ANNA UNIVERSITY CHENNAI
CHENNAI - 600 025

UNIVERSITY DEPARTMENTS

REGULATIONS 2012

CURRICULA AND SYLLABI FOR
I TO VIII SEMESTERS

B.E. INDUSTRIAL ENGINEERING
(FULL TIME)

ANNA UNIVERSITY: CHENNAI 600 025

UNIVERSITY DEPARTMENTS

R-2012

B.E. INDUSTRIAL ENGINEERING

I – VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER I

CODE	COURSE TITLE	L	T	P	C
THEORY					
HS8151	Technical English - I	3	1	0	4
MA8151	Mathematics - I	3	1	0	4
PH8151	Engineering Physics	3	0	0	3
CY8151	Engineering Chemistry	3	0	0	3
GE8151	Computing Techniques	3	0	0	3
GE8152	Engineering Graphics	2	0	3	4
PRACTICAL					
PH8161	Physics Laboratory	0	0	2	1
CY8161	Chemistry Laboratory	0	0	2	1
GE8161	Computer Practices Laboratory	0	0	3	2
GE8162	Engineering Practices Laboratory	0	0	3	2
	TOTAL	**17**	**2**	**13**	**27**

SEMESTER II

CODE	COURSE TITLE	L	T	P	C
THEORY					
HS8251	Technical English - II	3	1	0	4
MA8251	Mathematics - II	3	1	0	4
PH8251	Materials Science	3	0	0	3

GE8251	Engineering Mechanics	3	1	0	4
EE8202	Fundamentals of Electrical Engineering	3	0	0	3
ME8252	Manufacturing Technology – I	3	0	0	3
PRACTICAL					
EE8262	Electrical Engineering Laboratory	0	0	3	2
ME8262	Manufacturing Technology Lab - I	0	0	3	2
	TOTAL	**18**	**3**	**6**	**25**

SEMESTER III

CODE	COURSE TITLE	L	T	P	C
THEORY					
MA8356	Probability and Statistics	3	1	0	4
CE8353	Strength of Materials	3	0	0	3
EC8352	Electronics Engineering	3	0	0	3
IE8301	Engineering Economy and Cost Estimation	3	0	0	3
IE8302	Facility Layout and Materials Handling	3	0	0	3
IE8303	Work System Design	3	0	0	3
PRACTICAL					
CE8362	Strength of Materials laboratory	0	0	3	2
EC8361	Electronics Engineering Laboratory	0	0	3	2
IE8311	Work System Design Laboratory	0	0	3	2
	TOTAL	**18**	**1**	**9**	**25**

SEMESTER IV

CODE	COURSE TITLE	L	T	P	C
THEORY					
GE8351	Environmental Science and Engineering	3	0	0	3

CE8352	Fluid Mechanics and Machinery	3	0	0	3
IE8401	Operations Research-I	3	0	0	3
ME8451	Manufacturing Technology –II	3	0	0	3
ME8452	Mechanics of Machines	3	0	0	3
ME8453	Thermodynamics	3	1	0	4
PRACTICAL					
CE8413	Fluid Mechanics and Machinery Laboratory	0	0	3	2
ME8461	Manufacturing Technology Laboratory - II	0	0	3	2
	TOTAL	**18**	**1**	**6**	**23**

SEMESTER V

CODE	COURSE TITLE	L	T	P	C
THEORY					
IE8501	Manufacturing Automation	3	0	0	3
IE8502	Operations Research - II	3	0	0	3
IE8503	Quality Control and Assurance	3	0	0	3
ME8553	Machine Design	3	1	0	4
E1	Elective - I	3	0	0	3
E2	Elective - II	3	0	0	3
PRACTICAL					
IE8511	Automation Lab	0	0	3	2
IE8512	Optimization Lab	0	0	3	2
MF8561	CAD Lab	0	0	3	2
	TOTAL	**18**	**1**	**9**	**25**

SEMESTER VI

CODE	COURSE TITLE	L	T	P	C
THEORY					
MG8654	Total Quality Management	3	0	0	3
IE8601	Applied Ergonomics	3	0	0	3
IE8602	Production and Operations Management	3	0	0	3
IE8603	Reliability Engineering	3	0	0	3
E3	Elective - III	3	0	0	3
E4	Elective - IV	3	0	0	3
PRACTICAL					
HS8561	Employability Skills	0	0	2	1
IE8611	Ergonomics Lab	0	0	3	2
	TOTAL	**18**	**0**	**5**	**21**

SEMESTER VII

CODE	COURSE TITLE	L	T	P	C
THEORY					
IE8701	Simulation Modeling and Analysis	3	0	0	3
IE8702	Supply Chain and Logistics Management	3	0	0	3
IE8755	Design of Experiments	3	0	0	3
E5	Elective - V	3	0	0	3
E6	Elective - VI	3	0	0	3
E7	Elective - VII	3	0	0	3
PRACTICAL					
IE8711	Comprehension	0	0	2	1
IE8712	Data Analytics Lab	0	0	3	2
IE8713	Discrete Simulation Lab	0	0	3	2
IE8612	Industrial Training/Mini Project	0	0	3	2
	TOTAL	**18**	**0**	**11**	**25**

SEMESTER VIII

CODE	COURSE TITLE	L	T	P	C
THEORY					
E8	Elective - VIII	3	0	0	3
E9	Elective - IX	3	0	0	3
PRACTICAL					
IE8811	Project work	0	0	12	6
	TOTAL	**6**	**0**	**12**	**12**

TOTAL NUMBER OF CREDITS: 183

ELECTIVES

Sl.No.	Code	Course Title	L	T	P	C
1.	IE8001	Accounting and Finance for Management	3	0	0	3
2.	IE8002	Advanced Optimization Techniques	3	0	0	3
3.	IE8003	Applied Multi-Variate Statistical Analysis	3	0	0	3
4.	IE8004	Computational Methods and Algorithms	3	0	0	3
5.	IE8005	Decision Support and Intelligent Systems	3	0	0	3
6.	IE8006	Evolutionary Optimization	3	0	0	3
7.	IE8007	Information Systems Analysis and Design	3	0	0	3
8.	IE8008	Maintenance Engineering and Management	3	0	0	3
9.	IE8009	Metrology and Inspection	3	0	0	3
10.	IE8010	Modeling of Manufacturing Systems	3	0	0	3
11.	IE8011	Operations Scheduling	3	0	0	3
12.	IE8012	Product Design and Value Engineering	3	0	0	3
13.	IE8013	Productivity Management and Re-engineering	3	0	0	3
14.	IE8014	Project Management	3	0	0	3
15.	IE8015	Safety Engineering and Management	3	0	0	3

16.	IE8016	Systems Engineering	3	0	0	3
17.	IE8017	Technology Management	3	0	0	3
18.	IE8071	Human Resource Management	3	0	0	3
19.	MA8353	Numerical Methods	3	1	0	4
20.	GE8751	Engineering Ethics and Human Values	3	0	0	3
21.	MG8653	Principles of Management	3	0	0	3
22.	ME8076	Entrepreneurship Development	3	0	0	3
23.	IE8019	Principles of Marketing Management	3	0	0	3
24.	IE8018	Computer Integrated Manufacturing Systems	3	0	0	3
25.	MF8072	Electronics Manufacturing Technology	3	0	0	3
26.	MF8073	Flexible Manufacturing Systems	3	0	0	3
27.	IE8020	Robotics Engineering	3	0	0	3
28.	GE8072	Disaster Management	3	0	0	3
29.	GE8073	Human Rights	3	0	0	3

HS8151 **TECHNICAL ENGLISH I** **L T P C**

(For all branches of B.E / B.Tech programmes) **3 1 0 4**

OBJECTIVES:

- To enable all students of engineering and technology develop their basic communication skills in English.
- To give special emphasis to the development of speaking skills amongst the students of engineering and technology.
- To ensure that students use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading for pleasure.

UNIT I

Listening – Introducing learners to GIE - Types of listening - Listening to audio (verbal and sounds); Speaking – Speaking about one's place, important festivals etc. – Introducing oneself, one's family / friend; Reading – Skimming a reading passage – Scanning for specific information – Note-making; Writing – Free writing on any given topic (My favourite place / Hobbies / School life, etc.) – Sentence completion – Autobiographical writing (writing about one's leisure time activities, hometown, etc.); Grammar – Prepositions - Reference words – Wh-questions - Tenses (Simple); Vocabulary – Word formation – Word expansion (root words / etymology); E-materials – Interactive exercises for Grammar and Vocabulary – Reading comprehension exercises – Listening to audio files and answering questions.

UNIT II

Listening – Listening and responding to video lectures / talks; Speaking – Describing a simple process (filling a form, etc.) – Asking & answering questions – Telephone skills – Telephone etiquette; Reading – Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing – Biographical writing (place, people) - Lab descriptions (general/specific description of laboratory experiments) - Definitions - Recommendations; Grammar – Use of imperatives - Subject-verb agreement; Vocabulary – Compound words - Word Association; E-materials – Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III

Listening – Listening to specific task - focused audio tracks; Speaking – Role-play – Simulation – Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading – Reading and interpreting visual material; Writing – Jumbled sentences - Coherence and cohesion in writing – Channel conversion (flowchart into process) - Types of paragraph (cause

and effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; Grammar – Tenses (Past) - Use of sequence words - Adjectives; Vocabulary – Different forms and uses of words, Cause and effect words; E-materials – Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV

Listening – Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions – Different forms of interviews – Speaking at different types of interviews; Reading – Making inference from the reading passage - Predicting the content of a reading passage; Writing – Interpreting visual materials (line graphs, pie charts etc.) – Essay writing – Different types of essays; Grammar – Adverbs – Tenses – future time reference; Vocabulary – Single word substitutes - Use of abbreviations and acronyms; E-materials – Interactive exercises for Grammar and Vocabulary – Sample interviews - film scenes – dialogue writing.

UNIT V

Listening – Listening to different accents, Listening to Speeches / Presentations, Listening to broadcast and telecast from Radio and TV; Speaking – Giving impromptu talks, Making presentations on given topics; Reading – Email communication – Reading the attachment files having a poem/joke/proverb - Sending their responses through email Writing – Creative writing, Poster making; Grammar – Direct and indirect speech; Vocabulary – Lexical items (fixed / semi fixed expressions); E-materials – Interactive exercises for Grammar and Vocabulary – Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters.

TOTAL: 60 PERIODS

OUTCOMES:

Learners should be able to

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- Listen/view and comprehend different spoken discourses/excerpts in different accents

TEXT BOOKS :

1. Mindscapes: English for Technologists and Engineers, Orient Black Swan, 2012 .
2. S.P.Dhanavel, English and Communication skills for students of science and Engineering, Orient Black Swan, Chennai, 2011.

