition, 2002.

3. P.C. Sharma, "A text book of production technology", S. Chand and Company, IV Edition, 2003.
4. Begman, 'Manufacturing Process', John Wiley & Sons, VIII Edition, 2005.
5. Serope Kalpajian, Steven R. Schmid, Manufacturing Engineering and Technology, Pearson Education, Inc. 2002 (Second Indian Reprint).
6. Beddoes. J and Bibby M.J, 'Principles of Metal Manufacturing Processes', Elsevier, 2006.
7. Rajput R.K, 'A text book of Manufacturing Technology', Lakshmi Publications, 2007.

ME3205

MECHANICS OF MACHINES

**LT P C
3 1 0 4**

OBJECTIVES:

- To understand the principles in the formation of mechanisms and their kinematics.
- To understand the effect of friction in different machine elements.
- To analyse the forces and torques acting on simple mechanical systems
- To understand the importance of balancing and vibration.

UNIT I KINEMATIC OF MECHANICS 10

Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – kinematics analysis in simple mechanisms – velocity and acceleration polygons – Analytical methods – computer approach – cams – classifications – displacement diagrams - layout of plate cam profiles – derivatives of followers motion – circular arc and tangent cams.

UNIT II GEARS AND GEAR TRAINS 9

Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains.

UNIT III FRICTION 8

Sliding and Rolling Friction angle – friction in threads – Friction Drives – Friction clutches – Belt and rope drives – brakes – Tractive resistance.

UNIT IV FORCE ANALYSIS 9

Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis – Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle – dynamic Force Analysis in simple machine members.

UNIT V BALANCING AND VIBRATION 9

Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines – free vibrations – Equations of motion – natural Frequency – Damped Vibration – bending critical speed of simple shaft – Torsional vibration – Forced vibration – harmonic Forcing – Vibration solution.

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

TEXT BOOKS

1. Ambekar A.G., "Mechanism and Machine Theory" Prentice Hall of India, New Delhi, 2007

2. Shigley J.E., Pennock G.R and Uicker J.J., "Theory of Machines and Mechanisms", Oxford University Press, 2003

REFERENCES

1. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
2. Ghosh.A, and A.K.Mallick, "Theory and Machine", Affiliated East-West Pvt. Ltd., New Delhi, 1988.
3. Rao.J.S. and Dukupatti R.V. "Mechanisms and Machines", Wiley-Eastern Ltd., New Delhi, 1992.
4. V.Ramamurthi, Mechanisms of Machine, Narosa Publishing House, 2002.
5. Robert L.Norton, Design of Machinery, McGraw-Hill, 2004.

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. IS12328 : 1988 Bevel Systems Part – 2 Spiral Bevel Gears.

CE3204

STRENGTH OF MATERIALS

**L T P C
3 0 0 3**

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 8

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic Constants – Volumetric strains – Stresses on inclined planes – Principal stresses and principal planes – Mohr's circle of stress.

UNIT II TRANSEVERSE LOADING ON BEAMS AND STRESSES IN BEAMS 13

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending - bending formula – bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT III TORSION 6

Stresses and deformation in circular and hollow shafts – Stepped shafts – Shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs.

UNIT IV DEFLECTION OF BEAMS 10

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

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9

3. Ronald L Rardin, Optimisation in Operations Research, Pearson, 2003
4. David R. Anderson, et al , An Introduction to Management Science – Quantitative approaches to Decision Making, Thomson,2003

ME2207

MANUFACTURING TECHNOLOGY LAB – I
(Only for Mechanical)

L T P C
0 0 3 2

OBJECTIVE

To gain hands on experience on working of general purpose machine tools and on various manufacturing processes.

UNIT I LATHE

- 1.1. Facing, plain turning and step turning
- 1.2. Taper turning using compound rest, Tailstock set over, etc
- 1.3. Single and Multi-start V thread, cutting and knurling
- 1.4. Boring and internal thread cutting.

UNIT II WELDING EXERCISES

- 2.1. Horizontal, Vertical and Overhead welding.
- 2.2. Gas Cutting, Gas Welding
- 2.3. Brazing - for demonstration purpose

UNIT III SHEET METAL WORK

- 3.1. Fabrication of sheet metal tray
- 3.2. Fabrication of a funnel

UNIT IV PREPARATION OF SAND MOULD

- 4.1. Mould with solid, split patterns
- 4.2. Mould with loose-piece pattern
- 4.3. Mould with Core

UNIT V PLASTIC MOULDING

- 5.1 Injection Moulding- for demonstration purpose

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS

1.	<i>Centre Lathe with accessories</i>	15
2.	<i>Welding</i>	
2.1	Arc welding machine	04
2.2	Gas welding machine	01
2.3	Brazing machine	01
3.	<i>Sheet Metal Work facility</i>	
3.1	Hand Shear 300mm	01
3.2	Bench vice	05
3.3	Standard tools and calipers for sheet metal work	05
4	Sand moulding Facility	
4.1	Moulding Table	05
4.2	Moulding boxes, tools and patterns	05
5	Plastic Moulding	

5.1	Injection Moulding Machine	01
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IM3203

WORK SYSTEM DESIGN LAB

L T P C
0 0 2 1

OBJECTIVE:

To understand the theory better and apply in practice, practical training is given in the following areas:

1. Graphic tools for method study
2. Peg board experiment
3. Stop watch time study
4. Performance rating exercise
5. Work sampling
6. MTM practice

TOTAL : 30 PERIODS

CE3207

STRENGTH OF MATERIALS LABORATORY

L T P C
0 0 3 2

OBJECTIVE:

To study the properties of materials when subjected to different types of Loading.

LIST OF EXPERIMENTS

1. Tension test on mild steel rod.
2. Double shear test on metals.
3. Torsion test on mild steel rod.
4. Impact test on metal specimen.
5. Hardness test on metals.
6. Compression test on helical spring
7. Deflection test on carriage spring.

TOTAL : 45 PERIODS

(Semester III – Common to all B.E/B.Tech Students)

(To be conducted as a Practical Paper by the Depts of English for 3 hrs per week)

OBJECTIVES:

- To improve the learners' oral fluency in English
- To help the learners acquire the readiness to speak in English
- To develop the sub-skills required for paper presentations and group discuss
- To help the learners improve their vocabulary related to specific fields of technology
- To facilitate the development of the learners' proficiency in meaningful interaction
- To provide them linguistic support for managing vital sub-functions of communication

COURSE CONTENT:**A) Phonetic practice (7 hrs)**

- English phonemes with special emphasis on the diphthongs
- Stress patterns for words that end with specific suffixes.
(*'ion'*, *'ic'* *'ical'* *'ious'*, *'ate'*, *'ise/-ize'*, *'fy'*, *'logy'*, *'ity'*)

B) Speech practice (8 hrs)

- Speaking on the themes by developing the hints provided.

The themes are:

1. Cloning
2. Artificial satellites
3. Renewable sources
4. Telecommunication
5. Cyber Revolution
6. Space research
7. Polythene pollution
8. Fossil fuels
9. Climate change
10. Ecological threats
11. Water resources
12. Nuclear technology
13. Scientific farming
14. Thermal power plants
15. Natural calamities
16. Robotics
17. Artificial intelligence
18. Role of Fibre Optics
19. Exploration of Mars
20. Gas turbines

**C) Group Quiz on technical aspects related to the themes (4hrs) D)
Language Functions (8 hrs)**

1. comparing and contrast
2. reporting the conversation of others
3. talking about future plans and intentions
4. giving reasons
5. expressing preferences
6. quantifying
7. expressing certainty and uncertainty
8. expressing opinions and impressions
9. making suggestions
10. expressing assumptions
11. evaluating options
12. hypothesising/deducing
13. defending a point of view

E) Seminar presentation on the themes allotted (18 hrs)

PROCEDURE:

A) Phonetic practice

All the speech sounds should be taught. The learners should be given drills pronunciation of at least 30 words for each sound. While practicing stress pa they should be encouraged to identify as many words as possible for each endings.

B) Speech practice

Every student should be allowed to choose one theme more than 4 students in a section cannot choose the same theme). The teacher prepare at least 4 hints development tasks on each theme and should provide to each learner to speak on those hints related to his/ her theme (5 minutes). The may be supplied to the students in advance. When a student speaks, the class be encouraged to ask questions as well as note down the words related to the fields.

C) Group Quiz on technical phrases related to the themes.

The class should be divided into groups that specialize on a particular theme group should conduct a quiz (question & answer session) which will be answer by the other groups.

D) Language Functions

The teacher should build micro activities to develop the use of language required to handle these sub-functions of communication. In this, process, the learners should use to the linguistic elements needed for these functions.

E) Seminar presentation on the themes allotted

Each student should collect materials from books, journals and newspapers for his/her theme and prepare a short seminar paper. The presentation should be for minutes. It should be followed 'open house' during which others should come forward to question, clarify, supplement or evaluate.

RECORD LAY OUT:

Every student has to maintain a record in which he/she has to incorporate the following details.

1. First page containing learner details and the topic of specialization.
2. Twenty words for each phoneme
3. Twenty words with stress marks for each suffix ending
4. Vocabulary list (technical words and compound words) related to the 20 t identified for this semester.
5. Three news paper items, two journal items and three internet sources related to the special theme selected by the student. (To be pasted on the pages)
6. The Quiz questions of the group with expected answers.
7. The seminar paper presented by the learner with details about the open house
8. Notes of observation. (Details about any three seminar paper presentation others)

The record should be duly signed by the course teacher and submitted to the External Examiner for verification during the semester practicals.

MODE OF EVALUATION:

Internal Examiner (20 marks) (10 marks for the Record and 10 marks for seminar presentation)

External Examiner (80 marks)

The external practical* will consist of the following segments (7 minutes approx. for student)

1. Pronouncing sentences containing the target words
2. Deploying linguistic elements for language functions
3. Speaking on the hints
4. A conversation with the examiner on the special theme as worked out in the Record)

(*Every learner will be assessed with a different set of question which he/she will pick at random)

MA3211

PROBABILITY AND STATISTICS

**LT P C
3 1 0 4**

AIM:

This course aims at providing the required skill to apply the statistical tools in engineering problems.

OBJECTIVES:

- The students will have a fundamental knowledge of the concepts of probability.
- Have knowledge of standard distributions which can describe real life phenomenon.
- Have the notion of sampling distributions and statistical techniques used in management problems.

OBJECTIVES:

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

UNIT I INTRODUCTION 9 + 3

Units and dimensions, Properties of fluids – specific gravity, specific weight, viscosity, compressibility, vapor pressure and gas laws – Capillarity and surface tension – Flow characteristics: Concepts of system and control volume. Application of control volume to continuity equation, momentum equation and moment of momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS 9 + 3

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

UNIT III DIMENSIONAL ANALYSIS 7 + 2

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

UNIT IV ROTODYNAMIC MACHINES 12 + 4

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

UNIT V POSITIVE DISPLACEMENT MACHINES 8 + 3

Reciprocating pumps, indicator diagram. Work saved by air vessels. Rotary pumps. Classification. Working and performance curves.

T: 45 + 15 ,TOTAL : 60 PERIODS

TEXT BOOKS

1. Streeter V.L. and Wylie, E.B. Fluid Mechanics, McGraw Hill, 1983
2. Ramamritham, S. Fluid Mechanics, Hydraulics and Fluid Machines, Dhanpat Rai and Sons, Delhi 1988.

REFERENCES

1. Kumar, K.L. Engineering Fluid Mechanics(7th Edn.) Eurasia Publishing House (P)Ltd. New Delhi, 1995.
2. Bansal R.K. Fluid Mechanics and Hydraulic Machines. Laxmi Publications (P) Ltd. New Delhi.