REFERENCES :

1. Pickett, Nell Ann, Ann A.Laster and Katherine E.Staples. “Technical English: Writing, Reading and Speaking”, New York: Longman, 2001.
2. Bailey, Stephen, “Academic Writing: A practical guide for students”, New York: Rutledge, 2011.
3. Morgan, David and Nicholas Regan, “Take-Off: Technical English for Engineering. Reading”, Garnet Publishing Limited, 2008.
4. Thorn, Michael and Alan Badrick, “An Introduction to Technical English”, Harlow: Prentice Hall Europe, 1993.
5. Rizvi, M.Ashraf, “Effective Technical Communication”, New Delhi: Tata McGraw-Hill Publishing Company, 2007.

Extensive Readers

1. Murthy, Sudha. Wise & Otherwise. New Delhi: Penguin Books India, 2006.
2. Gates, Bill and Collins Hemingway, “Business @ the Speed of Thought: Succeeding in the Digital Economy”, New York: Warner Business Books, 2000.

Website Resources

1. www.uefap.com
2. www.eslcafe.com
3. www.listen-to-english.com
4. www.owl.english.purdue.edu
5. www.chompchomp.com

MA8151 MATHEMATICS – I L T P C

(Common to all branches of B.E. / B.Tech. Programmes in I Semester) 3 1 0 4

OBJECTIVES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES 9+3

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II INFINITE SERIES 9+3

Sequences – Convergence of series – General properties – Series of positive terms – Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test) – Alternating series – Series of positive and negative terms – Absolute and conditional convergence – Power Series – Convergence of exponential, logarithmic and Binomial Series.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9+3

Limits and Continuity – Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables –Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV IMPROPER INTEGRALS 9+3

Improper integrals of the first and second kind and their convergence – Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions – Properties – Evaluation of integrals using Beta and Gamma functions – Error functions.

UNIT V MULTIPLE INTEGRALS 9+3

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals – Area of a curved surface.

TOTAL: 60 PERIODS

OUTCOMES:

- This course equips students to have basic knowledge and understanding in one field of materials, integral and differential calculus

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.

REFERENCES:

1. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
2. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.

3. Greenberg M.D., “Advanced Engineering Mathematics”, Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
4. Peter V.O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH8151 ENGINEERING PHYSICS L T P C

(Common to ALL Branches of B.E./B.Tech. Programmes) 3 0 0 3

OBJECTIVE:

- To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

Elasticity – Poisson’s ratio and relationship between moduli (qualitative) – Stress-strain diagram – factors affecting elasticity – bending of beams – cantilever – bending moment – theory and experiment of Young’s modulus determination – Uniform and non-uniform bending – I shaped girders – twisting couple – hollow cylinder – shaft – torsion pendulum – determination of rigidity modulus- moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound – loudness and intensity – Weber-Fechner Law – standard intensity and intensity level – decibel – reverberation – reverberation time – rate of growth and decay of sound intensity – derivation of Sabine’s formula – absorption coefficient and its determination – factors affecting acoustics of buildings : focussing, interference, echo, Echelon effect, resonance – noise and their remedies. Ultrasonics – production – magnetostriction and piezoelectric methods – detection of ultrasound – acoustic grating – industrial applications – NDT – Ultrasonic method: scan modes and practice.

UNIT III THERMAL PHYSICS 9

Thermal expansion – thermal stress – expansion joints – bimetallic strips – thermal conductivity – conductions in solids – Forbe’s and Lees’ disc methods – Rectilinear flow of heat through a rod – flow of heat through a compound materials – radical flow of heat through a spherical shell - thermal insulation of buildings – Laws of blackbody radiation: Kirchoffs law, Stephens law, Wiens law, Raleigh-Jean law and Planks law (derivation). Laws of thermodynamics – Otto and diesel engines and their efficiency – entropy – entropy of Carnot’s cycle – reverse Carnot’s cycle – refrigerator.

UNIT IV APPLIED OPTICS 9

Interference – Michelson interferometer: construction, working, determination of wave length and thickness – anti-reflection coating – air wedge and its application – Lasers – Einstein’s coefficients – CO_2 , Nd:YAG and semiconductor lasers - homo junction and hetro junction -

construction and working – applications – Optical fibres – classification (index & mode based) – principle and propagation of light in optical fibres – acceptance angle and numerical aperture – fibre optic communication system – active and passive sensors.

UNIT V SOLID STATE PHYSICS 9

Nature of bonding – growth of single crystals (qualitative) – crystal systems – crystal planes and directions – expressions for interplanar distance – coordination number and packing factor for simple structures: SC, BCC, FCC and HCP – structure and significance of NaCl, ZnS, diamond and graphite – crystal imperfections: point defects, dislocations and stacking faults – unit cell, Bravais space lattices – miller indices.

TOTAL : 45 PERIODS

OUTCOMES:

- The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXT BOOKS:

1. Gaur R.K., and Gupta, S.L., "Engineering Physics", Dhanpat Raj Publications,2003.
2. Palanisamy, P.K., "Engineering Physics", Scitech Publications (P) Ltd, 2006.
3. Arumugam, M., "Engineering Physics", Anuradha Publications, 2000.

REFERENCES:

1. Sankar, B.N., Pillai.S.O., "Engineering Physics", New Age International (P) Ltd., 2007.
2. Rajendran.V., "Engineering Physics", Tata McGraw-Hill, 2009.

CY8151 ENGINEERING CHEMISTRY L T P C

(Common to all branches of Engineering and Technology) 3 0 0 3

OBJECTIVES:

- To make the students conversant with basics of polymer chemistry.
- To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- To acquaint the students with the basics of nano materials, their properties and applications.

UNIT I CHEMICAL THERMODYNAMICS 9

Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore. Chemical potential;

Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II POLYMER CHEMISTRY 9

Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III KINETICS AND CATALYSIS 9

Introduction – reaction velocity, factors affecting reaction velocity, rate constant, order of reaction, molecularity, pseudo molecular reactions, zero, first, second and third order reactions, reactions of fractional orders, determination of order of reactions. Catalysis: Auto catalysis - Enzyme Catalysis: Michaelis-Menton equation; factors affecting enzyme catalysis. Heterogeneous Catalysis: Types of adsorption isotherms: Langmuir–Hinselwood and Rideal–Eley Mechanism.

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Photoprocesses - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitisation. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram) and applications.

UNIT V NANOCHEMISTRY 9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: Nanocluster, nanorod, nanotube and nanowire. Synthesis: Precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and Applications. Risk discussion and Future perspectives.

TOTAL : 45 PERIODS

OUTCOMES:

- The knowledge gained on polymer chemistry, thermodynamics. spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.

TEXT BOOKS:

1. P. Kannan and A. Ravikrishnan, “Engineering Chemistry”, Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009.
2. S. Vairam, P. Kalyani and Suba Ramesh, “Engineering Chemistry”, Wiley India, 2011.

REFERENCES :

1. P.W. Atkins and de Paula Julio, “Physical Chemistry”, Oxford University Press, 8th Ed., (Indian Student Edition) (2009).
2. K. K. Rohatgi-Mukherjee, “Fundamental of Photochemistry” New Age International (P) Ltd., New Delhi, 1986.
3. G.A. Ozin and A.C. Arsenault, “Nanochemistry: A Chemical Approach to Nanomaterials”, RSC Publishing, 2005.
4. V.R.Gowariker, N.V.Viswanathan and Jayadev Sreedhar, “Polymer Science”, New Age International P (Ltd.,), Chennai, 2006.

GE8151 COMPUTING TECHNIQUES L T P C

3 0 0 3

OBJECTIVES:

The students should be made to:

- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION 8

Generation and Classification of Computers- Basic Organization of a Computer – Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

UNIT II C PROGRAMMING BASICS 10

Problem formulation – Problem Solving - Introduction to ‘ C’ programming –fundamentals – structure of a ‘C’ program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in ‘C’ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – Matrix operations.

UNIT IV FUNCTIONS AND POINTERS 9

Function – Definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

UNIT V STRUCTURES AND UNIONS 9

Introduction – Need for structure data type – Structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design C Programs for problems.
- Write and execute C programs for simple applications.

TEXTBOOKS:

1. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.

REFERENCES:

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
2. Byron S Gottfried, " Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007

GE8152 ENGINEERING GRAPHICS L T P C

2 0 3 4

OBJECTIVES :

To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

Concepts and conventions (Not for Examination) 1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING 14

Basic Geometrical constructions, Curves used in engineering practices

Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales.

Visualization concepts and Free Hand sketching: Visualization principles –

Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14

Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces.

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 14

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3

Introduction to drafting packages and demonstration of their use.

TOTAL: 75 PERIODS

OUTCOMES:

On Completion of the course the student will be able to

- perform free hand sketching of basic geometrical constructions and multiple views of objects.
- do orthographic projection of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- prepare isometric and perspective sections of simple solids.
- demonstrate computer aided drafting.

TEXT BOOK :

1. N.D.Bhatt and V.M.Panchal, “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.

REFERENCES:

1. K.R.Gopalakrishna., “Engineering Drawing” (Vol I&II combined) Subhas Stores Bangalore, 2007.
2. Luzzader, Warren.J., and Duff,John M.,,’’ Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production”, Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005
3. M.B.Shah and B.C.Rana, “Engineering Drawing”, Pearson, 2nd Edition, 2009
4. K.Venugopal and V.Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited ,2008.
5. K. V.Natrajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
6. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi,2008.

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

SPECIAL POINTS APPLICABLE TO UNIVERSITY EXAMINATIONS ON ENGINEERING GRAPHICS:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

PH 8161	PHYSICS LABORATORY	L T P C
	(Common to all branches of B.E. / B.Tech. Programmes)	0 0 2 1

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

1.	Torsional pendulum	Determination of rigidity modulus of wire and moment of inertia of disc
2.	Non–uniform bending	Determination of young's modulus
3.	Lee's disc	Determination of thermal conductivity of a bad conductor
4.	Potentiometer	Determination of thermo e.m.f. of thermocouple
5.	Air wedge	Determination of thickness of a thin sheet of paper
6.	i. Optical fibre	Determination of Numerical Aperture and acceptance angle
	ii. Compact disc	Determination of width of the groove using laser
7.	Acoustic grating	Determination of velocity of ultrasonic waves in liquids
8.	Post office box	Determination of Band gap of a semiconductor
9.	Spectrometer	Determination of wavelength using grating
10.	Viscosity of liquids	Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

TOTAL : 30 PERIODS

OUTCOMES:

- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

CY 8161 **CHEMISTRY LABORATORY** **L T P C**

(Common to all branches of Engineering and Technology) **0 0 2 1**

OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry.