ME2303**DESIGN OF MACHINE ELEMENTS**

L T P C
3 1 0 4

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

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS 12

Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties -- Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – 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

UNIT II DESIGN OF SHAFTS AND COUPLINGS 12

Design of solid and hollow shafts based on strength, rigidity and critical speed – Design of keys, key ways and splines - Design of crankshafts -- Design of rigid and flexible couplings.

UNIT III DESIGN OF TEMPORARY AND PERMANENT JOINTS 12

Threaded fasteners - Design of bolted joints including eccentric loading, Knuckle joints, Cotter joints – Design of welded joints, riveted joints for structures - theory of bonded joints.

UNIT IV DESIGN OF ENERGY STORING ELEMENTS 12

Design of various types of springs, optimization of helical springs -- rubber springs -- Design of flywheels considering stresses in rims and arms, for engines and punching machines.

UNIT V DESIGN OF BEARINGS AND MISCELLANEOUS ELEMENTS 12

Sliding contact and rolling contact bearings -- Design of hydrodynamic journal bearings, McKee's Eqn., Sommerfield Number, Raimondi & Boyd graphs, -- Selection of Rolling Contact bearings -- Design of Seals and Gaskets -- Design of Connecting Rod.

TUTORIAL = 15 L = 45 TOTAL: 60 PERIODS

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

TEXT BOOKS:

1. Shigley J.E and Mischke C. R., “Mechanical Engineering Design”, Sixth Edition, Tata McGraw-Hill , 2003.
2. Bhandari V.B, “Design of Machine Elements”, Second Edition, Tata McGraw-Hill Book Co, 2007.

REFERENCES:

1. Sundararamoorthy T. V, Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2003.
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:

2. HMT – “Production Technology”, Tata McGraw-Hill, 1998.

REFERENCES

1. Rao, P.N. “Manufacturing Technology”, Metal Cutting and Machine Tools, Tata McGraw–Hill, New Delhi, 2003.
2. P.C. Sharma, “A Text Book of Production Engineering”, S. Chand and Co. Ltd, IV edition, 1993.
3. Shrawat N.S. and Narang J.S, ‘CNC Machines’, Dhanpat Rai & Co., 2002.
4. P.N.Rao, ‘CAD/CAM Principles and Applications’, TATA Mc Craw Hill, 2007.
5. M.P.Groover and Zimers Jr., ‘CAD/CAM’ Prentice Hall of India Ltd., 2004.
6. Milton C.Shaw, ‘Metal Cutting Principles’, Oxford University Press, Second Edition, 2005.
7. Rajput R.K, ‘A text book of Manufacturing Technology’, Lakshmi Publications, 2007.
8. Philip F.Ostwald and Jairo Munoz, ‘Manufacturing Processes and systems’, John Wiley and Sons, 9th Edition,2002.
9. Mikell P.Groover, ‘Fundamentals of Modern Manufacturing, Materials, Processes and Systems’, John Wiley and Sons, 9th Edition,2007.
10. Chapman. W. A. J and S.J. Martin, Workshop Technology, Part III, Viva Books Private Ltd., 1998

ME3215

THERMODYNAMICS

L T P C

4 0 0 4

AIM:

To impart the importance of thermal science aspects in the field of manufacturing engineering.

OBJECTIVES:

- To understand the basic laws of thermodynamics and heat transfer.
- To understand the principle of operation of thermal equipments like IC engine, boilers, turbine and refrigerator etc.

UNIT I BASIC CONCEPTS OF THERMODYNAMICS

12

Thermodynamics and Energy – Systems – Types and properties - State and Equilibrium - Processes and Cycles – Forms of Energy – Temperature and Zeroth law of Thermodynamics – Pure substances – Phase change processes of pure substances – Property diagrams – Internal energy – Enthalpy – Energy transfer by Heat, Work and Mass – Applications.

UNIT II FIRST AND SECOND LAW OF THERMODYNAMICS

12

First law of thermodynamics – Energy balance for closed systems and steady flow systems – Applications of First law of Thermodynamics – Energy balance for Unsteady flow processes – Second law of Thermodynamics – Entropy – Carnot principles – Change in Entropy – Entropy and irreversibility -Applications.

UNIT III HEAT ENGINES

12

Internal Combustion Engines – C.I and S.I Engines – Four Stroke and Two Stroke Engines – Gas Turbines - Boilers – Fire Tube Boiler & Water Tube Boilers , Boiler Accessories and Components. Turbines – Impulse Turbine and Reaction Turbine , Turbine Components - Refrigeration Cycle – Vapour Compression & Vapour Absorption System ,Gas Refrigeration System – Environmental friendly Refrigerants – Air Conditioning.

UNIT IV GASES AND VAPOUR MIXTURES 12

Ideal and Real gases – Vander waals equations – Reduced property – Compressibility chart -Properties of mixture of gases – Dalton’s law and Gibbs – Dalton law – Internal energy, Enthalpy and specific heats of gas mixtures.

UNIT V HEAT TRANSFER 12

Conduction – Plane Wall, Cylinder system, Composite Walls – Critical insulation thickness – Simple, fins convection – Free convection and forced convection – Flow over Flat plates and Flow through Pipes – Radiation – Black Body, Grey Body Radiation.

TOTAL: 60 PERIODS

TEXT BOOKS

1. “Thermodynamics an Engineering Approach” Yunus A. Cengel and Michael A.Boles, Tata McGraw hill, Fourth edition, 2004.
2. “Fundamentals of Engineering Thermodynamics” Michael J.Moran, Howard N.Shapiro, John wiley & Sons, Fourth editon,2000.

REFERENCES

1. “A Text book of Engineering Thermodynamics” R.K.Rajput , Laxmi puplication(P) Ltd. ,Third Edition, 2007.
2. “Engineering Thermodynamics” P.K.Nag, Tata McGraw hill, Third edition, 2005
3. “A course in Thermal engineering” S.Domkundwar, C.P.Kothandaraman, Dhanpat rai & co (p) Ltd, Fifth edition, 2000.

**IM3251 ENGINEERING ECONOMY, COSTING AND ACCOUNTING LT P C
3 1 0 4**

OBJECTIVES:

To impart knowledge in the areas of cost estimation, pricing of products, cost control methods and principles of accounting.

After undergoing the course, the students will be able to estimate cost of products, analyze product cost and suggest cost reduction measure.

UNIT I INTRODUCTION 6

Objectives of Managerial Economics, Firm, Cost Estimation, Costing, Cost Accounting, Factors Influencing Managerial Decisions & Theoretical Concepts, Classification and Elements of cost.

UNIT II PRODUCTION ANALYSIS AND PRICING 9

Production Function-Least Cost Combination of Inputs-Factor Productivities & Return to Scale-Determinants of Price-Pricing under different objectives and Market Structures-Price Discrimination & Pricing methods in practice.

UNIT III ESTIMATION 10

Estimation of Material, Labor and Overhead Cost, Allocation of Overheads. Estimation for different types of jobs.

UNIT IV COSTING 10

Job Costing-Operating Costing-Process Costing- Standard Costing (Variance Analysis)

UNIT V ACCOUNTING

10

Balance Sheet-Profit & Loss Statement-Evaluation of Investment decisions- Average Rate of Return-Payback Period-Net Present Value & IRR.

L: 45 T: 15 TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jawaharlal, Cost Accounting, TMH, 1996
2. A. Ramachandran Aryasry & VV.Ramana Murthy, Engg Economics & Financial Accounting, TMH, NewDelhi, 2004.

REFERENCES:

1. James.C.Van Home, "Fundamentals of financial Management", PHI, NewDelhi, 2004.
2. V.L.Mote, Samuel Paul & G.S.Gupta, Managerial Economics-Concepts & Cases, TMH Co, NewDelhi, 1989
3. T.P.Banga & S.C.Sharma, Mechanical Estimating and Costing, Khanna Publishers, 1984.

CE3218 FLUIDS MECHANICS AND MACHINERY LABORATORY

**LT P C
0 0 3 2**

AIM:

To perform experiments on various types of pumps and turbines to understand their characteristics.

OBJECTIVES:

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

UNIT I FLOW MEASUREMENT

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

UNIT II PUMPS

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

UNIT III TURBINES

Determination of performance characteristics of turbines – reaction turbines and impulse turbines.

TOTAL : 45 PERIODS

REFERENCE

1. CWR, Hydraulics Laboratory Manual,2004

ME2258

MANUFACTURING TECHNOLOGY LAB II

L T P C

0 0 3 2

OBJECTIVE

To give a practical hands on exposure to students in the various metal cutting operations using commonly used machine tools

EXERCISES

1. Two or More Measurements in Metal Cutting Experiment (Example: Shear Angle, Cutting Force, Tool Wear etc.)
2. One or More Exercises in Shaper, Slotter, Planner, Drilling, Milling Machines (Example: Round to Square, Dovetail in shaper, Internal keyway cutting in Slotter, Round to square in Planner, Drilling, reaming and tapping in Drilling machine, Gear Milling and Keyway milling in Milling machine.)
3. Two or More Exercises in Grinding / Abrasive machining (Example: Surface Grinding, Cylindrical Grinding.)
4. Two or More Exercises in Assembly of Machined Components for different fits. (Example: Parts machined using Lathes, Shapers, Drilling, Milling, and Grinding Machines etc.)
5. One or More Exercises in Capstan or Turret Lathes
6. One or More Exercises in Gear Machining (Example: Gear Milling, Gear Hobbing etc.)

LIST OF EQUIPMENT

(For a batch of 30 students)

1.	Centre Lathes	-	2 Nos.
2.	Turret and Capstan Lathes	-	1 No
3.	Horizontal Milling Machine	-	1 No
4.	Vertical Milling Machine	-	1 No
5.	Surface Grinding Machine	-	1 No.
6.	Cylindrical Grinding Machine	-	1 No.
7.	Shaper	-	2 Nos.
8.	Slotter	-	1 No.
9.	Planner	-	1 No.
10.	Radial Drilling Machine	-	1 No.
11.	Tool Dynamometer	-	1 No
12.	Gear Hobbing Machine	-	1 No
13.	Tool Makers Microscope	-	1 No

TOTAL: 45 PERIODS

GE3323 COMMUNICATION SKILLS AND TECHNICAL SEMINAR – II

L T P C

0 0 3 2

(Semester IV for all the B.E/ B.Tech students)

(To be conducted as a Practical Paper by the Depts of English for 3 hrs per week)

OBJECTIVES:

- To improve the learners' oral fluency in English
- To help the learners acquire the readiness to speak in English
- To develop the sub-skills required for paper presentations and group discussions
- To help the learners improve their vocabulary related to specific fields of technology
- To facilitate the development of the learners' proficiency in meaningful interaction
- To provide them linguistic support for managing vital sub-functions of communication

COURSE CONTENT:

A) Phonetic practice (7 hrs)

All the English phonemes with special emphasis on the following

- 1) /æ/ and /eɪ/
- 2) /e/ and /i/
- 3) First syllable and second syllable stress
- 4) Three different ways of pronouncing 'ed' past tense endings
eg. '*played*', '*walked*', '*wanted*'
- 5) Correct pronunciation of commonly used words (A list of 1000 words will be suggested by the university)
- 6) Silent letters

C) Speech practice (8 hrs)

- Speaking on the themes by developing the hints provided.