1. Estimation of HCl using Na2CO3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics – ester hydrolysis.
13. Corrosion experiment – weight loss method.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters

REFERENCES :

1. A. L. Vogel, A text of quantitative inorganic analysis, ELBS London. 1995.
2. D.P. Shoemarker and C.W. Gardad, Experiments in physical chemistry, McGraw Hill, London, 2001.
3. American Public Health Association.

GE8161 **COMPUTER PRACTICES LABORATORY** **L T P C**

0 0 3 2

OBJECTIVES:

The student should be made to:

- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.

- Learn to use Arrays, strings, functions, structures and unions.

LIST OF EXPERIMENTS:

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

GE8162 ENGINEERING PRACTICES LABORATORY L T P C

(Common to all Branches of B.E. / B.Tech. Programmes) 0 0 3 2

OBJECTIVE:

To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL AND ELECTRICAL)

1. CIVIL ENGINEERING PRACTICE 12

PLUMBING

Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

Laying pipe connection to the suction side of a pump – inlet.

Laying pipe connection to the delivery side of a pump – out let.

Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK

Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

STUDY

Study of joints in door panels, wooden furniture

Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICE **9**

Basic household wiring using switches, fuse, indicator – lamp etc.,

Preparation of wiring diagrams

Stair case light wiring

Tube – light wiring

Study of iron-box, fan with regulator, emergency lamp

GROUP – B (MECHANICAL AND ELECTRONICS) **15**

3. MECHANICAL ENGINEERING PRACTICE

WELDING

Arc welding of butt joints, lap joints, tee joints.
Gas welding Practice.

Basic Machining

Simple turning, drilling and tapping operations.

Machine assembly Practice.

Study and assembling the following:

Centrifugal pump, mixies and air conditioners.

Demonstration on

(a) Smithy operations like the production of hexagonal bolt.

(b) Foundry operation like mould preparation for grooved pulley.

4. ELECTRONIC ENGINEERING PRACTICE **9**

Soldering simple electronic circuits and checking continuity.
Assembling electronic components on a small PCB and testing.
Study of Telephone, FM radio, low-voltage power supplies.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to fabricate carpentry components and pipe connections including plumbing works.
- Ability to use welding equipments to join the structures
- Ability to fabricate electrical and electronics circuits

HS8251	TECHNICAL ENGLISH II	L T P C
	(FOR ALL BRANCHES OF B.E / B.TECH PROGRAMMES)	3 1 0 4

OBJECTIVES :

- To make the students acquire listening and speaking skills meant for both formal and informal contexts.
- To help them develop their reading skills by exposing them to different types of reading strategies.
- To equip them with writing skills needed for academic as well as workplace situations.
- To make them acquire language skills at their own pace by using e-materials and language lab component.

UNIT I

Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on something, weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using 'emoticons' as symbols in email messages; Grammar - Regular & irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II

Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his success, thanking one's friend / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials

- Interactive exercise on Grammar and vocabulary, Extensive reading activity (reading stories / novels from links), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students' dialogues.

UNIT III

Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret etc.); Reading - Speed reading – reading passages with the time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading the articles from the journals - Format for the journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. 'rock', 'train', 'ring'); E-materials - Interactive exercise on Grammar & vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU materials – Attending a meeting and writing minutes.

UNIT IV

Listening - Listening to a telephone conversation, Viewing a model interview (face-to-face, telephonic and video conferencing) and observing the practices; Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping the interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar & Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V

Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/ agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading Writing - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises - Pictures for discussion; Language Lab - Different models of group discussion

TOTAL : 60 PERIODS

OUTCOMES:

Learners should be able to

- Speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
- Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
- Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXT BOOKS :

1. "Mindscapes: English for Technologists and Engineers", Orient Black Swan, 2012 .
2. S.P.Dhanavel, "English and Communication skills for students of science and Engineering", Orient Black Swan, Chennai, 2011.

REFERENCES :

1. Laws, Anne. Presentations. Hyderabad: Orient BlackSwan, 2000.
2. Lewis, Hedwig, "Body Language: A Guide for Professionals". New Delhi: Sage Publications, 1998.
3. Naterop, Jean B. and Rod Revell, "Telephoning in English". Cambridge: Cambridge University Press, 1987.
4. Rutherford, Andrea J, "Basic Communication Skills for Technology", New Delhi: Pearson Education, 2001.
5. Ur, Penny, "Teaching Listening Comprehension", Cambridge: Cambridge University Press, 1984.

Extensive Readers

1. Abdul Kalam, A P J. "Ignited Minds: Unleashing the Power within India", New Delhi: Penguin Books India, 2002.
2. Parameswaran, Uma, "C.V.Raman: A Biography", New Delhi: Penguin Books India, 2011.

Web Resources

1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
4. www.mindtools.com
5. www.esl.about.com

MA8251 MATHEMATICS II L T P C

(Common to all branches of B.E. / B.Tech. Programmes in II Semester) 3 1 0 4

OBJECTIVES:

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I DIFFERENTIAL EQUATIONS 9+3

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT II VECTOR CALCULUS 9+3

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION 9+3

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9+3

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS 9+3

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL : 60 PERIODS

OUTCOMES:

- The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2010.

REFERENCES:

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH8251 MATERIALS SCIENCE L T P C

(Common to Manufacturing, Industrial, Mining, Mechanical, Aeronautical, Automobile and Production Engineering) 3 0 0 3

OBJECTIVE:

- To introduce the essential principles of materials science for mechanical and related Engineering applications.

UNIT I MECHANICAL PROPERTIES 9

Introduction to mechanical properties - tensile test - plastic deformation mechanisms - slip and twinning - role of dislocations in slip - strengthening methods - strain hardening - refinement of the grain size - solid solution strengthening - precipitation hardening - creep resistance - creep curves - mechanisms of creep - creep-resistant materials - fracture - the Griffith criterion - critical stress intensity factor and its determination - fatigue failure - fatigue tests - methods of increasing fatigue life - hardness - Rockwell and Brinell hardness - Knoop and Vickers microhardness.

UNIT II PHASE DIAGRAMS 9

Solid solutions - Hume Rothery's rules - free energy of solid solution - intermediate phases - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the level rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions - microstructural change during cooling.

UNIT III FERROUS ALLOYS AND HEAT TREATMENT 9

The iron-carbon equilibrium diagram - phases, invariant reactions - microstructue of slowly cooled steels - eutectoid steel, hypo and hypereutectoid steels - effect of alloying elements on the Fe-C system - diffusion in solids - Fick's law - phase transformations - pearlitic transformations - T-T-T-diagram for eutectoid steel - baintic and martensitic transformations - tempering of martensite - heat treatment of steels - annealing - normalizing - quenching and tempering - case hardening - induction, flame and laser hardening - carburizing, cyaniding, carbonitriding and nitriding.

UNIT IV ELECTRONIC MATERIALS 9

Classification of solids - energy bands - concept of Fermi level - conductor, semiconductor, insulator - Semiconductors: intrinsic, extrinsic - carrier concentration expression (qualitative) - compound semiconductors (qualitative) - dielectric materials - polarization mechanisms - dielectric breakdown - magnetic materials - ferromagnetic materials & hysterisis - ferrites - superconducting materials, properties, types and applications.

UNIT V NEW MATERIALS AND APPLICATIONS 9

Introduction to Ceramics and its applications - Ceramic Fibres - Fibre reinforced Plastics – Fibre reinforced Metal – Metallic glasses – Shape memory alloys – Copper base alloys – Nickel – Titanium alloys – Relaxor- Ferroelectric materials – Electro and magneto rheological fluids - Sensors and Actuators – polymer semiconductos – photoconducting polymers – liquid crystals - Bio-sensors - Scintillation detectors (Position sensitive) –Bio materials – hydroxyapatite – PMMA – Silicone.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply the different materials, their processing, and heat treatments in suitable application in mechanical engineering fields.

TEXT BOOKS :

1. Raghavan, V., “Materials Science and Engineering”, Prentice Hall of India, 2007.
2. Palanisamy, P.K., “Applied Materials Science”, Scitech, 2003.
3. Raghavan, V., “Physical Metallurgy”, Prentice Hall of India, 2002.

REFERENCES :

1. Calister, W.D., “Materials Science and Engineering an Introduction”, John Wiley, 2003.
2. Rajendarn V and Marikani A, “Materials Science”, Tata McGraw Hill, 2006

GE8251 ENGINEERING MECHANICS L T P C

3 1 0 4

OBJECTIVE :

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

UNIT I BASICS AND STATICS OF PARTICLES 12

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces — Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports –Action and reaction forces –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 – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS 12

Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids 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 laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL: 60 PERIODS

OUTCOMES:

- ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
- ability to analyse the forces in any structures.
- ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R, "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004)
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

REFERENCES:

1. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education, 2010.
2. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education, 2006.
3. J.L.Meriam and L.G.Kraige, " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2,Third Edition, John Wiley & Sons,1993.
4. Rajasekaran, S and Sankarasubramanian, G., "Engineering Mechanics Statics and Dynamics",3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.
5. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
6. Kumar, K.L., "Engineering Mechanics", 3rd Revised Edition, Tata McGraw-Hill Publishing company, New Delhi, 2008.

EE8202 FUNDAMENTALS OF ELECTRICAL ENGINEERING L T P C

3 0 0 3

AIM :

To provide knowledge in the basic concepts of circuits, electrical machines and measurement techniques.

OBJECTIVE :

To impart knowledge on

- Electric circuit laws
- Principle of Electrical Machines
- Various measuring instruments

UNIT I ELECTRIC CIRCUITS 9

An introduction to electric circuits – series and parallel networks – Ohms Law – Kirchhoff's Law – Introduction to alternative voltage and current- waveform, RMS value, power, power factor.

UNIT II DC MACHINES 9

Introduction – DC machine construction – shunt, series and compound windings – motor & generator – EMF and torque equation – losses – efficiency – DC motors starter – speed control of DC motors.

UNIT III TRANSOFRMER AND THREE-PHASE CIRCUITS 9

Introduction – transformer principle of operation – EMF equation of a transformer – transformer construction – transformer losses and efficiency – auto transformers. Three-phase supply – star connection – Delta connection – power in three-phase systems – measurement of power in three-phase systems – advantages.

UNIT IV AC MACHINES 9

Introduction – rotating magnetic field – synchronous field – construction of three-phase induction motors – principle of operation – slip – induction motor losses and efficiency – torque equation for an induction motor – induction motor torque speed characteristics – starting methods for induction motors – advantages of squirrel - cage induction motor – uses of three-phase induction motor – principles of operation of alternator.

UNIT V MEASUREMENTS 9

Classification of instruments – moving coil and moving iron ammeter and Voltmeter – Multimeters – dynamometer type Wattmeter– energy meter – megger – Instrument transformer (CT & PT)

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to identify the electrical components explain the characteristics of electrical machines.
- Ability to identify electronics components and use of them to design circuits.

TEXT BOOKS:

1. Del Toro, "Electrical Engineering fundamentals", Pearson Education, New Delhi, 2007
2. John Bird, "Electrical Circuit theory and technology", Elsevier, First Indian Edition, 2006.
3. V.K Mehta and Rohit Mehta, "Principle of Electrical Engineering", S Chand & Co, 2008

REFERENCES

1. Thereja.B.L., "Fundamentals of Electrical Engineering and Electronics", S Chand & Co.Ltd., 2008.
2. Asfaq Hussain, "Electric Machines", Dhanpat Rai & Co.

ME8252 MANUFACTURING TECHNOLOGY – I L T P C

3 0 0 3

OBJECTIVE:

To introduce the students on the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.

UNIT I METAL CASTING PROCESSES 9

Sand Casting – Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Moulding sand Properties and testing – Cores –Types and applications – Moulding machines – Types and applications– Melting furnaces – Principle of special casting processes- Shell, investment – Ceramic mould – Pressure die casting – Centrifugal Casting - CO_2 process – Stir castings - Defects in Sand casting.

UNIT II JOINING PROCESSES 9

Fusion welding processes – Type of Gas welding – Flame characteristics – Filler and Flux materials – Arc welding ,Electrodes , Coating and specifications – Principles and types of Resistance welding – Gas metal arc welding – 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 – Methods and process capabilities –Adhesive bonding, Types and applications.

UNIT III BULK DEFORMATION PROCESSES 9

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

UNIT IV SHEET METAL PROCESSES 9

Sheet metal characteristics – Typical shearing, bending and drawi9ng operations – Stretch forming operations – Formability of sheet metal – Test methods – Special forming processes- Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning – Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Micro forming.

UNIT V MANUFACTURE OF PLASTIC COMPONENTS 9

Types and characteristics of plastics – Moulding of thermoplastics – working principles and typical applications – 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

OUTCOMES:

- Upon completion of this course, the students can able to apply the different manufacturing process and use this in industry for component production

TEXT BOOKS :

1. Kalpakjian. S, “Manufacturing Engineering and Technology”, Pearson Education India Edition, 2006.
2. S. Gowri. P, Hariharan and A.Suresh Babu, “Manufacturing Technology” I, Pearson Education, 2008.

REFERENCES:

1. Roy. A. Lindberg, “Processes and materials of manufacture”, PHI / Pearson education, 2006.
2. Hajra Chouldhary S.K and Hajra Choudhury. AK., “Elements of workshop Technology, volume I and II”, Media promoters and Publishers Private Limited, Mumbai, 1997.
3. Paul Degarma E, Black J.T and Ronald A. Kosher, Materials and Processes, in Manufacturing, Prentice – Hall of India, 8th Edition, 1997.
4. Sharma, P.C., “A Text book of production Technology”, S.Chand and Co, Ltd., 2004.
5. P.N. Rao, “Manufacturing Technology Foundry, Forming and Welding”, TMH, 2nd Edition, 2003.

EE8262 ELECTRICAL ENGINEERING LABORATORY L T P C

0 0 3 2

AIM :

To provide the practical knowledge and control methods of electrical machines

OBJECTIVE:

To impart practical knowledge on

I. Characteristics of different machines

II. Method of speed control of machines

III. Measurement of various electrical parameters.

1. Study of Starters
2. Power Measurements in Three-Phase Circuits
3. Speed Control of DC Motor
4. Load Test on DC Shunt Motor
5. OCC & Load Test on DC Shunt Generator

6. Load Test on DC series motor.
7. OC and SC Test on Single- Phase Transformer
8. Load Test on Single-Phase Transformer
9. Load Test on Single-Phase Induction Motor
10. Load Test on Three-Phase Induction Motor
11. Load Characteristics of Alternator.

TOTAL : 45 PERIODS

OUTCOMES

Ability to perform speed characteristic of different electrical machine

ME8262 MANUFACTURING TECHNOLOGY LAB – I L T P C
0 0 3 2

OBJECTIVE:

To Study and practice the various operations that can be performed in lathe, shaping, drilling, milling etc. and to equip with the practical knowledge required in the core industries.

LIST OF EXPERIMENTS:

Machining, Measurement and Machining time estimations of: Taper Turning

External Thread cutting Internal Thread Cutting

Eccentric Turning Knurling

Square Head Shaping

Hexagonal Head Shaping

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course, the students can able to demonstrate and fabricate different types of components using the machine tools

MA8356 PROBABILITY AND STATISTICS L T P C
3 1 0 4

OBJECTIVES:

To make the students acquire a sound knowledge in statistical techniques that model engineering problems. The Students will have a fundamental knowledge of the concepts of probability.

UNIT I RANDOM VARIABLES 9+3

Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions – Functions of a random variable

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and Conditional distributions –Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTS OF SIGNIFICANCE 9+3

Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – x^2-test for goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness and Rank-sum test (Wilcoxon test).

UNIT IV DESIGN OF EXPERIMENTS 9+3

Completely randomized design – Randomized block design – Latin square design - 2- factorial design - Taguchi's robust parameter design.

UNIT V STATISTICAL QUALITY CONTROL 9+3

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL: 60 PERIODS

OUTCOMES :

After successfully completing the course, students should be able to do the following:

- Use statistical methodology and tools in the engineering problem-solving process.
- Compute and interpret descriptive statistics using numerical and graphical techniques.
- Understand the basic concepts of probability, random variables, probability distribution, and joint probability distribution.
- Compute point estimation of parameters, explain sampling distributions, and understand the central limit theorem.

TEXT BOOKS:

1. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, New Delhi, 4th Edition, 3rd reprint, 2008.
2. Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", pearson Education, Asia, 8th Edition, 2011.

CE8353 STRENGTH OF MATERIALS L T P C

3 0 0 3

OBJECTIVE:

To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

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

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

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 stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT III TORSION 9

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS 9

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

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2007.
2. Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi, 2007.

REFERENCES:

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

EC8352 ELECTRONICS ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To introduce important analog electronic devices and their characteristics
- To introduce concepts analog amplifiers and oscillators in discrete and IC form
- To teach digital logic, related digital circuits and analog to digital and digital to analog conversions

UNIT I SEMICONDUCTORS AND RECTIFIERS 9

Classification of solids based on energy band theory, Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Half and Full wave rectifiers, Zener effect, Zener diode, Zener diode Characteristics, Zener diode as a regulator.

UNIT II TRANSISTOR AND AMPLIFIERS 9

Bipolar junction transistors – CB, CE, CC configurations and characteristics, Biasing circuits – Fixed bias, Voltage divider bias, CE amplifier, Concept of feedback, Negative feedback, voltage series feedback amplifier, Current series feedback amplifier.

UNIT III FET AND POWER ELECTRONIC DEVICES 9

FET – Configuration and characteristics, FET amplifier, Characteristics and simple applications of SCR, Diac, Triac and UJT.

UNIT IV SIGNAL GENERATORS AND LINEAR ICs 9

Positive feedback, Sinusoidal oscillators – RC phase shift, Hartley, Colpitts, Wein bridge oscillators, Operational amplifier – Adder, Inverting and Non-inverting amplifiers, integrator and differentiator, IC 555 based Astable and Monostable Multivibrators.

UNIT V DIGITAL ELECTRONICS **9**

Boolean algebra, Logic Gates, , Half and Full adders, Decoder, Encoder, Multiplexer, Demultiplexer, Flip flops, Digital to Analog converters - R-2R and weighted resistor types, Analog to Digital converters - Successive approximation and Flash types.

TOTAL : 45 PERIODS

OUTCOMES:

- ability to identify electronics components and use of them to design circuits.

TEXT BOOK:

1. Malvino, “Electronic Principles”, McGraw Book Co., 1993.

REFERENCES:

1. Grob. B and Schultz. M.E. “Basic Electronics”, Tata Mcgraw Hill, 2003.
2. Thomas L. Floyd, “Electronics Devices”, Pearson Education, 2002.
3. Thomas L. Floyd, “Digital Fundamentals”, Pearson Education, 2003.
4. Millman, Halkias Jacob, Jit Christos and Satyabrata, “Electronic devices and Circuits”, Tata McGraw Hill, 2nd Edition.

IE8301 ENGINEERING ECONOMY AND COST ESTIMATION **L T P C**
3 0 0 3

OBJECTIVES :

- To study and understand the concept of Engineering Economics and apply in the real word.
- To gain knowledge in the field of cost estimation to enable the students to estimate the cost of various manufacturing processes.

UNIT I INTRODUCTION TO MANAGERIAL ECONOMICS AND DEMAND ANALYSIS **9**

Definition of Managerial Economics - Nature and scope of Managerial Economics - Managerial Economics and other disciplines. Objectives of the firm - Factors influencing Managerial decisions - Basic concepts of Managerial Economics. Demand Analysis – Defining demand, Types of demand and Determinants of demand, Elasticity of demand and demand forecasting.

UNIT II PRODUCTION AND COST ANALYSIS **9**

Production Analysis – Production function, Returns to a factor, Returns to scale, ISO quants and Least cost combination of inputs. Cost Analysis – Cost concepts, Determinants of cost, Short-run cost-output Relationship, Long-run cost output relationship, Economies and Diseconomies of scale and Estimating cost – Output Relationship.

UNIT III PRICING **9**

Determinants of price – Pricing under different objectives – Pricing under different market structures – Price discrimination – Pricing of Joint products – Pricing methods in practice.

UNIT IV ESTIMATION OF MATERIAL AND LABOUR COSTS **9**

Introduction to Estimation and Costing – Elements of costs – Allocation of overheads – Estimation of Material cost – Estimation of Labour cost.

UNIT V ESTIMATION OF OPERATIONAL COST **9**

Estimation in Machine shop – Estimation in Sheet metal shop – Estimation in Forging shop –Estimation in welding shop – Estimation in Foundry shops.