The themes are:

1. Indian space missions
2. Converting agricultural wastes for useful purposes
3. Developments in transportation
4. Technology and agriculture
5. Impact of global warming
6. Desalination of water
7. Technology for national security
8. Industrial development and ecological issues
9. Applications of nano technology
10. Hazards of e-waste

D) Preparation of power point frames on the given topic (2hrs)

(Only pictures, graphs, equations should be given through power point and not the text of the presentation as such)

D) Language Functions (14 hrs)

Reporting the conversation of others
Using the third conditional
Expressing agreement and disagreement
Numerical expressions
Describing manner and frequency
Evaluating different standpoints
Developing an argument
Describing daily routines, events, and weather

D) Seminar presentation on the themes allotted using power point frames (14 hrs)

PROCEDURE:

A) Phonetic practice

The learners should be given drills in the pronunciation of at least 30 words for each sound. While practising stress patterns, they should be encouraged to identify as many words as possible for each pattern.

B) Speech practice

Every student should be allowed to choose one theme to specialize in. (However not more than 7 students in a section can choose the same theme). The teacher has to prepare at least 4 hints development tasks on each theme and should provide chance to each learner to speak on those hints related to his/ her theme (5 minutes). The hints may be supplied to the students in advance. When a student speaks, the class should be encouraged to ask questions as well as note down the words related to the different fields.

C) Language Functions

The teacher should build micro activities to develop the use of language required to handle these sub-functions of communication. In the process, the learners should get used to the linguistic elements needed for these functions.

D) Seminar presentation on the themes allotted

Each student should collect materials from books, journals and newspapers for his/her theme and prepare a short seminar paper. The presentation should be for 10 minutes using power point frames. It should be followed by an 'open house' during which others should come forward to question, clarify, supplement or evaluate.

RECORD LAY OUT:

Every student has to maintain a record in which he/she has to incorporate the following details.

1. First page containing learner details and the topic of specialization.
2. Twenty words for each phoneme /ae/, /ei/, /i/ and /e/
 - a. Fifty words with first syllable stress and fifty for second syllable stress (The learner will be required to pronounce some of these words during the practical exam)
3. Vocabulary list (technical words and compound words) related to the 10 themes identified for this semester.
4. Three newspaper items, two journal items and three internet sources related to the special theme selected by the student. (To be pasted on the pages)
5. The seminar paper presented by the learner with a soft copy of the power point frames.
6. Notes of observation. (Details about any two seminar paper presentations by others)

The record should be duly signed by the course teacher and submitted to the external Examiner for verification during the semester practicals.

MODE OF EVALUATION:

Internal Examiner (20 marks) (10 marks for the Record and 10 marks for the seminar presentation) External Examiner (80 marks)

The external practicals* will consist of the following segments (7 minutes approx. for each student)

1. Pronouncing the target words.
2. Deploying linguistic elements for language functions
3. Speaking on the hints
4. A conversation with the examiner on the special theme as worked out in the Record)

(*Every learner will be assessed with a different set of question which he/she will choose at random)

TOTAL : 45 PERIODS

IM3301	MANAGEMENT AND ENTREPRENEURSHIP	LT P C
		3 0 0 3
UNIT I	MANAGEMENT	9
Introduction – Meaning – nature and characteristics of Management, Scope and Functional areas of management – Management as a science, art of profession – Management & Administration – Roles of Management, Levels of Management, Development of Management Thought – early management approaches – Modern management approaches.		
UNIT II	PLANNING	9
Nature, importance and purpose of planning process – Objectives – Types of plans (Meaning Only) – Decision making – Importance of planning – steps in planning & planning premises – Hierarchy of plans.		
UNIT III	ORGANIZING AND STAFFING	9
Nature and purpose of organization – Principles of organization – Types of organization – Departmentation – Committees- Centralization Vs Decentralization of authority and responsibility – Span of control – MBO and MBE (Meaning Only) Nature and importance of staffing–Process of Selection & Recruitment (in brief).		
UNIT IV	DIRECTING & CONTROLLING	9
Meaning and nature of directing – Leadership styles, Motivation Theories, Communication – Meaning and importance – coordination, meaning and importance and Techniques of Co –Ordination. Meaning and steps in controlling – Essentials of a sound control system – Methods of establishing control (in brief).		
UNIT V	ENTREPRENEUR	9
Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur - an emerging Class. Concept of Entrepreneurship – Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.		

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Principles of Management – P.C.Tripathi, P.N.Reddy – Tata McGraw Hill.
2. Dynamics of Entrepreneurial Development & Management – Vasant Desai – Himalaya Publishing House
3. Entrepreneurship Development – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (2 & 4).

REFERENCES:

1. Management Fundamentals – Concepts, Application, Skill Development – Robers Lusier – Thomson – Entrepreneurship Development – S.S.Khanka – S.Chand & Co.
2. Management – Stephen Robbins – Pearson Education/PHI – 17th Edition, 2003.

IM3302**OPERATIONS RESEARCH – II****LT P C
3 1 0 4****OBJECTIVE**

To impart knowledge on some probabilistic optimization techniques

UNIT I DETERMINISTIC INVENTORY MODELS 12

Purchase model with no shortages – manufacturing model with no shortage – Purchase model with shortage – Manufacturing model with shortages –model with price breaks

UNIT II PROBABILISTIC INVENTORY MODELS 12

Probabilistic inventory model – Reorder point model – multi product-Selective Inventory control.

UNIT III QUEUING THEORY 12

Queuing theory terminology – Single server, multi server, Limited queue capacity – applications – Markov chains

UNIT IV DECISION THEORY 12

Decision making under certainty – Decision making under risk – Decision making under uncertainty – Decision tree analysis – MCDM – AHP. Game Theory - Two person zero sum games, pure and mixed strategies – graphical solution – solving by LP.

UNIT V REPLACEMENT MODELS 12

Replacement models – Money value, present worth factor and discount rate.

TOTAL: 60 PERIODS**TEXT BOOK**

1. Philips, Ravindran and Solberg, Operations Research, John Wiley,2002

REFERENCES

1. Hamdy A Taha, Operations Research – An Introduction, Prentice Hall india,2003
2. Ronald L Rardin, Optimisation in Operations Research, Pearson, 2003

UNIT I PRODUCTIVITY 7

Definition of productivity, individual enterprises, task of management Productivity of materials, land, building, machine and power. Measurement of productivity, factors affecting the productivity, productivity improvement programmes, wages and incentives (simple numerical problems)

UNIT II WORK STUDY 13

Definition, objective and scope of work study. Human factor in work study. Work study and management, work study and supervision, work study and worker.

INTRODUCTION TO METHOD STUDY: Definition, objective and scope of method study, activity recording and exam aids. Charts to record moments in shop operation – process charts, flow process charts, travel chart and multiple activity charts.(With simple problems)

UNIT III MICRO AND MEMO MOTION STUDY 8

Charts to record moment at work place – principles of motion economy, classification of moments two handed process chart, SIMO chart, and micro motion study. Development, definition and installation of the improved method, brief concept about synthetic motion studies.

UNIT IV INTRODUCTION TO WORK MEASUREMENT 8

Definition, objective and benefit of work measurement. Work measurement techniques. Work sampling: need, confidence levels, sample size determinations, random observation, conducting study with the simple problems.

UNIT V TIME STUDY 9

Time Study, Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating & standard Rating, standard performance, scale of rating, factors of affecting rate of working, allowances and standard time determination. Predetermined motion time study – Method time measurement (MTM)

TOTAL : 45 PERIODS

TEXT BOOKS:

1. ILO, Introduction to work study - III Revised Edition, 1981
2. Motion and Time study - Ralph M Barnes; John Wiley, 8th Edition, 1985.
3. Engineered work Measurement - Wledon, ELBS , 1991 Marvin E. Mundel- Motion and Time study, PHI, 1st edition

REFERENCES:

1. Human Factors in Engineering Design - S Sanders and E J McCormick, 6th Edition, Mc Graw Hill
2. Work Study and Ergonomics - S Dalela and Sourabh, – Chand Publishers, 3rd edition.
3. Industrial Engineering Hand book Maynard –

METHOD STUDY

1. Recording Techniques: Preparing the following charts and diagrams (Minimum 3 Charts)
Outline process chart
Multiple Activity Chart
Flow process chart and Flow diagram
String diagram,
2. Experiments on the Application of principle of motion economy Two handed process chart
3. Exercises on conducting method study for assembling simple components and office work.
4. Development of Layout plans using SLP technique
5. Experiments on Line balancing.

WORK MEASUREMENT

6. Rating practice using walking simulator
7. Rating practice using pin board assembly
8. Rating practice for dealing a deck of cards
9. Rating practice for marble collection activity
10. Determining the standard time for simple operations using stopwatch time study
11. Exercises on estimating standard time using PMTS.
12. Determination of standard time using PDA device and time study software
13. Experiments on office work measurement through work sampling
14. Measurement of parameters (heart beat rate, calorie consumption) using walking simulator
15. Measurement of parameters (heart beat rate, calorie consumption, revolutions per minute) using ergometer Effect of Noise, Light, Heat on human efficiency in work environments.

REFERENCES:

1. Work Study - Ralph & Barnes
2. Introduction to Work Study - ILO

IM3309**TECHNICAL SEMINAR I****LT PC
0 0 2 1**

To enrich the communication skills of the student and presentations of technical topics of interest, this course is introduced. In this course, a student has to present three Technical papers or recent advances in engineering/technology that will be evaluated by a Committee constituted by the Head of the Department.

TOTAL : 30 PERIODS**IM3311****MULTI VARIATE STATISTICAL ANALYSIS****L T P C**

OBJECTIVE:

To impart knowledge on applications of Multi Variate Statistical analysis.

UNIT I REGRESSION AND CORRELATION 9

Simple Regression, and Correlation – estimation using the regression line, correlation analysis, Multiple Regression and Canonical Correlation analysis – finding the multiple regression equation, modeling techniques, Making inferences about population parameters

UNIT II MULTIVARIATE NORMAL 9

An overview of multivariate methods, Multivariate normal distribution, Eigen values and Eigen vectors

UNIT III FACTOR ANALYSIS 9

Principal components analysis – objectives, estimation of principal components, testing for independence of variables, Factor analysis model – factor analysis equations and solution

UNIT IV DISCRIMINANT ANALYSIS 9

Discriminant analysis – discrimination for two multi variate normal populations- Discriminant rules –Discriminant Functions.

UNIT V CLUSTER ANALYSIS 9

Cluster analysis – clustering methods, Multivariate analysis of variance

TOTAL : 45 PERIODS

TEXT BOOK:

1. Dallas E Johnson, Applied multi variate methods for data analysis, Duxbury Press (1998)

REFERENCE:

1. Richard I Levin, Statistics for Management, PHI (2000)

IM3312 PRINCIPLES OF COMPUTER INTEGRATED MANUFACTURING L T P C

3 0 0 3

OBJECTIVE:

To provide some aspects of Fixed, Flexible and integrated automation along with their applications

UNIT I GT AND FMS 9

Part families, production flow analysis, cellular manufacturing, ROC, Flexible manufacturing systems- components, FMS applications, FMS analysis – bottleneck model.

UNIT II	TRANSFER LINES	9
Automated production lines – applications, Analysis – with and without buffers automated assembly systems, line unbalancing concept.		
UNIT III	MANUFACTURING SUPPORT SYSTEMS	9
Product design and CAD, CAD/CAM and CIM, Computer aided process planning-variant and generative approaches, Concurrent engineering and design for manufacture, Lean production, Agile manufacturing.		
UNIT IV	FUNDAMENTALS OF COMMUNICATIONS	9
Information Communications matrix, Computer communications, Network architecture, Tools and techniques.		
UNIT V	DATABASE AND CIM MANAGEMENT	9
Manufacturing data, database technology, Database management, Management OF CIM – role, cost justification, expert systems		
		TOTAL: 45 PERIODS

REFERENCES:

1. Mickel P Groover, Automation production systems and computer integrated manufacturing, PHI, second edition, 2003.
2. S.Kant Vajpayee, Principles of Computer-Integrated Manufacturing, PHI, 2005

IM3313	RELIABILITY ENGINEERING	LT P C
		3 0 0 3

OBJECTIVE:

To cover the basic concepts of reliability, reliability estimation, and reliability management

UNIT I	RELIABILITY CONCEPTS	6
Reliability definition – Reliability function – Graphical representation – a priori, a posteriori probabilities of survival. Component mortality – Mortality curve – Useful life – Reliability mathematics.		
UNIT II	FAILURE DATA MODELING	13
Failure data requirements – Measures of reliability: Failure rate, MTBF, MTTF – Median time to failure – Comparison of measures of central tendency – Design life – Performance parameters using histogram – Survival curves – Failure time distributions Variable failure rates – Ranking of data – Probability plotting: Binomial, Exponential, Weibull hazard plotting – Goodness of fit: Chi square test – Kolmogorov Smirnov test – Confidence intervals.		
UNIT III	RELIABILITY PREDICTION AND MODELING	13
Series – parallel configurations – Redundant systems – Standby systems – K out of n redundancy – Reliability of complex systems: RBD approach – Baye’s decomposition method – Cut and tie sets – Fault tree analysis – Markov model – Software reliability prediction and measurement.		

UNIT IV RELIABILITY MANAGEMENT 8

Reliability in design – limitations – Reliability life testing – Reliability growth monitoring – Reliability allocation – Reliability Centered Maintenance (RCM) – Replacement models: Items that deteriorate with time – Items which fail completely – Economic life of asset – Spares planning – System availability – Restorability demonstration.

UNIT V RISK ASSESSMENT 5

Perception of risk and ALARP – Measurement of risk – Hazard identification: HAZOP, HAZID – FMEA – Probabilistic Risk Assessment. (PRA).

TOTAL : 45 PERIODS

REFERENCES:

1. An introduction to, “Reliability and Maintainability Engineering”- Charles E.Ebeling, TMH, 2000.
2. Practical Reliability Engineering – Patrick D.T.O’Corner John Wiley & Sons Ltd.,2003.
3. Reliability for Technology, Engineering and Management”, Paul Kales, Prentice Hall, New Jersey, 1998.

**IM3314 SUPPLY CHAIN MANAGEMENT L T P C
3 0 0 3**

UNIT I BUILDING A STRATEGIC FRAME WORK TO ANALYSE SUPPLY CHAINS 7

Supply chain stages and decision phases process view of a supply chain. Supply chain flows. Examples of supply chains. Competitive and supply chain strategies. Achieving strategic fit. Expanding strategic scope. Drivers of supply chain performance. Framework for structuring drivers – Inventory, Transportation, Facilities, Information. Obstacles to achieving fit. Case discussions.

UNIT II DESIGNING THE SUPPLY CHAIN NETWORK 10

Distribution Networking – Role, Design. Supply Chain Network (SCN) – Role, Factors, Framework for Design Decisions.

FACILITY LOCATION AND NETWORK DESIGN

Models for facility location and capacity allocation. Impact of uncertainty on SCN – discounted cash flow analysis, evaluating network design decisions using decision using decision trees. Analytical problems.

UNIT III PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN 6

Review of inventory concepts. Trade promotions, Managing multi-echelon cycle inventory, safety inventory determination. Impact of supply uncertainty aggregation and replenishment policies on safety inventory. Optimum level of product availability; importance factors. Managerial levers to improve supply chain profitability.

UNIT IV SOURCING, TRANSPORTATION AND PRICING PRODUCTS 6

Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration.

SOURCING, TRANSPORTATION AND PRICING PRODUCTS

Role of transportation, Factors affecting transportation decisions. Modes of transportation and their performance characteristics. Designing transportation network. Trade-off in transportation design. Tailored transportation, Routing and scheduling in transportation. International transportation. Analytical problems. Role Revenue Management in the supply chain, Revenue management for: Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts.

UNIT V COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN 6

Co-ordination in a supply chain: Bullwhip effect. Obstacles to coordination. Managerial levers to achieve co-ordination, Building strategic partnerships.

COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN

The role of IT supply Chain, The Supply Chain IT framework, CRM, Internal SCM, SRM. The role of E-business in a supply chain, The E-business framework, E-business in practice. Case discussion.

EMERGING CONCEPTS 10

Reverse Logistics; Reasons, Activities, Role. RFID Systems; Components, applications, implementation. Lean supply chains, Implementation of Six Sigma in Supply Chains.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Supply Chain Management – 2001, Strategy, Planning & Operation. Sunil Chopra & Peter Meindl; Pearson Education Asia, ISBN: 81-7808-272-1.

REFERENCEBOOKS:

1. Supply Chain Redesign – Transforming Supply Chains into Integrated Value Systems -Robert B Handfield, Ernest L Nichols, Jr., 2002, Pearson Education Inc, ISBN: 81-297-0113-8
2. Modelling the Supply Chain -Jeremy F Shapiro, Duxbury;, 2002, Thomson Learning, ISBN 0-534-37363
3. Designing & Managing the Supply Chain -David Simchi Levi, Philip Kaminsky & Edith Simchi Levi;; Mc Graw Hill
4. Going Backwards Reverse Logistics Trends and Practices -Dr. Dale S. Rogers,Dr. Ronald S. Tibben-Lembke,University of Nevada, Reno, Center for Logistics Management.

IM3315

OPERATIONS MANAGEMENT

LT P C

3 0 0 3

UNIT I

6

Operations Management Concepts: Introduction, Historical development, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity, International dimensions of productivity, The environment of operations, Production systems decisions- a look ahead.

UNIT II OPERATIONS DECISION MAKING

10

Introduction, Management as a science, Characteristics of decisions, Framework for decision making, Decision methodology, Decision support systems, Economic models, Statistical models.

SYSTEM DESIGN AND CAPACITY

Introduction, Manufacturing and service systems, Design and systems capacity, Capacity planning.

UNIT III FORECASTING DEMAND 10

Forecasting objectives and uses, Forecasting variables, Opinion and Judgemental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts.

AGGREGATE PLANNING AND MASTER SCHEDULING: Introduction- planning and scheduling, Objectives of aggregate planning, Aggregate planning methods, Master scheduling objectives, Master scheduling methods.

UNIT IV MATERIAL AND CAPACITY REQUIREMENTS PLANNING 6

Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities.

UNIT V SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES 13

Introduction, PAC, Objectives and Data requirements, Scheduling strategy and guide lines, Scheduling methodology, priority control, capacity control.

SINGLE MACHINE SCHEDULING: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule, minimizing the number of tardy jobs.

FLOW –SHOP SCHEDULING: Introduction, Johnson’s rule for ‘n’ jobs on 2 and 3 machines, CDS heuristic.

JOB-SHOP SCHEDULING: Types of schedules, Heuristic procedure, scheduling 2 jobs on ‘m’ machines.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Operations Management -Monks, J.G., McGraw-Hill International Editions, 1987.
2. Production and Operations Management -Pannerselvam. R., 2nd edition PHI.
3. Productions & operations management - Adam & Ebert.5th edition PHI

REFERENCE S:

1. Modern Production/Operations Management -Buffa, Wiely Eastern Ltd., 4th edition
2. Production and Operations Management, Chary, S.N., Tata-McGraw Hill., 3rd edition
3. Operations management - James Dilworth. PHI, 3rd edition
4. Operations Management -Lee J Karjewski and Larry P Ritzman,– strategy and Analysis, 6th Edn, Pearson Education Asia

OBJECTIVE:

- To apply the concepts of various techniques covered in the areas of Industrial Engineering in a given practical situation. Projects shall be assigned In the following areas:
 1. Forecasting and Aggregate Planning
 2. Materials Requirement Planning and Capacity Planning
 3. Transportation and Distribution of goods
 4. Group technology and Cellular manufacturing
 5. Production and Project Scheduling
 6. Quality Control
 7. Plant Layout Design
 8. Methods improvement in manufacturing and service organization

TOTAL: 90 PERIODS

OBJECTIVE:

To give adequate exposure to applications of software packages in the areas of Applied Statistics, Operations Research and Reliability

UNIT-I Basic Statistics

1. Mean, Median, Mode, measures of dispersion

UNIT- II Use of Spreadsheet

2. Look up tables, Statistics

UNIT- III Use of RELIASOFT

3. Data analysis

UNIT- IV Simple Operation Research Programs

4. Initial Solution of TP, Inventory Price Break Models

UNIT- V Optimization Package (TORA /LINDO)

5. LP Models
6. Transportation
7. Assignment
8. Maximal flow
9. Minimal spanning tree
10. Shortest route
11. Network scheduling

TOTAL: 45 PERIODS

AIM:

To enhance the overall capability of students and to equip them with the necessary Communication Skills and Soft Skills that would help them excel in their profession.

OBJECTIVES:

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

I. PC based session**A. Career Lab (15 periods) Viewing and discussing audio-visual materials**

1. **Resume / Report Preparation / Letter Writing:** (3)
Letter writing – Job application with Resume - Project report - Email etiquette.
2. **Presentation skills:** (3)
Elements of effective presentation – Structure of presentation - Presentation tools – Body language.
3. **Soft Skills:** (3)
Time management – Stress management – Assertiveness – Negotiation strategies, Psychometrics - Analytical and logical reasoning.
4. **Group Discussion:** (3)
Group discussion as part of selection process, Structure of group discussion – Strategies in group discussion – Mock group discussions.
5. **Interview Skills:** (3)
Kinds of interviews – Interview techniques – Corporate culture – Mock interviews.

TOTAL 30 PERIODS**II. Class Room Session**

1. **Resume / Report Preparation / Letter writing:** Students prepare their own resume and report. (9)
2. **Presentation Skills:** Students make presentations on given topics. (12)
3. **Group Discussion:** Students participate in group discussions. (12)
4. **Interview Skills:** Students participate in Mock Interviews (12)

Note: Classroom sessions are practice sessions.

REFERENCES:

1. Prakash P, Verbal and Non-Verbal Reasoning, Macmillan India Ltd., 2nd Edition, New Delhi, 2004.
2. John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi 2004.
3. Paul V Anderson, Technical Communication, Thomson Wadsworth , 6th Edition, New Delhi, 2007.

4. Edgar Thorpe and Showick Thorpe, Objective English, Pearson Education, 2nd Edition, New Delhi 2007.
5. David Evans, Decision maker, CUP, 1997

Lab Requirement:

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

IM3401	DESIGN OF EXPERIMENTS	L	T	P	C
		3	1	0	4

OBJECTIVE:

To impart knowledge on statistical tools for industrial experimentation related to selection of product and process parameters in various environments.

UNIT I CONCEPTS AND TERMINOLOGY 5

Review of hypothesis testing – P Value, “t” Vs paired “t” test, simple comparative experiment, planning of experiment – steps. Terminology - factors, levels, variables, Design principles – replication, randomization, blocking, confounding, Analysis of variance, sum of squares, degrees of freedom.

UNIT II SINGLE FACTOR EXPERIMENTS 10

Completely randomized design, Randomized block design, effect of coding the observations, Latin Square design, orthogonal contrasts, comparison of treatment means – Duncan’s multiple range test, Newman- Keuel’s test, Fisher’s LSD test, Tukey’s test.

UNIT III FACTORIAL EXPERIMENTS 10

Main and interaction effects, Rules for sum of squares and expected mean square, two and three factor full factorial design, 2^k designs with two and three factors, Yate’s algorithm, practical applications.