TOTAL: 45 PERIODS

OUTCOMES:

Students will become familiar with principles of micro economics and cost estimation. They will be able to apply these principles to appreciate the functioning of product and input market as well as the economy

TEXT BOOKS:

1. Yogesh Maheshwari, “Managerial Economics”, second edition, PHI 2005.
2. T.R.Banga and S.C.Sharma, Mechanical Estimating and Costing, Khanna Publishers, 1988.

REFERENCES:

1. V.L.Mote, Samuel Paul and G.S.Gupta, Managerial Economics – concepts and cases,TMH, 40th reprint 2007.
2. A.Ramachandra Aryasri and V.V.Ramana Murthy, “Engineering Economics and Financial Accounting”, TMH, New Delhi, 2004.

IE8302 FACILITY LAYOUT AND MATERIALS HANDLING **L T P C**

3 0 0 3

OBJECTIVE:

To explain the basic principles in facilities planning, location, layout designs and material handling systems

UNIT I PLANT LOCATION **9**

Introduction , Factors affecting location decisions , Location theory , Qualitative models , Semi-Quantitative models -Composite measure , Brown & Gibbs model , Break-Even analysis model, Single facility location problems – Median model, Gravity location model, Mini-Max model, Multi-facility location problems, Network and warehouse location problems.

UNIT II FACILITY LAYOUT DESIGN 9

Need for Layout study , Factors influencing plant layout ,Objectives of a good facility layout, Classification of layout , Layout procedure – Nadler's ideal system approach, Immer's basic steps, Apple's layout procedure, Reed's layout procedure –Layout planning – Systematic Layout Planning – Information gathering, flow analysis and activity analysis, relationship diagram, space requirements and availability, designing the layout. Utilities planning

UNIT III COMPUTERISED LAYOUT PLANNING 9

Concepts, Designing process layout – CRAFT, ALDEP, CORELAP – Trends in computerized layout, Algorithms and models for Group Technology.

UNIT IV DESIGNING PRODUCT LAYOUT 9

Line balancing - Objectives, Line balancing techniques – Largest Candidate rule- Kilbridge and Wester method- RPW method- COMSOAL.

UNIT V MATERIAL HANDLING AND PACKAGING 9

Objectives and benefits of Material handling, Relationship between layout and Material handling, Principles of material handling, Unit load concept, Classification of material handling equipments, Equipment selection, Packaging.

TOTAL: 45 PERIODS

OUTCOMES:

- Students must analyse, design and apply layout principles for layout product, material handling and packaging.

TEXT BOOK :

1. Francis, R.L., and White, J.A, "Facilities layout and Location", Prentice Hall of India, 2002.

REFERENCES :

1. Tompkins, White et al., "Facilities planning", John Wiley & Sons, inc. 2003.
2. James, Apple, "Material Handling System design", Ronald Press, 1980.
3. Krajewski, J. and Ritzman, "Operations Management – Strategy and Analysis", Addison – Wesley publishing company, 5th Edition, 1999.
4. Pannerselvam.R, "Production and Operations Management", PHI, 2nd Edition, 2005.

IE8303 **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, Introduction to 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), Introduction to MOST standard, 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

OUTCOMES:

- The Students should be able to measure productivity of a work system through work system design and apply various above mentioned techniques.

TEXT BOOK :

1. Barnes, R.M, “Motion and Time Study, Design and measurement of work”, John Wiley sons(Asia), Seventh edition,2003.

REFERENCES :

1. Benjamin W.Niebel, Andris Freivalds, “Methods, standards and Work Design”, McGraw hill, Eleventh edition, 2002.
2. ILO, “Introduction to Work Study”, Oxford and IBH publishing , 2008
3. Maynard H.B, “Industrial Engineering Hand book”, McGraw-Hill,2008
4. Prem Vrat, G.D. Sardana and B.S. Sahay, Productivity Management – A Systems Approach, Narosa Publishing House, 1998

CE8362 STRENGTH OF MATERIALS LABORATORY L T P C
0 0 3 2

OBJECTIVES:

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 metal
3. Torsion test on mild steel rod
4. Impact test on metal specimen (Izod and Charpy)
5. Hardness test on metals (Rockwell and Brinell Hardness Tests)
6. Deflection test on metal beam
7. Compression test on helical spring
8. Deflection test on carriage spring

TOTAL: 45 HOURS

OUTCOMES:

- Ability to perform different destructive testing
- Ability to characteristic materials

REFERENCE:

1. Relevant Indian Standards

EC8361 ELECTRONICS ENGINEERING LABORATORY L T P C
0 0 3 2

1. VI Characteristics of PN Junction and Zener Diodes.
2. Characteristics of CE configuration of Transistor.
3. Characteristics of UniJunction Transistor.
4. Characteristics of FET.
5. Operational Amplifier Applications – Adder, Multiplier.
6. RC Oscillator
7. LC Oscillators
8. IC 555 Astable and Monostable multivibrators

9. Half and Full adders
10. RS , T and D FFs
11. BCD counter using IC 7490

Equipment required

1.	Dual Regulated power supplies(0-30V)	: 10 Nos
2.	Function Generators (3 MHz)	: 10Nos
3.	CRO (30MHz)	: 10 Nos
4.	Diodes (1N4007)	: 25
5.	Zener diodes	: 25
6.	Transistors (BC107, BC 148)	: 25
7.	UJT (2N2636)	: 25
8.	FET (BFW10)	: 25
9.	Inductances and capacitances	
10.	OR, NOR and AND gate ICs	: 25
	IC 7483,7486,7490	:25

IE8311 WORK SYSTEM DESIGN LABORATORY L T P C
0 0 3 2

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 a. Walking rating
b. Card dealing
5. Work sampling
6. MTM practice
7. Video Based Time Study

TOTAL: 45 PERIODS

OUTCOMES:

- Students should able to design, analyse and apply the above mentioned techniques to measure productivity

GE8351 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

OBJECTIVES

To the study of nature and the facts about environment.

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

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive

use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

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

TOTAL : 45 PERIODS

OUTCOMES:

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

- Public awareness of environmental is at infant stage.

- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXT BOOKS

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

REFERENCE BOOKS

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

CE8352 FLUID MECHANICS AND MACHINERY L T P C

3 0 0 3

OBJECTIVES:

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

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 8

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

UNIT II FLOW THROUGH CIRCULAR CONDUITS 7

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

UNIT III DIMENSIONAL ANALYSIS 8

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

UNIT IV PUMPS **12**

Impact of jets - Euler's equation - Theory of rotodynamic machines – various efficiencies – velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps – working principle - work done by the impeller - performance curves - Reciprocating pump - working principle – indicator diagram – work saved by fitting air vessels – Rotary pumps – classification – comparison of working principle with other pumps – advantages.

UNIT V TURBINES **10**

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

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

1. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co, 2010.
2. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House Pvt. Ltd. New Delhi, 2004.
3. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House. New Delhi, 2002.

REFERENCES:

1. Robert W.Fox, Alan T. Mc Donald, Philip J.Pritchard, "Fluid Mechanics and Machinery", ISBN 978-0-470-54755-7, 2011.

IE8401 OPERATIONS RESEARCH-I **L T P C**

3 0 0 3

OBJECTIVE :

To learn the basics of deterministic optimization tools.

UNIT I LINEAR PROGRAMMING **9**

Introduction - Formulation of linear programming model - Graphical solution – Solving LPP using simplex algorithm – Revised Simplex Method.

UNIT II ADVANCES IN LPP – I **9**

Duality theory - Dual simplex method - Sensitivity analysis – Transportation problems – Assignment problems - Traveling sales man problem

UNIT III ADVANCES IN LPP – II **9**

Integer programming – Multi objective optimization: Goal programming–Introduction to Data Envelopment Analysis

UNIT IV NETWORK MODELS **9**

Maximal flow problems – Shortest route problem – Minimal spanning tree - Project network -CPM – PERT – Crashing.

UNIT V DYNAMIC PROGRAMMING **9**

Elements of dynamic programming – state –stage-recursive equations – computational procedure – applications

TOTAL : 45 PERIODS

OUTCOME:

The students can solve optimization problems of deterministic nature

TEXT BOOKS:

1. G.Srinivasan., “Operations Research Principles and Applications”, PHI, 2008.
2. R.Panneerselvam, “Operations Research”, PHI, 2006

REFERENCES:

1. Philips, Ravindran and Solberg, “Operations Research”, John Wiley,2002
2. Hamdy A Taha, “Operations Research – An Introduction”, Prentice Hall India, 2003.
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.
5. Hillier and Lieberman, “Introduction to Operations Research”, TMH, 2000.

ME8451 MANUFACTURING TECHNOLOGY – II **L T P C**

3 0 0 3

OBJECTIVES:

To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching. To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNC Programming.

UNIT I THEORY OF METAL CUTTING **9**

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools – nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

UNIT II TURNING MACHINES 9

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle : Swiss type, automatic screw type – multi spindle.

UNITIII RECIPROCATING, MILLING AND GEAR CUTTING MACHINES 9

Reciprocating machine tools: shaper, planer, slotter: Types and operations- Hole making : Drilling ,reaming,boring,Tapping, Milling operations-types of milling cutter –attachments-machining time calculations -,Gear cutting – forming and generation principle, gear milling , hobbing and gear shaping – micro finishing methods.

UNIT IV ABRASIVE PROCESS AND BROACHING 9

Abrasive processes: grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centreless grinding, internal grinding- micro finishing methods - Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

UNIT V ADVANCED MANUFACTURING TECHNIQUES 9

Numerical Control(NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micro machining – wafer machining

TOTAL: 45 PERIODS

OUTCOMES:

- The students can understand and compare the functions and applications of different metal cutting tools and also demonstrate the programming in CNC machining.

TEXT BOOKS:

1. Roy. A.Lindberg, “Process and materials of manufacture,” PHI/Pearson Education fourth, Edition 2006.
2. Rao. P.N, “Manufacturing Technology,” Metal Cutting and Machine Tools, Tata McGraw-Hill, New Delhi, 2003.

REFERENCES

1. Richerd R kibbe, John E. Neely, Roland O.Merges and Warren J.White, “Machine Tool Practices”, Prentice Hall of India, 1998
2. “HMT – Production Technology”, Tata Mc Graw Hill, 1998.
3. Hajra Choudhury, “Elements of Workshop Technology – Vol.II”, Media Promoters.

ME8452 **MECHANICS OF MACHINES** **L T P C**

3 0 0 3

OBJECTIVES:

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

UNIT I KINEMATIC OF MECHANICS **9**

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 IN MACHINE ELEMENTS **9**

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction aspects in brakes – Friction in vehicle propulsion and braking.