UNIT IV SPECIAL EXPERIMENTAL DESIGNS 10

Blocking and confounding in 2^k design, nested design, split – plot design, two level fractional factorial design, fitting regression models, introduction to response surface methods- Central composite design.

UNIT V TAGUCHI TECHNIQUES 10

Introduction, Orthogonal designs, data analysis using ANOVA and response graph, parameter design – noise factors, objective functions (S/N ratios), multi-level factor OA designs, applications.

TOTAL : 45 +15 = 60 PERIODS

TEXT BOOK :

1. Douglas C.Montgomery, Design and Analysis of Experiments, John Wiley & Sons,2005

REFERENCES :

1. Angela M. Dean and Daniel Voss, Design and Analysis of Experiments, Springer texts in Statistics, 2000.
2. Philip J. Ross, Taguchi Techniques for Quality Engineering, Prentice Hall, 1989.

GE3403

TOTAL QUALITY MANAGEMENT

LT P C

3 0 0 3

AIM:

To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES:

- To understand the various principles, practices of TQM to achieve quality
- To learn the various statistical approaches for quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems.

UNIT I INTRODUCTION 9

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

UNIT II TQM PRINCIPLES 9

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

UNIT III TQM TOOLS & TECHNIQUES I 9

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

UNIT IV TQM TOOLS & TECHNIQUES II 9

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

UNIT V QUALITY SYSTEMS 9

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

TOTAL : 45 PERIODS

TEXT BOOK

1. Dale H. Besterfield, et al., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.

2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., (2006).

IM3402

SIMULATION MODELING AND ANALYSIS

LT P C

3 0 0 3

OBJECTIVE:

To cover various aspects of discrete dynamic, stochastic systems modeling and conducting experiments with those models on a computer.

UNIT I INTRODUCTION 3
Systems – Modelling – types – systems components – Simulation basics

UNIT II RANDOM NUMBERS/ VARIATES 10
Random numbers – methods of generation – random variates for standard distributions like uniform, exponential, Poisson, binomial, normal etc – Testing of Random variates – Monte Carlo Simulation

UNIT III DESIGN OF SIMULATION EXPERIMENTS 12
Steps on Design of Simulation Experiments – Development of models using of High-level language for systems like Queuing, Inventory, Replacement, Production etc., – Model validation and verification, Output analysis.

UNIT IV SIMULATION LANGUAGES 12
Need for simulation Languages – Comparisons & Selection of Languages GPSS-ARENA- EXTEND – Study of any one of the languages

UNIT V CASE STUDIES USING SIMULATION LANGUAGES 8

TOTAL : 45 PERIODS

REFERENCES

1. Jerry Banks, John S Corson,Barry.L. Nelson,David M. Nicol and P.Shahabudeen, Discrete Event Systems Simulation, Pearson education, Fourth edition,2007.
2. Geoffrey Gordon, Systems Simulation, Prentice Hall, 2002
3. Law A M & Kelton W D, Simulation Modelling and analysis, Tata McGraw- Hill, 2003
4. David Kelton, Rondall P Sadowski, David T Sturrock, Simulation with Arena, Mc Graw Hill, 2004
5. Thomas J Schriber, Simulation Using GPSS, John Wiley,2002.
<http://www.bcnn.net>

IM3403

MANAGEMENT INFORMATION SYSTEMS

L T P C
3 0 0 3

UNIT I FUNDAMENTALS OF INFORMATION SYSTEMS 12

Information systems in business, fundamentals of information systems solving business problems with information systems.

Business Information systems, Transaction processing systems, management information systems and decision support systems. Artificial intelligence technologies in business, information system for strategic applications and issues in information technology.

UNIT II ISSUES IN MANAGING INFORMATION TECHNOLOGY 12

Managing information resources and technologies global information technology, management, planning and implementing change, integrating business change with IT, security and ethical challenges in managing IT, social challenges of information technology.

UNIT III INTRODUCTION TO E-BUSINESS 8

E-commerce frame work, Media convergence, Consumer applications, Organization applications.

E-BUSINESS MODEL: Architectural frame work for E-commerce, Application services and transaction Models – B2C Transactions, B2B Transactions, Intra-Organisational Transactions. WWW Architecture: Client server structure of the web, e-Commerce architecture, Technology behind the web.

UNIT IV CONSUMER-ORIENTED E-COMMERCE 7

Consumer oriented Application: Finance and Home Banking, Home shopping, Home Entertainment, Mercantile Process Models, Consumers perspective, Merchants perspective.

UNIT V ELECTRONICS DATA INTERCHANGE (EDI) 6

EDI Concepts, Applications in business – components of international trade, Customs Financial EDI, Electronic fund transfer, Manufacturing using EDI, Digital Signatures and EDI.

TEXT BOOKS:

1. Management Information systems- managing information technology in the internet worked enterprise- jams. A O'Brien - Tata McGraw Hill publishing company limited, 2002.
2. Management Information Systems - Laaudon & Laudon PHI ISBN 81-203-1282-1.1998.

REFERENCES:

1. Management Information systems- S. Sadogopan. PHI 1998Edn. ISBN 81-20311809
2. Information systems for modern management - G.R. Murdick PHI, 2nd Edition.

IM3404

DISCRETE SIMULATION LABORATORY

L T P C
0 0 3 2

OBJECTIVE

To give hands on experience with reference to computer based discrete system simulation experiments

1. Random Number Generation Mid Square, Constant Multiplier, Congruential
2. Random variates Generation Exponential, Poisson, Normal, Binomial
3. Testing of Random variates Chi-Square, KS, Run
4. Monte Carlo Simulation Random Walk Problem
5. Queuing Models Single, Multi Server
6. Other IE oriented models Inventory, Replacement, Production system etc
- 7-10 Use of Simulation Language/Package

TOTAL: 45 PERIODS

IM3405

COMPREHENSION

L T P C
0 0 2 1

AIM:

To give a comprehensive knowledge and understanding in the various fields of Industrial Engineering

The objective of this comprehension is to achieve an understanding of the fundamentals of contemporary manufacturing systems including materials, manufacturing process, product and process control, computer integrated manufacture and quality. The students work in groups and solve a variety of problems given to them. The problems given to the students should be of real like industrial problems selected by a group of faculty members of the concerned department. A minimum of three small problems have to be solved by each group of students. The evaluation is based on continuous assessment by a group of Faculty Members constituted by the professor in-charge of the course.

TOTAL: 30 PERIODS

IM3411

ADVANCED ERGONOMICS

L T P C
3 0 0 3

UNIT I	INTRODUCTION	9
Historical background. Modern ergonomics, Future direction. Human Machine Systems – interfaces.		
UNIT II	ANATOMY, POSTURE AND BODY MECHANICS	9
Muscle Functionin, Spine, Musculoskeletal problems in Sitting and Standing.		
UNIT III	ANTHROPOMETRIC PRINCIPLES	9
Anthropometric Data – sample, equipment, analysis. Applications of Anthropometry in Design. Workstation design for standing and seated posture.		
UNIT IV	UPPER BODY AT WORK	9
Injuries due to upper body at work, Neck problems, shoulder, elbow and wrist, Design of manual handling tasks.		
UNIT V	PHYSIOLOGY, WORKLOAD AND WORK CAPACITY	9
Energy for action, cardiovascular system, Physical work capacity, Factors affecting work capacity, fitness for work. Vision – Measurement of light, Lighting design consideration, visual fatigue. Sound and Noise – Measurement, Industrial Noise control, Thermal conditions – Measurement, effect on human being.		

TOTAL : 45 PERIODS

TEXT BOOKS:

1. M. S. Sanders and Ernest J. McCormick, “*Human Factors Engineering and Design*”, McGraw-Hill Inc.
2. E. Grad jean, “Fitting Task to the Man” Taylor and Francis.
3. The Factories Act, 1948.

REFERENCES:

1. ILO, “Introduction to Work study”.
2. Curie R. M. & Faraday, “Work study” Pitman for the British Institute of Management
3. R. S. Bridger, “Introduction to Ergonomics”, Taylor and Francis

IM3412	PROJECT WORK	L T P C
		0 0 12 6

A Project topic must be selected either from published lists or the students themselves may propose suitable topics in consultation with their guides. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

ME3021 ENERGY CONSERVATION AND MANAGEMENT

**LT P C
3 0 0 3**

AIM :

To instruct the importance of energy conservation in both thermal and electrical energy and its management for the better utilization of resources.

OBJECTIVE :

At the end of the course, the student expected to do

- Understand and analyze the plant energy data
- Energy audit and suggest methodologies for energy savings
- Energy accounting and balance and
- Able to utilize the available resources in optimal way

PRE-REQUISITE : NIL

UNIT I IMPORTANCE OF ENERGY CONSERVATION AND MANAGEMENT

8

World, national Energy consumption – environmental aspects – Energy prices, policies – Energy auditing : methodology, analysis, energy accounting – Measurements – Thermal and Electrical.

UNIT II ELECTRICAL SYSTEMS

12

AC / DC current systems, Demand control, power factor correction, load management, Motor drives : motor efficiency testing, energy efficient motors, motor speed control – Lighting : lighting levels, efficient options, daylighting, timers, Energy efficient windows – electrical distribution systems – Transformers – Power quality – harmonic distortion.

UNIT III THERMAL SYSTEMS

10

Boiler – efficiency testing, excess air control, Steam distribution & use – steam traps, condensate recovery, flash steam utilization, Thermal Insulation. Heat exchanger networking – concept of pinch, target settling, problem table approach.

UNIT IV ENERGY CONSERVATION

8

Energy conservation in Pumps, Fans (flow control) and blowers, Compressed Air Systems, Refrigeration and air conditioning systems – Waste heat recovery recuperators, heat sheets, heat pipes, heat pumps.

UNIT V ENERGY MANAGEMENT, ECONOMICS

7

Energy resource management – Energy Management information systems – Computerized energy management – Energy economics – discount rate, payback period, internal rate of Return, life cycle costing – Financing energy conservation Projects.

TOTAL : 45 PERIODS

UNIT I	INDIVIDUAL BEHAVIOR	9
Personality –Types –Influencing Personality – Learning Process, Attribute Perception – Motivation Theories		
UNIT II	GROUP BEHAVIOR	9
Group Organization, Group Dynamics, Emergence of Informal Leader, Leadership Styles-theories, Group decision making, Inter personal Relations, Communication - Team.		
UNIT III	DYNAMICS OF ORGANIZATIONAL BEHAVIOR	9
Organizational Climate, the Satisfactory –Organizational change – the Change Process & Change Management.		
UNIT IV	HUMAN RESOURCES PLANNING	9
Requirements of Human Resources –HR audit, Recruitment-Selection-Interviews		
UNIT V	HUMAN RESOURCES DEVELOPMENT	9
Employee Training-Career Development-Performance Appraisal-Compensation-safety and Health-Employee Relation-Management Development.		

TOTAL: 45 PERIODS

TEXT BOOK:

Stephen R. Robbins, “Organizational Behavior”, PHI, 1998.

REFERENCES:

1. David A. Decenzo & Stephen R. Robbins, “Personnel/Human Resources Management”, PHI, 1997.
2. Fred Lutherans, “Organizational Behavior”, Oxford University Press, 2000.

IM3004 INDUSTRIAL ENGINEERING APPLICATIONS IN SERVICE SECTOR	L T P C
	3 0 0 3

UNIT I	INTRODUCTION TO SERVICE SECTOR	8
Various Services: i) Hotel ii) Health Care iii) Bank iv) Retail Marketing / Department Stores v) Urban bodies, vi) Education vii) Construction viii) Transport and Communication ix) Government. Content of Product Vs. Services.		

UNIT II	RESOURCES USED IN SERVICE SECTOR	12
a) Space b) Manpower c) Capital d) Material, e) Equipment f) Energy g) Transport and Communication h) Information I) Knowledge.		

CRITICAL ASPECTS OF SERVICE SECTOR:

i) Customer Satisfaction ii) Cost reduction iii) Efficiency iv) Quality & Productivity of Service organisations, Measurement of these characteristics.

UNIT III	APPLICATION OF INDUSTRIAL ENGINEERING TECHNIQUES TO THE SERVICE SECTOR	10
i) Data collection – Various charting techniques, Flow Diagram, work measurement – time		

study, activity sampling, self recording, etc. ii) Quantitative techniques. iii) Data analysis – Critical Examination / evaluation of data. iv) Work of simplification, form design. v) Computer application to collection, storage and retrieval of information / data.

UNIT IV USE OF COMPUTERS IN SERVICE ORGANIZATIONS 7
Plant, local area network, wide area network to Collect, store, retrieve, transmit information / data.

UNIT I FUTURE OF SERVICE SECTOR 8
Increasing role of service sector in National Economy. Management methods in Service Sector. Need for optimizing resources in Service Sector.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. J. Nevan Wright, Peter Race, "The Management of Service Operations", Thomson Learning
2. Anderson R. G.; "Organisation & Methods", N & E Hand book Series.
3. Cemach H. P.; "Workstudy in office"; Ambar Publications.

REFERENCES:

1. Gerard Blokdijk, Ivanka Menken, "Service Level Management Best Practice Handbook",
2. T. Benley, Holt Rinahan & Winston; "Management Service Handbook", Institute of Management Service
3. Fitzsimmons; Service Management; Mc Graw Hill Publications.
4. Salvendy Gavriel, "Handbook of industrial engineering: technology and operations management", John Willey and Sons Inc.

**IM3005 ADVANCED OPTIMIZATION TECHNIQUES LT P C
3 0 0 3**

OBJECTIVE

Some of the Operations Research techniques which are not covered in the first level course are dealt with.

UNIT I MULTI CRITERIA MODELS 9
Data Envelopment Analysis, Multicriteria Decision Problems- Goal Programming, Analytic Hierarchy Process

UNIT II NON –LINEAR MODELS -I 9
Types of Non-linear programming problems, unconstrained optimization, Linearly Constrained Optimization, Quadratic Programming, Convex Programming,

UNIT III NON –LINEAR MODELS –II 9
KKT conditions for constrained optimization, Separable programming, Non-convex programming, Geometric programming

UNIT IV MARKOV PROCESSES 9
Markov Processes, Neural network based optimization

UNIT V METAHEURISTICS**9**

Metaheuristics - Genetic Algorithms, Simulated Annealing, Ant Colony Optimization.

TOTAL: 45 PERIODS**REFERENCES:**

1. Hillier and Liberman, Introduction to Operations Research, TMH, 2000
2. Singiresu S Rao, Engineering Optimization, Wiley,1998
3. Kalyanmoy Deb, Optimization for Engineering Design, PHI,2000
4. David R. Anderson, et al , An Introduction to Management Science – Quantitative approaches to Decision Making, Thomson,2003
5. Fred Glover et al., Handbook of Metaheuristics, Kluwer,2003

IM3006 VALUE ENGINEERING AND PROJECT MANAGEMENT**L T P C
3 0 0 3****OBJECTIVE:**

To give a brief account of the value analysis and engineering tool for productivity improvement through project management

UNIT I VALUE ENGINEERING BASICS**9**

Origin of Value Engineering, Meaning of value, Definition of Value Engineering and Value analysis, Difference between Value analysis and Value Engineering, Types of Value, function - Basic and Secondary functions, concept of cost and worth, creativity In Value Engineering.

UNIT II VALUE ENGINEERING JOB PLAN AND PROCESS**9**

Seven phases of job plan, FAST Diagram as Value Engineering Tool, Behavioural and organizational aspects of Value Engineering, Ten principles of Value analysis, Benefits of Value Engineering.

UNIT III PROJECT FORMULATION AND APPRAISAL**9**

Project Management – An overview, Feasibility and Technical analysis, Marketing feasibility, Financial and Economic feasibility, Formulation of Detailed Project Reports (DPR).

UNIT IV PROJECT IMPLEMENTATION AND CONTROL**9**

Project planning, Project organization, Tools and techniques of project management, Project management Information system, Human resources, Financial aspects.

UNIT V PROJECT COMPLETION AND EVALUATION**9**

Monitoring and Control of project, Integrated project management control system, Managing transition from project to operations, project review.

TOTAL: 45 PERIODS**REFERENCES:**

1. Mudge, Arthur E. "Value Engineering"- A systematic approach, McGraw Hill, New York, 2000.
2. Martandtelsang, Industrial Engineering and Production Management" S.Chand and Company LTd., New Delhi, 2002.

3. Choudhury, S. "Project scheduling and monitoring in practice, South Asian Publishers, New Delhi, 2001.
4. Goodman, L.J. Project planning and Management – An integrated system for improving productivity, Van Norstand, New York, 2000.
5. Kerzner, H. "Project Management" A system for approach to planning, scheduling and controlling 2nd Rf/CBS publishers, Delhi, 2002.
6. P.Gopalakrishnan, Text book of Project Management, Macmillan, India, 2000.

IM3007

TECHNOLOGY MANAGEMENT

**L T P C
3 0 0 3**

UNIT I INTRODUCTION

9

Technology management - Scope, components, and overview. Technology and environment, Technology and society, Technology Impact analysis, environmental, social, legal, political aspects, techniques for analysis - steps involved. Technology policy strategy: Science and technology Policy of India, implications to industry.

UNIT II TECHNOLOGY FORECASTING MODELS

9

Technology forecasting - need, methodology and methods - trend Analysis, Analogy, Delphi, Soft System Methodology, Mathematical Models, Simulation, and System Dynamics.

UNIT III EVALUATION METHODS

9

Technology Choice and Evaluation - Methods of analysing alternate technologies, Techno-economic feasibility studies, Need for multi-criteria considerations such as, social, environmental, and political, Analytic hierarchy method, Fuzzy multi-criteria decision making, and other methods.

UNIT IV TECHNOLOGY TRANSFER

9

Technology Transfer and Acquisition - Import regulations, Implications of agreements like Uruguay Round and WTO, Bargaining process, Transfer option, MOU- Technology Adoption and Productivity - Adopting technology-human interactions, Organisational redesign and re-engineering, Technology productivity.

UNIT V TECHNOLOGY INNOVATION

9

Technology Absorption and Innovation - present status in India, Need for new outlook, Absorption strategies for acquired technology, creating new/improved technologies, Innovations. Technology Measurement- Technology Audit.

TOTAL: 45 PERIODS

TEXT BOOK

2. Viswanadham and Narahari, "Performance modeling of automated manufacturing systems", PHI, 2003.
3. Nicholas J M, "Competitive Manufacturing Management", TMH, 001.
4. Buzacot and Shantikumar, "Queueing networks in Manufacturing", Wiley Sons, 2000.
5. Reisig W, "System Design Using Petrinets", Springer, 2000.

IM3009 COMPUTATIONAL METHODS & ALGORITHMS

**LT PC
3 0 0 3**

OBJECTIVE

A brief introduction to algorithmic design tools with some applications

UNIT I	INTRODUCTION	5
Review of C/C++ - writing and debugging large programs-controlling numerical errors		
UNIT II	ALGORITHM DESIGN METHODS	12
Greedy – divide and conquer – backtracking – branch & bound – heuristics- Meta heuristics		
UNIT III	BASIC TOOLS	12
Structured approach – networks – trees – data structures		
UNIT IV	COMPUTATIONAL PERFORMANCE	6
Time complexity – space complexity – algorithm complexity		
UNIT V	APPLICATIONS	10
Sorting – searching - net works – scheduling – optimisation models – IE applications		

TOTAL : 45 PERIODS

REFERENCES:

1. Goodman S F & Headtruemu ST , Introduction to design of algorithms, McGraw Hill,2002
2. Sahni, Data Structures, algorithms and applications in C++, McGraw Hill, 2003
3. Dromey,R.G.,How to solve it with computers?,PHI,2002
4. Alfred V. Aho , Jeffrey D. Ullman and John E. Hopcroft,Data Structures and Algorithms,Addison-Wesley ,1993.

IM3010 DECISION SUPPORT AND INTELLIGENT SYSTEMS L T P C
3 0 0 3

OBJECTIVE:

To impart knowledge on basics of DSS and Knowledge based systems

UNIT I INTRODUCTION	5
Managerial decision making, system modeling and support-preview of the modeling process-phases of decision making process.	
UNIT II ANALYSIS	10
DSS components- Data warehousing, access, analysis, mining and visualization-modeling and analysis-DSS development.	
UNIT III TECHNOLOGIES	10
Group support systems- enterprise DSS- supply chain and DSS-knowledge management methods, technologies and tools.	
UNIT IV EXPERT SYSTEMS	10
Artificial intelligence and expert systems-concepts, structure, types-knowledge acquisition and validation-difficulties, methods, selection.	
UNIT V SEMANTIC NETWORKS	10
Representation in logic and schemas, semantic networks, production rules and frames, inference techniques, intelligent system development, implementation and integration of management support systems.	

TOTAL: 45 PERIODS

REFERENCES

1. Efraim Turban and Jay E Aronson, Decision Support and Intelligent Systems, Pearson education Asia, Sixth edition, 2002.
2. S S Mitra, Decision support systems, tools and techniques, John Wiley, 1996.
3. Elain Rich and Kevin Knight, Artificial intelligence, TMH,1993.

IM3011 EVOLUTIONARY OPTIMIZATION L T P C
3 0 0 3

OBJECTIVE

To cover some of the evolutionary algorithms and their applications in optimization

UNIT I INTRODUCTION	9
Introduction to evolutionary computation, Evolutionary computation and AI, Historical branches of evolutionary computation	
UNIT II SEARCH SCHEMA	9
Search operators, Selection schemes, Ranking methods, Importance of representation	
UNIT III EVOLUTIONARY ALGORITHMS	9

Evolutionary combinatorial optimization – evolutionary algorithms, Constraint handling

UNIT IV GENETIC PROGRAMMING 9

Genetic programming – steps, Search operators on trees, examples

UNIT V MULTIOBJECTIVE OPTIMISATION 9

Pareto optimality, Multiobjective evolutionary algorithms, Analysis of evolutionary algorithms

TOTAL: 45 PERIODS

REFERENCES:

1. W Banzhaf et al , Genetic Programming – An introduction, Morgan Kaufmann Publications (1999)
2. X Yao, “Evolutionary computations – Theory and Applications”, World Scientific Publications (1999)
3. J Baeck, “Handbook of Evolutionary computation”, IOS Press, 1997.
4. Goldberg D E , Genetic Algorithms in search, optimization, Addison Wesley (1989)

IM3012

SYSTEMS ENGINEERING

**L T P C
3 0 0 3**

OBJECTIVE :

To cover the basics of systems engineering study steps and associated techniques in the systems analysis.

UNIT I INTRODUCTION 6

Definitions, Systems theory, Life-Cycle phases, Systems Engineering processes, Seven-phase and twenty-two phase life cycle for systems acquisition.

UNIT II FORMULATION OF ISSUES 9

Problem or Issue identification, Formulation of issues with an example – Identification Of needs, alterables, constraints, Value system design, Requirements statement, Generation of Alternatives or System synthesis, Feasibility studies.