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 isolation.

TOTAL: 45 PERIODS

OUTCOME

- The students can apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOK:

1. Uicker J.J, Pennock G.R and Shigley J.E., “Theory of Machines and Mechanisms”, 3rd Edition, Oxford University Press, 2009.

REFERENCES:

1. Rattan S.S., “Theory of Machines”, 3rd Edition, Tata McGraw-Hill, 2009.
2. Bevan T., “Theory of Machines’, 3rd Edition, CBS Publishers and Distributors, 2005.
3. Cleghorn W. L, “Mechanisms of Machines”, Oxford University Press, 2005
4. Benson H.T., ”Principles of Vibrations”, Oxford University Press, 2nd Edition, 2007
5. Robert L.N, “Kinematics and Dynamics of Machinery”, Tata McGraw-Hill, 2009.
6. Allen S.H Jr., “Kinematics and Linkage Design”, Prentice Hall, 1961
7. Ghosh A. and Mallick A.K., “Theory of Mechanisms and Machines’, Affiliated East-West Pvt. Ltd., New Delhi, 1988.
8. Rao J.S. and Dukkipati R.V. “Mechanisms and Machine Theory”, Wiley-Eastern Ltd., New Delhi, 1992.
9. Hannah J. and Stephens R.C., “Mechanics of Machines”, Viva Low-Prices Student Edition, 1999.
10. Grover. G.T., “Mechanical Vibrations”, Nem Chand and Bros., 1996
11. Thomson W.T., Dahleh M.D. and Padmanabhan C., “Theory of Vibration with Application”, 5th edition Pearson Education, 2011
12. V.Ramamurthi, “Mechanics of Machines”, Narosa Publishing House, 2002.
13. Khurmi. R.S., “Theory of Machines”, 14th Edition, S Chand Publications.

STANDARDS:

IS 2458: 2001, Vocabulary of Gear Terms – Definitions related to Geometry.
IS 3756: 2002, Method of Gear Correction – Addendum modification for External cylindrical gears with parallel axes.
IS 5267: 2002 Vocabulary of Gear Terms – Definitions Related to Worm Gear Geometry.
IS 12328: Part 1: 1988 Bevel Gear Systems Part – 1 Straight Bevel Gears.
IS 12328: 1988 Bevel Systems Part – 2 Spiral Bevel Gears.

ME8453 THERMODYNAMICS L T P C
3 1 0 4

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 THERMODYNAMIC 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 15

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 10

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 11

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

TOTAL : 60 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply the Thermodynamic Principles to Mechanical Engineering Application.
- Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

TEXT BOOKS:

1. Cenegal Y.A. and Boles M.A., "Thermodynamics an Engineering Approach", Tata McGraw hill, Fourth edition, 2004.
2. Moran M.J. and Shapiro H.N., "Fundamentals of Engineering Thermodynamics", John wiley &Sons, Fourth Editon, 2000.

REFERENCE BOOKS:

1. Dhar P.L., “Engineering Thermodynamics – A Generalized Approach”, Elsevier, 2008.
2. Rathakrishnan E., “Fundamentals of Engineering Thermodynamics”, Prentice Hall of India, Second Edition,
3. Nag P.K., “Engineering Thermodynamics” ,Tata McGraw hill, Third edition, 2005

CE8413 FLUID MECHANICS AND MACHINERY LABORATORY L T P C

0 0 3 2

OBJECTIVE:

Students should able to verify the principles studied in theory by performing the experiments in lab.

A. Flow Measurement

1. Calibration of Rotometer
2. Flow through Venturimeter
3. Flow through a circular Orifice
4. Determination of mean velocity by Pitot tube
5. Verification of Bernoulli’s Theorem

B. Losses in Pipes

6. Determination of friction coefficient in pipes
7. Determination of losses due to bends, fittings and elbows

C. Pumps

8. Characteristics of Centrifugal pumps
9. Characteristics of Gear pump
10. Characteristics of Submersible pump
11. Characteristics of Reciprocating pump

D. Turbines

12. Characteristics of Pelton wheel turbine
13. Characteristics of Francis turbine

E. Determination of Metacentric height

14. Determination of Metacentric height

TOTAL: 45 PERIODS

OUTCOMES:

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

REFERENCE BOOKS:

1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2004.
2. Modi P.N. and Seth S.M., “Hydraulics and Fluid Mechanics”, Standard Book House, New Delhi, 2000.
3. Subramanya, K., “Flow in open channels”, Tata McGraw - Hill pub. Co., 1992.
4. Subramanya, “K. Fluid mechanics”, Tata McGraw- Hill pub. Co., New Delhi, 1992.

ME8461 MANUFACTURING TECHNOLOGY LAB – II L T P C

0 0 3 2

OBJECTIVES:

To Study and acquire knowledge on various basic machining operations in special purpose machines and its applications in real life manufacture of components in the industry

LIST OF EXPERIMENTS:

1. Contour milling using vertical milling machine
2. Spur gear cutting in milling machine
3. Helical Gear Cutting in milling machine
4. Gear generation in hobbing
5. Gear generation in shaping
6. Spline Broaching
7. Plain Surface grinding
8. Cylindrical grinding
9. Tool angle grinding with tool and Cutter Grinder
10. Measurement of cutting forces in Milling /Turning Process
11. CNC Part Programming.

OTAL : 45 PERIODS

OUTCOMES:

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

IE8501 MANUFACTURING AUTOMATION L T P C
3 0 0 3

OBJECTIVE:

To give a brief exposure to automation principles and applications to production systems covering few types of automation.

UNIT I MANUFACTURING OPERATIONS 9

Automation in production systems, principles and strategies, Product/production relationships, Production concepts and mathematical models, manufacturing economics.

UNIT II CONTROL TECHNOLOGIES 9

Automated systems – elements, functions, levels, Continuous Vs discrete control, Computer process control, Sensors, Actuators, ADC, DAC, Programmable logic controllers – ladder logic diagrams.

UNIT III TRANSFER LINES 9

Automated production lines – applications, Analysis – with and without buffers, automated assembly systems, line unbalancing concept.

UNIT IV NUMERICAL CONTROL AND ROBOTICS 9

NC - CNC – Part programming – DNC – Adaptive control – Robot anatomy – Specifications – End effectors – Industrial applications.

UNIT V AUTOMATED HANDLING AND STORAGE 9

Automated guided vehicle systems, AS/RS, Carousel storage, Automatic data capture - Bar code technology.

TOTAL: 45 PERIODS

OUTCOMES:

- To provide employability in the industries using various automated equipments such as transfer lines, CNC machines, industrial robots, automated inspection, material handling, storage and data collection systems.

REFERENCES:

1. Mikell P.Groover, Automation, “Production Systems and Computer Integrated Manufacturing” PHI, 2008.
2. Mikell P.Groover, Emory W. Zimmers, Jr., “CAD/CAM: Computer - Aided Design and Manufacturing”, PHI, 2007.

IE8502 **OPERATIONS RESEARCH - II** **L T P C**

3 0 0 3

OBJECTIVE :

To impart knowledge on some probabilistic optimization techniques.

UNIT I DETERMINISTIC INVENTORY MODELS 9

Purchase model with no shortages – Manufacturing model with no shortages – purchase model with shortages – Manufacturing model with shortages – Model with price breaks.

UNIT II PROBABILISTIC INVENTORY MODELS 9

Probabilistic inventory model – Reorder point model – Multiproduct-selective inventory control

UNIT III QUEUING THEORY 9

Queuing therory terminology – Single server, multi server, limited queue capaticity, limited population capacity – Applications – Markov chains.

UNIT IV DECISION THEORY 9

Decision making under certainty – Decision making under risk – Decision making under uncertainty – Decision tree analysis – Introduction to MCDM; AHP. Game Theory – Two person zero sum games, pure and mixed strategies – Theory of dominance - Graphical Solution – Solving by LP.

UNIT V NON-LINEAR PROGRAMMING 9

Introduction to non-linear programming – Unconstrained extreme points – Constrained problems with equality constraints: Lagrangean method - Constrained problems with inequalities: Kuhn tucker conditions – Quadratic programming.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be able to handle optimization problems of probabilistic nature. They can also apply scientific method for decision making.

TEXT BOOKS:

1. Ravindran A. ,Don T. Phillips,James J. Solberg “Operations Research: Principles And Practice”, Wiley India,2007
2. R.Panneerselvam, “Operations Research”, PHI,2006.

REFERENCES:

1. Hamdy A Taha, “Operations Research – An Introduction”, Prentice Hall India, 2003.
2. Ronald L Rardin, “Optimisation in Operations Research”, Pearson, 2003.
3. Hillier and Lieberman, “Introduction to Operations Research”, TMH, 2000.

IE8503 QUALITY CONTROL AND ASSURANCE L T P C
3 0 0 3

OBJECTIVES:

- To impart knowledge to enable the students to design and implement Statistical Process Control in any industry.
- To design and implement acceptance sampling inspection methods in industry.

UNIT I QUALITY FUNDAMENTALS 9

Importance of quality- evolution of quality- definitions of quality- dimensions of quality- quality control- quality assurance- areas of quality- quality planning- quality objectives and policies- quality costs- economics of quality- quality loss function- quality Vs productivity- Quality Vs reliability.

UNIT II CONTROL CHARTS FOR VARIABLES 9

Process variation- preliminary decisions- control limits and their computation- construction and application of X bar, R and S charts- warning and modified control limits- process adjustment for trend,- Comparison of process variation with specification limits- O.C. curve for X bar chart.

UNIT III STATISTICAL PROCESS CONTROL 9

Process stability- process capability study using control charts- capability evaluation- Cp, Cpk and Cpm – capability analysis using histogram and normal probability plot- machine capability study- gauge capability study- setting statistical tolerances for components and assemblies- individual measurement charts- X-chart, moving average and moving range chart, multi-vari chart.

UNIT IV CONTROL CHARTS FOR ATTRIBUTES 9

Limitations of variable control charts- Control charts for fraction non-conforming- p and np charts, variable sample size, operating characteristic function, run length- Control chart for nonconformities (defects)- c, u, ku charts, demerits control chart- applications.

UNIT V ACCEPTANCE SAMPLING 9

Need- economics of sampling- sampling procedure- single and double sampling- O.C. curves- Average outgoing quality- Average sample number- Average total inspection- Multiple and sequential sampling- Standard sampling plans- Military, Dodge-Roming, IS 2500.

TOTAL: 45 PERIODS

OUTCOMES:

- Control the quality of processes using control charts for variables in manufacturing industries.
- Control the occurrence of defective product and the defects in manufacturing companies.
- Control the occurrence of defects in services.