UNIT III ANALYSIS OF ALTERNATIVES 12

Analysis of systems with uncertain and imperfect information, structural modeling – trees, causal loops, and influence diagrams, system dynamics models, Economic models, Reliability models, Discrete event models.

UNIT IV DECISION ASSESSMENT 9

Interpretation of alternative courses of action, Formal Decisions – prescriptive and normative decision assessments, Descriptive decision models – Group decision making.

UNIT V SYSTEMS ENGINEERING MANAGEMENT 9

Organizational structures, Methods for systems Engineering Management, Human and cognitive factors in Systems Engineering and Systems Management.

TOTAL: 45 PERIODS

TEXT BOOK

1. Andrew P.Sage, James E.Armstrong Jr, "Introduction to Systems Engineering", John Wiley and Sons Inc. 2000.

REFERENCES:

1. Andrew P.Sage, "Systems Engineering", John Wiley & Sons, 1992.
2. Andrew P.Sage, William B.Rouse, "Hand book of Systems Engineering and Management", John Wiley & Sons, 1999.

IM3013 MAINTENANCE ENGINEERING AND MANAGEMENT

**LT P C
3 0 0 3**

OBJECTIVE:

To cover maintenance strategies, associated models for application and evaluation in different types of industries

UNIT I MAINTENANCE CONCEPT 8

Need for Maintenance – Maintenance management – Tero technology – Challenges of physical asset management – Scope of Maintenance department – Maintenance organization – Maintenance costs – Imperfect maintenance – Toyota maintenance concept – Maintenance policies: PM, CM, DOM, OM – Condition monitoring.

UNIT II MAINTENANCE MODELS 10

Probability models in maintenance – Choice between PM and b/d maintenance – Optimal PM schedule and quality loss – Inspection decisions: Maximization of profit – Minimization of downtime – Analysis of downtime – Repair time distribution: exponential, lognormal – System repair time – Maintainability prediction – Corrective maintenance downtime – Design for maintainability.

UNIT III MAINTENANCE LOGISTICS 12

Maintenance Planning – Maintenance – Priority Systems - Proactive/reactive maintenance – Minimum/extensive maintenance – Work order form – Spare parts control: setting reorder point – Overall part availability – unique/interchangeable spares – Ebel graph – Capital spare – Maintenance resource requirements – Queuing theory applications: Optimal number of workshop machines – Optimal repair effort – Maintenance crew size – use of learning curves – simulation – Human factors in maintenance.

UNIT IV REPLACEMENT MODELS 9

TEXT BOOKS:

1. Pramod Verma, "*Management of Industrial Relations*", Oxford and IBH Publishing Co., Mumbai.
2. C. Jagamohandas and Co., Mumbai – publications of Acts with short notes.
3. Taxman, Commercial Laws.
4. Taxman, Labour Laws.

REFERENCE:

1. Bare Acts and Bare Acts with Cases for each of these.

ME2029**DESIGN OF JIGS, FIXTURES & PRESS TOOLS****L T P C
3 0 0 3****OBJECTIVES:**

- To understand the functions and design principles of Jigs, fixtures and press tools
- To gain proficiency in the development of required views of the final design.

UNIT I LOCATING AND CLAMPING PRINCIPLES: 8

Objectives of tool design- Function and advantages of Jigs and fixtures – Basic elements – principles of location – Locating methods and devices – Redundant Location – Principles of clamping – Mechanical actuation – pneumatic and hydraulic actuation Standard parts – Drill bushes and Jig buttons – Tolerances and materials used.

UNIT II JIGS AND FIXTURES 10

Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT III PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES 10

Press Working Terminologies - operations – Types of presses – press accessories – Computation of press capacity – Strip layout – Material Utilization – Shearing action – Clearances – Press Work Materials – Center of pressure- Design of various elements of dies – Die Block – Punch holder, Die set, guide plates – Stops – Strippers – Pilots – Selection of Standard parts – Design and preparation of four standard views of simple blanking, piercing, compound and progressive dies.

UNIT IV BENDING FORMING AND DRAWING DIES 10

Difference between bending, forming and drawing – Blank development for above operations – Types of Bending dies – Press capacity – Spring back – knockouts – direct

and indirect – pressure pads – Ejectors – Variables affecting Metal flow in drawing operations – draw die inserts – draw beads- ironing – Design and development of bending, forming, drawing reverse re-drawing and combination dies – Blank development for ax- symmetric, rectangular and elliptic parts – Single and double action dies.

UNIT V MISCELLANEOUS TOPICS 7

Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke - Course should be supplemented with visits to industries.

(Use of Approved design Data Book permitted).

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Joshi, P.H. “Jigs and Fixtures”, Second Edition, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2004.
2. Donaldson, Lecain and Goold “Tool Design”, III rd Edition Tata McGraw Hill, 2000.

REFERENCES:

1. K. Venkataraman, “Design of Jigs Fixtures & Press Tools”, Tata McGraw Hill, New Delhi, 2005.
2. Kempster, “Jigs and Fixture Design”, Hoddes and Stoughton – Third Edition 1974.
3. Joshi, P.H. “Press Tools” – Design and Construction”, Wheels publishing, 1996.
4. Hoffman “Jigs and Fixture Design” – Thomson Delmar Learning, Singapore, 2004.
5. ASTME Fundamentals of Tool Design Prentice Hall of India.
6. Design Data Hand Book, PSG College of Technology, Coimbatore.

ME2353	FINITE ELEMENT ANALYSIS	L T P C
		3 1 0 4

INTRODUCTION (Not for examination) 5

Solution to engineering problems – mathematical modeling – discrete and continuum modeling – need for numerical methods of solution – relevance and scope of finite element methods – engineering applications of FEA

UNIT I FINITE ELEMENT FORMULATION OF BOUNDARY VALUE PROBLEMS 5+3

Weighted residual methods –general weighted residual statement – weak formulation of the weighted residual statement –comparisons – piecewise continuous trial functions-example of a bar finite element –functional and differential forms – principle of stationary total potential – Rayleigh Ritz method – piecewise continuous trial functions – finite element method – application to bar element

UNIT II ONE DIMENSIONAL FINITE ELEMENT ANALYSIS 8+4

General form of total potential for 1-D applications – generic form of finite element equations – linear bar element – quadratic element –nodal approximation – development of shape functions – element matrices and vectors – example problems – extension to plane truss– development of element equations – assembly – element connectivity – global equations – solution methods –beam element – nodal approximation – shape functions – element matrices and vectors – assembly – solution – example problems

UNIT III TWO DIMENSIONAL FINITE ELEMENT ANALYSIS 10+4

Introduction – approximation of geometry and field variable – 3 noded triangular elements – four noded rectangular elements – higher order elements – generalized coordinates approach to nodal approximations – difficulties – natural coordinates and coordinate transformations – triangular and quadrilateral elements – iso-parametric elements – structural mechanics applications in 2-dimensions – elasticity equations – stress strain relations – plane problems of elasticity – element equations – assembly – need for quadrature formulæ – transformations to natural coordinates – Gaussian quadrature – example problems in plane stress, plane strain and axisymmetric applications

UNIT IV DYNAMIC ANALYSIS USING FINITE ELEMENT METHOD 8+4

Introduction – vibrational problems – equations of motion based on weak form – longitudinal vibration of bars – transverse vibration of beams – consistent mass matrices – element equations – solution of eigenvalue problems – vector iteration methods – normal modes – transient vibrations – modeling of damping – mode superposition technique – direct integration methods

UNIT V APPLICATIONS IN HEAT TRANSFER & FLUID MECHANICS 6+3

One dimensional heat transfer element – application to one-dimensional heat transfer problems- scalar variable problems in 2-Dimensions – Applications to heat transfer in 2-Dimension – Application to problems in fluid mechanics in 2-D

L=42, T=18, TOTAL: 60 PERIODS

TEXT BOOK:

1. P.Seshu, "Text Book of Finite Element Analysis", Prentice-Hall of India Pvt. Ltd. New Delhi, 2007. ISBN-978-203-2315-5

REFERENCE BOOKS:

1. J.N.Reddy, "An Introduction to the Finite Element Method", McGraw-Hill International Editions(Engineering Mechanics Series), 1993. ISBN-0-07-051355-4
2. Chandrupatla & Belagundu, "Introduction to Finite Elements in Engineering", 3rd Edition, Prentice-Hall of India, Eastern Economy Editions. ISBN-978-81-203-2106-9
3. David V.Hutton,"Fundamentals of Finite Element Analysis", Tata McGraw-Hill Edition 2005. ISBN-0-07-239536-2
4. Cook,Robert.D., Plesha,Michael.E & Witt,Robert.J. "Concepts and Applications of Finite Element Analysis",Wiley Student Edition, 2004. ISBN-10 81-265-1336-5

Note: L- no. of lectures/week, T- no. of tutorials per week

MF3001

PRODUCT DESIGN AND DEVELOPMENT

LT P C

3 0 0 3

AIM:

The course aims at providing the basic concepts of product design, product features and its architecture so that student can have a basic knowledge in the common features a product has and how to incorporate them suitably in product.

OBJECTIVE:

The student will be able to design some products for the given set of applications; also the knowledge gained through prototyping technology will help the student to make a prototype of a problem and hence product design and development can be achieved.

UNIT I INTRODUCTION 5

Need for IPPD – Strategic importance of Product development – integration of customer, designer, material supplier and process planner, Competitor and customer – Behaviour analysis. Understanding customer – prompting customer understanding – involve customer in development and managing requirements – Organization – process management and improvement – Plan and establish product specifications.

UNIT II CONCEPT GENERATION AND SELECTION 5

Task – Structured approaches – clarification – search – externally and internally – explore systematically – reflect on the solutions and processes – concept selection – methodology – benefits.

UNIT III PRODUCT ARCHITECTURE 10

Implications – Product change – variety – component standardization – product performance – manufacturability – product development management – establishing the architecture – creation – clustering – geometric layout development – fundamental and incidental interactions – related system level design issues – secondary systems – architecture of the chunks – creating detailed interface specifications.

UNIT IV INDUSTRIAL DESIGN 10

Integrate process design – Managing costs – Robust design – Integrating CAE, CAD, CAM tools – Simulating product performance and manufacturing processes electronically – Need for industrial design – impact – design process – investigation of for industrial design – impact – design process – investigation of customer needs – conceptualization – refinement – management of the industrial design process –technology driven products – user – driven products – assessing the quality of industrial design.

UNIT V DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT 15

Definition – Estimation of Manufacturing cost – reducing the component costs and assembly costs – Minimize system complexity – Prototype basics – principles of prototyping – planning for prototypes – Economic Analysis – Understanding and representing tasks – baseline project planning – accelerating the project – project execution.

TOTAL : 45 PERIODS

TEXT BOOK

1. Kari T.Ulrich and Steven D.Eppinger,"Product Design and Development", McGraw-Hill International Edns. 1999.

REFERENCES

1. Kemneth Crow,"Concurrent Engg./Integrated Product Development", DRM Associates, 26/3, Via Olivera, Palos Verdes, CA 90274(310) 377-569, Workshop Book.
2. Stephen Rosenthal, "Effective Product Design and Development", Business OneOrwin, Homewood, 1992, ISBN 1-55623-603-4.
3. Staurt Pugh, "Tool Design –Integrated Methods for Successful Product Engineering", Addison Wesley Publishing, New york, NY.

WEB REFERENCE BOOK

- 1.<http://www.me.mit/.2.7444>.