- Achieve savings in rupees to the companies through quality control and improvement programmes.

TEXT BOOK:

1. Douglus C. Montgomery, “Introduction to Statistical Quality Control”, John Wiley & Sons, 2004.

REFERENCES:

1. Krishnaiah K.,” Applied Statistical Quality Control and Improvement”, PHI, 2014.
2. Eugene L. Grant and Richard S. Leaven Worth, “Statistical Quality Control”, TMH, Seventh Edition, 2000.
3. Dale H. Besterfield, Quality Control, Pearson Education Asia, Seventh Edition, 2004.

ME8553 MACHINE DESIGN L T P C
3 1 0 4

OBJECTIVES :

- To familiarize 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 IN MACHINE MEMBERS 10

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 -Factor of safety - theories of failure – Design based on strength and stiffness.

UNIT II SHAFTS, COUPLINGS, JOINTS AND BEARINGS 8

Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, key ways and splines – Rigid and flexible couplings.
Threaded fasteners, Welded joints and riveted joints for structures, Sliding contact and rolling contact bearings (Simple problems)

UNIT III ENERGY STORING ELEMENTS AND ENGINE COMPONENTS 9

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

UNIT IV DESIGN FOR FLEXIBLE ELEMENTS 9

Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets.

UNIT V SPUR GEARS, HELICAL GEARS AND GEAR BOXES 9

Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations.

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

TOTAL: 60 PERIODS

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

OUTCOMES:

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

TEXT BOOK:

1. Bhandari V, “Design of Machine Elements”, 3rd Edition, Tata McGraw-Hill Book Co, 2010.

REFERENCES:

1. Sundararajamoorthy T. V, Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2003.
2. Joseph Shigley,Charles Mischke,Richard Budynas and Keith Nisbett, “Mechanical Engineering Design”, 8th Edition, Tata McGraw-Hill , 2008.
3. Robert C. Juvinall and Kurt M. Marshek, “Fundamentals of Machine Design”,4th Edition, Wiley, 2005.
4. Alfred Hall, Halowenko, A and Laughlin, H., “Machine Design”, Tata McGraw-Hill Book Co.(Schaum’s Outline), 2010.
5. Bernard Hamrock, Steven Schmid, Bo Jacobson, “Fundamentals of Machine Elements”, 2nd Edition, Tata McGraw-Hill Book Co., 2006.
6. Orthwein W, “Machine Component Design”, Jaico Publishing Co, 2003.
7. Ansel Ugural, “Mechanical Design – An Integral Approach, 1st Edition, Tata McGraw-Hill Book Co, 2003.
8. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, “Design of Machine Elements” 8th Edition, Printice Hall, 2003.

STANDARDS:

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

IE8511 AUTOMATION LAB L T P C
0 0 3 2

OBJECTIVE:

To give hands on experience on CNC programming on lathe and milling as well as PLC controller

1. Part programming for CNC Lathe- Starturn
2. Simulation and Machining Process in CNC Lathe – Starturn
3. Part programming for CNC Lathe- XLturn
4. Simulation and Machining Process in CNC Lathe – XLturn
5. Part programming for CNC Milling- StarMill PC
6. Simulation and Machining Process in CNC Milling- StarMill PC
7. Part programming for CNC Milling- XLMill
8. Simulation and Machining Process in CNC Milling -XLMill
9. Programming Exercise for Robots
10. Programming of PLC using Ladder Logic Diagram

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to write CNC programming using G-code nd M-code
- Ability to write programming for robot control
- Ability to use PLC for actutation

IE8512 OPTIMIZATION LAB L T P C
0 0 3 2

OBJECTIVES:

To give adequate exposure to applications of software packages in the area of Operations Research.

Problem Formulation, Solving Using C ,C++,Excel and Optimisation Package (TORA/Lindo/ Lingo)

LP Models
Transportation Problem
Assignment Problems
Maximal Flow
Minimal Spanning Tree
Shortest route
Project Management- PERT and CPM
Goal Programming
AHP and DEA

TOTAL : 45 PERIODS

OUTCOMES:

- Due to the practical exposure, to the theoretical knowledge gained earlier, the students are capable of selecting to right tool to solve optimization problems.

MF8561 **CAD LAB** **L T P C**

0032

AIM:

To understand and handle design problems in a systematic manner. To gain practical experience in handling 2D drafting and 3D modeling software systems and to apply CAD in real life applications.

COMPUTER AIDED DESIGN (CAD)

- 2D drawing Using AUTOCAD
- 3D Part modeling – protrusion, cut, sweep, draft, loft, blend, rib
- Editing – Move, Pattern, Mirror, Round, Chamfer
- Assembly – creating assembly from parts – assembly constraints
- Conversion of 3D solid model to 2D drawing - different views, sections, isometric view and dimensioning
- Introduction to Surface Modeling
- 3D modeling of machine elements like Flanged coupling, screw jack etc. (PRO-E)

TOTAL: 45 PERIODS

OUTCOMES:

- Able to draw 2D and 3D models.
- Able to assemble various 3D models to form product model.
- Able to obtain 2D drawing from 3D models.

MG8654 TOTAL QUALITY MANAGEMENT L T 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 product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.

UNIT II TQM PRINCIPLES 9

Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - 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 – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

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

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 –Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.

TOTAL : 45 PERIODS

OUTCOMES:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

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

REFERENCE BOOKS:

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, Third 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.

IE8601 APPLIED ERGONOMICS L T P C
3 0 0 3

OBJECTIVE:

To explain the general principles that govern the interaction of humans and their working environment for improving worker performance and safety.

UNIT I INTRODUCTION 9

Brief history of human factors Engineering/Ergonomics – Interdisciplinary nature- Principles of Human factors Engineering- Biostatic and Biodynamic Mechanics.

UNIT II HUMAN PERFORMANCE 9

Factors influencing performance – Information receiving and processing – Information theory and its application – Human response and errors – Signal detection theory.

UNIT III PHYSIOLOGICAL ASPECTS OF HUMAN AT WORK 9

Metabolism – Physiological factors involved in muscular activity – Measurement of energy expenditure – Quantitative work load analysis – Physical work capacity and its evaluation – Physiological fatigue – Work and rest schedules – Physical fitness tests.

UNIT IV WORK PLACE DESIGN 9

Problems of body size, Anthropometry measures, Work posture – Work space layout and work station design – Design of displays, controls and VDT work stations – Hand tool design, illumination.

UNIT V OCCUPATIONAL HEALTH AND SAFETY 9

Industrial accidents, Personnel Protective devices, Safety Management practices – Effect of Environment – heat, cold & noise – NIOSH regulations and Factories Act

TOTAL: 45 PERIODS

OUTCOMES:

- The Student should apply ergonomic principles to design workplaces for the improvement of human performance and implement latest occupational health and safety to the work place.

TEXT BOOKS:

1. Bridger, R.S., “Introduction to Ergonomics”, McGraw Hill, 1995.
2. Martin Helander, “A guide to Ergonomics of Manufacturing”, TMH, 2006.

REFERENCES:

1. Mecormik, T.J., “Human Factors Engineering”, TMH, 1990.
2. John Grimaldi, “Safety Management”, A.I.B.S., 5th Edition, Hazard Control Technology 2003
3. Philips, Chandler A, “Human Factors Engineering”, John Wiley and Sons, Inc. 2000

IE8602 PRODUCTION AND OPERATIONS MANAGEMENT L T P C

3 0 0 3

OBJECTIVE:

To impart knowledge in the areas of production planning and control applicable to various types of manufacturing systems.

UNIT I INTRODUCTION 5

Overview of Production System, Objectives of Operation Management, Scope of Operations Management, Operations Management Frame work, Relationship of operations with other Functional areas, Manufacturing Vs Service sector, Operations Decision making, Production Design Process and Process choices

UNIT II FORECASTING 12

Need, Determinants of Demand, Demand Patterns, Measures of forecast error, Qualitative Forecasting Methods-Delphi techniques. Market Research, Nominal Group Technique Quantitative Forecasting methods – Moving Average Methods, Exponential Smoothing Methods, Regression methods, Monitoring and Control of Forecasts, Requirements and Selection of Good forecasting methods.

UNIT III AGGREGATE PLANNING 10

Role of aggregate Product planning, Managerial inputs to Aggregate planning, Pure and Mixed strategies, Mathematical Models for Aggregate planning – Transportation Method, Linear programming Formulation, Linear Decision Rues, Master Production Schedule(MPS), Procedure for developing MPS, MRP, Lot sizing methods of MRP, MRP Implementation issues, MRP – II.

UNIT IV CAPACITY MANAGEMENT 8

Measures of capacity, Factors affecting capacity, Capacity planning, Systematic approach to capacity planning, Long-term and short-term capacity decisions, Tools for capacity planning, Capacity Requirement planning- Business process outsourcing

UNIT V PRODUCTION ACTIVITY CONTROL 10

Objectives and Activities of Production Activity Control, Flow-shop, Intermittent flow shop, Job shop, Shop floor control – High volume Production Activity Control, Job-shop Production Activity Control.

TOTAL: 45 PERIODS

OUTCOMES

- Upon completion of this course, the students will be able to demonstrate the knowledge in fundamental concepts and issues of operations management in creating and enhancing a firm's competitive advantages

REFERENCES:

1. Seetharama L.Narasimhan, Dennis W.McLeavey, Peter J.Billington,"Production Planning And Inventory Control" , PHI, 2nd Edition, 2002.
2. Norman Gaither, Greg Frazier, Operations Management, Thomson Learning, 9th Edition, 2002.
3. Monks J.G, "Operations Management", McGraw Hill, 1997
4. Panneerselvam. R, Production and operations Management,PHI,2005
5. Lee J.Krajewski, Larry P.Ritzman, "Operations Management Strategy and Analysis", PHI, 6th Edition, 2003.

IE8603 RELIABILITY ENGINEERING L T P C

3 0 0 3

OBJECTIVE:

To impart knowledge in reliability concepts, reliability estimation methods and reliability improvement methods

UNIT I RELIABILITY CONCEPT 9

Reliability definition –Reliability parameters- f(t), F(t) and R(t) functions- Measures of central tendency – Bath tub curve – A priori and posteriori probabilities of failure – Component mortality - Useful life.

UNIT II LIFE DATA ANALYSIS 9

Data classification – Non parametric methods: Ungrouped, Grouped, Complete, Censored data – Time to failure distributions – Probability plotting: Exponential, Weibull - Goodness of fit tests – Survival graphs.