OBJECTIVES:

- To understand the basic concepts associated with the design and functioning and applications of Robots To study about the drives and sensors used in Robots
- To learn about analyzing robot kinematics and robot programming

UNIT I FUNDAMENTALS OF ROBOT 7

Robot – Definition – Robot Anatomy – Co-ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Payload – Robot Parts and Functions – Need for Robots – Different Applications

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 10

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of Drives End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations

UNIT III SENSORS AND MACHINE VISION 10

Requirements of a sensor, Principles and Applications of the following types of sensors – Position of sensors (Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, Pneumatic Position Sensors), Range Sensors (Triangulation Principle, Structured, Lighting Approach, Time of Flight Range Finders, Laser Range Meters), Proximity Sensors (Inductive, Hall Effect, Capacitive, Ultrasonic and Optical Proximity Sensors), Touch Sensors, (Binary Sensors, Analog Sensors), Wrist Sensors, Compliance Sensors, Slip Sensors. Camera, Frame Grabber, Sensing and Digitizing Image Data – Signal Conversion, Image Storage, Lighting Techniques. Image Processing and Analysis – Data Reduction: Edge detection, Segmentation Feature Extraction and Object Recognition - Algorithms. Applications – Inspection, Identification, Visual Servicing and Navigation.

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING 10

Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems. Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effector commands, and Simple programs

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS 8

RGV, AGV; Implementation of Robots in Industries – Various Steps; Safety Considerations for Robot Operations; Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of Return Method.

TOTAL: 45 PERIODS**TEXT BOOK:**

1. M.P.Groover, "Industrial Robotics – Technology, Programming and Applications", McGraw-Hill, 2001

REFERENCES:

1. Fu.K.S. Gonzalz.R.C., and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw-Hill Book Co., 1987

2. Yoram Koren, "Robotics for Engineers", McGraw-Hill Book Co., 1992
3. Janakiraman.P.A., "Robotics and Image Processing", Tata McGraw-Hill, 1995

IM3015 **WORLD CLASS MANUFACTURING** **L T P C**
3 0 0 3

UNIT I INDUSTRIAL DECLINE AND ASCENDANCY 9
Manufacturing excellence - US Manufacturers - French Manufacturers - Japan decade - American decade - Global decade

UNIT II BUILDING STRENGTH THROUGH CUSTOMER – FOCUSED PRINCIPLES 9
Customer - Focused principles - General principles - Design - Operations - Human resources - Quality and Process improvement - Promotion and Marketing

UNIT III VALUE AND VALUATION 9
Product Costing - Motivation to improve - Value of the enterprises

QUALITY
The Organization : Bulwark of stability and effectiveness - Employee stability – Quality Individuals Vs. Teams - Team stability and cohesiveness - Project cohesiveness and stability

UNIT IV STRATEGIC LINKAGES 9
Product decisions and customer service - Multi-company planning - Internal manufacturing planning - Soothing the demand turbulence

UNIT V IMPEDIMENTS 9
Bad plant design - Mismanagement of capacity - Production Lines - Assembly Lines – Whole Plant Associates - Facilitators - Teamsmanship - Motivation and reward in the age of continuous Improvement

TEXT BOOKS
1. By Richard B. Chase, Nicholas J. Aquilano, F. Robert Jacobs – "OperationsManagement for Competitive Advantage", McGraw-Hill Irwin, ISBN 0072323159
2. Moore Ran, "Making Common Sense Common Practice: Models for ManufacturingExcellence", Elsevier Multiworth
3. Narayanan V. K., "Managing Technology & Innovation for Competitive Advantage",Pearson Education Inc.
4. Korgaonkar M. G., "Just In Time Manufacturing", MacMillan Publishers India Ltd.,
5. Sahay B. S., Saxena K. B. C., Ashish Kumar, "World Class Manufacturing", MacMillanPublishers

MF3404 **FLEXIBLE MANUFACTURING SYSTEMS** **L T P C**
3 0 0 3

AIM:

To impart knowledge on group technology, simulation, computer control, automatic manufacturing systems and factory of the future.

OBJECTIVES:

At the end of this course the student should be able to understand

- Modern manufacturing systems
- To understand the concepts and applications of flexible manufacturing systems

UNIT I PLANNING, SCHEDULING AND CONTROL OF FLEXIBLE MANUFACTURING SYSTEMS 9

Introduction to FMS– development of manufacturing systems – benefits – major elements – types of flexibility – FMS application and flexibility –single product, single batch, n – batch scheduling problem – knowledge based scheduling system.

UNIT II COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE MANUFACTURING SYSTEMS 9

Introduction – composition of FMS– hierarchy of computer control –computer control of work center and assembly lines – FMS supervisory computer control – types of software specification and selection – trends.

UNIT III FMS SIMULATION AND DATA BASE 9

Application of simulation–model of FMS–simulation software – limitation – manufacturing data systems–data flow–FMS database systems–planning for FMS database.

UNIT IV GROUP TECHNOLOGY AND JUSTIFICATION OF FMS 9

Introduction – matrix formulation – mathematical programming formulation –graph formulation – knowledge based system for group technology – economic justification of FMS- application of possibility distributions in FMS systems justification.

UNIT V APPLICATIONS OF FMS AND FACTORY OF THE FUTURE 9

FMS application in machining, sheet metal fabrication, prismatic component production – aerospace application – FMS development towards factories of the future – artificial intelligence and expert systems in FMS – design philosophy and characteristics for future.

TOTAL : 45 PERIODS

TEXT BOOK

1. Jha, N.K. "Handbook of flexible manufacturing systems", Academic Press Inc.,1991.

REFERENCES

1. Radhakrishnan P. and Subramanyan S., "CAD/CAM/CIM", Wiley Eastern Ltd.,New Age International Ltd., 1994.
2. Raouf, A. and Ben-Daya, M., Editors, "Flexible manufacturing systems: recent development", Elsevier Science, 1995.
3. Groover M.P., "Automation, production systems and computer integrated manufacturing", Prentice Hall of India Pvt., New Delhi, 1996.
4. Kalpakjian, "Manufacturing engineering and technology", Addison-Wesley Publishing Co., 1995.
5. Taiichi Ohno, "Toyota production system: beyond large-scale production", Productivity Press (India) Pvt. Ltd. 1992.

ME2035 ENTREPRENEURSHIP DEVELOPMENT L T P C
(COMMON TO MECHANICAL, PRODUCTION & AUTOMOBILE) 3 0 0 3

OBJECTIVE:

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

UNIT I ENTREPRENEURSHIP 9

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

UNIT II MOTIVATION 9

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

UNIT III BUSINESS 9

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

UNIT IV FINANCING AND ACCOUNTING 9

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

UNIT V SUPPORT TO ENTREPRENEURS 9

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

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

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

MA3021

NUMERICAL METHODS

L T P C
3 1 0 4

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS (10 +3)

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton-Raphson method- Solution of linear system of equations - Gauss Elimination method – Pivoting - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method - Eigenvalues of a matrix by Power method and by Jacobi's method.

UNIT II INTERPOLATION AND APPROXIMATION (8 + 3)

Interpolation with unequal intervals - Lagrange interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION (9 + 3)

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS (9 + 3)

Single step-methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations –Multistep methods - Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS (9 + 3)

Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank Nicholson) methods - One dimensional wave equation by explicit method.

L: 45 T: 15 TOTAL : 60 PERIODS

TEXT BOOKS

- Grewal, B.S. and Grewal, J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2004.
- Sankara Rao, K. "Numerical methods for Scientists and Engineers", 3rd Edition Prentice Hall of India Private Ltd., New Delhi, 2007.

REFERENCES

1. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, New Delhi, 2006.
3. Brian Bradie, "A friendly introduction to Numerical analysis", Pearson Education Asia, New Delhi, 2007.

PT3024

PACKAGING MATERIALS & TECHNOLOGY

LT P C

3 0 0 3

OBJECTIVES:

To study the fundamentals of packaging, manufacturing process, packaging materials and package testing.

UNIT I FUNDAMENTALS OF PACKAGING 6

Definition, functions of packaging, types and selection of package, Packaging hazards, interaction of package and contents, materials and machine interface, Environmental and recycling considerations - life cycle assessment Package Design - Fundamentals, factors influencing design, stages in package development, graphic design, Structural design – simulation softwares

UNIT II PACKAGING MATERIALS 11

Major Plastic packaging materials viz. Polyolefins, Polystyrene, Polyvinylchloride, Polyesters, Polyamides (Nylons), Polycarbonate and newer materials such as High Nitrile Polymers, Polyethylene Naphthalate (PEN), Nanomaterials, biodegradable materials – properties and applications, recycling; Wood, Paper, Textile, Glass, Metals -Tin, Steel, aluminum, Labelling materials, Cushioning Materials – properties and areas of application.

UNIT III CONVERSION TECHNOLOGY 12

Extrusion – Blown film, cast film, sheet, multilayer film & sheet, Lamination, Injection moulding, Blow moulding, Thermoforming; Cartoning Machinery, Bottling, Can former, Form Fill and Seal machines, Corrugated box manufacturing machineries, Drums – types of drums, moulded pulp containers, Closures, Application of Robotics in packaging. Surface treatment for printing, Printing processes – offset, flexo, gravure and pad printing

UNIT IV SPECIALITY PACKAGING 9

Aerosol packaging, Shrink and Stretch wrapping, Blister packaging, Anti-static packaging, Aseptic packaging, Active packaging, Modified Atmospheric Packaging, Ovenable package; Cosmetic packaging, Hardware packaging, Textile packaging, Food packaging; Child resistant and Health care packaging, Export packaging, Lidding, RFID in packaging.

UNIT V TESTING 7

Package Testing – Drop test, Impact test, Vibration Test, Stacking and Compression test, Packaging Materials Testing: Mechanical – Tensile, tear burst, impact, compression test, Elongation, barrier properties - WVTR test, Adhesion test, Optical – Gloss, haze and clarity; Chemical Resistance test – solvents and chemicals, solubility test, burning test, solvent retention; Hardness and corrosion test for metals; Clarity and brittleness test for glass.

TEXT BOOKS

1. Aaron L.Brody & Kenneth S.Marsh, "Encyclopedia of Packaging Technology",John Wiley Interscience Publication, II Edition, 1997.
2. F.A. Paine, "Fundamentals of Packaging", Brookside Press Ltd., London, 1990.
3. A.S.Athayle, "Plastics in Flexible Packaging", Multi-tech Publishing Co., First Edition, 1992.

REFERENCES

1. Mark J.Kirwar, "Paper and Paperboard Packaging Technology", Blackwell Publishing, 2005
2. "Handbook of Package Design Research", Water stem Wiley Intrascience, 1981.
3. Paine, "Packaging Development", PIRA International, 1990.
4. Arthur Hirsch, "Flexible Food Packaging", Van Nostor and Reinhold, New York,1991.
5. E.P.Danger, "Selecting Colour for Packaging", Grover Technical Press, 1987.
6. Susan E.M.Salke & et al, Plastics Packaging, Hansar, 2nd edition 2004.
7. Bill Stewart, "Packaging Design Strategies", Pira International Ltd, 2nd Edition 2004. Gunilla Johnson, "Corrugated Board Packaging", PIRA International

GE3022

PROFESSIONAL ETHICS IN ENGINEERING

**LT P C
3 0 0 3**

AIM

To sensitize the engineering students on blending both technical and ethical responsibilities.

OBJECTIVES

- Identify the core values that shape the ethical behavior of an engineer.
- Utilize opportunities to explore one's own values in ethical issues.
- Become aware of ethical concerns and conflicts.
- Enhance familiarity with codes of conduct.
- Increase the ability to recognize and resolve ethical dilemmas.

UNIT I ENGINEERING ETHICS

9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION

9

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY

9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS

9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES**9**

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL : 45 PERIODS**TEXT BOOKS**

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003)
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001)
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004)
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)