UNIT III RELIABILITY ESTIMATION 9

Series parallel configurations – Parallel redundancy – m/n system – Complex systems: RBD approach – Baye's method – Minimal path and cut sets - Fault Tree analysis – Standby system.

UNIT IV RELIABILITY MANAGEMENT 8

Reliability testing: Failure terminated test – Time terminated test – Upper and lower MTBFs – Sequential Testing – Reliability growth monitoring – Reliability allocation.

UNIT V RELIABILITY IMPROVEMENT 10

Analysis of downtime – Repair time distribution – Maintainability prediction – Measures of maintainability – Availability definitions – System Availability – Replacement decisions – Economic life.

TOTAL: 45 PERIODS

OUTCOMES

- Students will be able to conduct reliability assessment and failure analysis on any complex systems.

REFERENCES:

1. Charles E.Ebeling, "An Introduction to Reliability and Maintainability Engineering", TMH, 2000.
2. Roy Billington and Ronald N. Allan, "Reliability Evaluation of Engineering Systems", Springer, 2007.

HS8561 EMPLOYABILITY SKILLS L T P C

(COMMON TO ALL BRANCHES OF FIFTH OR SIXTH SEMESTER 0 0 2 1
B.E / B.TECH PROGRAMMES)

OBJECTIVES :

- To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
- To help them improve their soft skills, including report writing, necessary for the workplace situations

1. Making presentations – introducing oneself – introducing a topic – answering questions – individual presentation practice
2. Creating effective PPTs – presenting the visuals effectively
3. Using appropriate body language in professional contexts – gestures, facial expressions, etc.
4. Preparing job applications - writing covering letter and résumé
5. Applying for jobs online - email etiquette
6. Participating in group discussions – understanding group dynamics - brainstorming the topic
7. Training in soft skills - persuasive skills – People skills - questioning and clarifying skills – mock GD

8. Writing Project proposals – collecting, analyzing and interpreting data / drafting the final report
9. Attending job interviews – answering questions confidently
10. Interview etiquette – dress code – body language – mock interview

TOTAL: 30 PERIODS

OUTCOME

- The students will have enough confidence to present themselves well using proper oral and written communication skills to any interview (or) discussion (or) presentation.

REFERENCES :

1. Dhanavel, S.P. 2010, “English and Soft Skills”, Hyderabad: Orient BlackSwan Ltd.
2. Corneilssen, Joep. How to Prepare for Group Discussion and Interview. New Delhi: Tata-McGraw-Hill, 2009.
3. D’Abreo, Desmond A, “Group Discussion and Team Building”, Mumbai: Better Yourself Books, 2004.
4. Ramesh, Gopalswamy, and Mahadevan Ramesh, “The ACE of Soft Skills”, New Delhi: Pearson, 2010.
5. Gulati, Sarvesh, “Corporate Soft Skills”, New Delhi: Rupa and Co. 2006.
6. Van Emden, Joan, and Lucinda Becker, “Presentation Skills for Students”, New York: Palgrave Macmillan, 2004.

EXTENSIVE READERS

1. Covey, Stephen R, “The 7 Habits of Highly Effective People”, New York: Free Press, 1989.
2. Bagchi, Subroto, “The Professional”, New Delhi: Penguin Books India, 2009.

WEB RESOURCES

1. www.humanresources.about.com
2. www.careerride.com

IE8611 **ERGONOMICS LAB** **L T P C**

0 0 3 2

OBJECTIVE:

To test the principles of human factors engineering in a laboratory

1. Effect of speed of walking on tread mill using heart rate and energy expenditure
2. Effect of workload on heart rate using Ergo cycle.

3. Evaluation of physical fitness using step test
4. Effect of work-rest schedule on physical performance (Ergo cycle / tread mill)
5. Development of anthropometric data for male and female.
6. Application of anthropometric data for the design of desk for students
7. Evaluation of physical facilities (chairs, tables etc.)Through comfort rating.
8. Evaluation of cognitive performance of individuals
9. Analysis of noise level in different environment
10. Study of Illumination of work places.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to design the industry with ergonomics consideration

IE8612 INDUSTRIAL TRAINING / MINI PROJECT L T P C

0 0 3 2

The student has the option of undergoing either industrial training or can carry out a mini project.

INDUSTRIAL TRAINING:

The objective is to give an exposure to the industrial environment and learn how they function. A minimum of 4 weeks of industrial training is required. He/she can undergo training either at a stretch or in two spells of a minimum of two weeks each. The training should have been completed in the immediate preceding one or two summers. A comprehensive report is to be submitted at the beginning of the VIIth semester. A certificate from the industry singed by an appropriate authority should be submitted along with the report. It will be evaluated by a two member committee constituted by the Head of the Department based on the report and oral examination.

MINI PROJECT:

The objective is to develop skill in applying industrial engineering techniques to real/ practical problems.

A student is expected to select a topic in the industrial engineering area such as Forecasting, production planning, scheduling, operations research, facilities planning and lay out, transportation and distribution, quality, supply chain, simulation etc. Identify a problem and collect necessary data and analyse using appropriate tool / technique. Data can be collected from industry or standard data sets available in literature can be used.

A comprehensive report is to be submitted towards the end of the VIIth semester. It will be

evaluated by a two member committee constituted by the Head of the Department based on the report and oral examination.

IE8701 SIMULATION MODELING AND ANALYSIS L T 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 – Input Data Modeling - 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 Queing, Inventory, Replacement, Production etc., - Model validation and verification, Output analysis. Use of DOE tools.

UNIT IV SIMULATION LANGUAGES 12

Need for simulation Languages – Study of GPSS and introduction to ARENA.

UNIT V CASE STUDIES USING SIMULATION LANGUAGES 8

TOTAL: 45 PERIODS

OUTCOMES:

- Will be able to analyse, models and simulate experiments to meet real world system and evaluate the performance.

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 and Kelton W D, Simulation Modelling and analysis, Tata McGraw Hill, 2003.
4. David Kelton, Rondall P Sadowski and David T Sturrock, “Simulation with Arena”, Mc Graw Hill, 2004
5. Thomas J Schriber, “Simulation Using GPSS”, John Wiley, 2002.
6. http://www.bcnn.net

IE8702 SUPPLY CHAIN AND LOGISTICS MANAGEMENT L T P C

3 0 0 3

OBJECTIVE:

To teach the basic principles of supply chains and associated logistics management.

UNIT I INTRODUCTION 5

Role of Logistics and Supply chain Management: Scope and Importance- Evolution of Supply Chain -Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles.

UNIT II SUPPLY CHAIN NETWORK DESIGN 10

Role of Distribution in Supply Chain – Factors influencing Distribution network design –Design options for Distribution Network Distribution Network in Practice-Role of network Design in Supply Chain – Framework for network Decisions

UNIT III LOGISTICS IN SUPPLY CHAIN 10

Role of transportation in supply chain – factors affecting transportations decision – Design option for transportation network – Tailored transportation – Routing and scheduling in transportation

UNIT IV SOURCING AND COORDINATION IN SUPPLY CHAIN 10

Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration - sourcing planning and analysis -supply chain co-ordination - Bull whip effect – Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain

UNIT V SUPPLY CHAIN AND INFORMATION TECHNOLOGY 10

The role IT in supply chain- The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain –E-Business in supply chain

TOTAL: 45 PERIODS

OUTCOMES:

- The student would understand the framework and scope of supply chain networks and functions.

TEXT BOOKS :

1. Sunil Chopra, Peter meindl and Kalra, “Supply Chain Management , Strategy, Planning, and operation”, Pearson Education, 2010.
2. Srinivasan G.S, “Quantitative models in Operations and Supply Chain Management, PHI, 2010.

REFERENCES

1. Jeremy F.Shapiro, “Modeling the supply chain”, Thomson Duxbury, 2002.
2. David J.Bloomberg , Stephen Lemay and Joe B.Hanna, “Logistics”, PHI 2002.
3. James B.Ayers, “Handbook of Supply chain management”, St.Lucle press, 2000.

IE8755 **DESIGN OF EXPERIMENTS** **L T P C**

3 0 0 3

OBJECTIVES:

- To impart knowledge to design experiments to a problem situation using traditional experimental designs as well as Taguchi Methods.
- To develop skill to conduct experiments and analyze the data to determine the optimal process parameters that optimize the process.

UNIT I FUNDAMENTALS OF EXPERIMENTAL DESIGNS 9

Hypothesis testing – single mean, two means, dependant/ correlated samples – confidence intervals, Experimentation – need, Conventional test strategies, Analysis of variance, F-test, terminology, basic principles of design, steps in experimentation – choice of sample size – Normal and half normal probability plot – simple linear and multiple linear regression, testing using Analysis of variance.

UNIT II SINGLE FACTOR EXPERIMENTS 9

Completely Randomized Design- effect of coding the observations- model adequacy checking - estimation of model parameters, residuals analysis- treatment comparison methods- Duncan's multiple range test, Newman-Keuel's test, Fisher's LSD test, Tukey's test- testing using contrasts- Randomized Block Design – Latin Square Design- Graeco Latin Square Design – Applications.

UNIT III FACTORIAL DESIGNS 9

Main and Interaction effects - Two and three factor full factorial designs- Fixed effects and random effects model - Rule for sum of squares and Expected Mean Squares- 2^K Design with two and three factors- Yate's Algorithm- fitting regression model- Randomized Block Factorial Design - Practical applications.

UNIT IV SPECIAL EXPERIMENTAL DESIGNS 9

Blocking and Confounding in 2^K Designs- blocking in replicated design- 2^K Factorial Design in two blocks- Complete and partial confounding- Confounding 2^K Design in four blocks- Two level Fractional Factorial Designs- one-half fraction of 2^K Design, design resolution, Construction of one-half fraction with highest design resolution, one-quarter fraction of 2^K Design- introduction to response surface methods, central composite design.

UNIT V TAGUCHI METHODS 9

Design of experiments using Orthogonal Arrays, Data analysis from Orthogonal experiments- Response Graph Method, ANOVA- attribute data analysis- Robust design- noise factors, Signal to noise ratios, Inner/outer OA design- case studies.

TOTAL: 45 PERIODS

OUTCOMES:

- Able to apply experimental techniques to practical problems to improve quality of processes / products by optimizing the process / product parameters.

TEXT BOOKS :

1. Krishnaiah K, and Shahabudeen P, "Applied Design of Experiments and Taguchi Methods", PHI, India, 2011.
2. Douglas C. Montgomery, "Design and Analysis of Experiments", John Wiley & sons, 2005.

REFERENCE :

1. Phillip J. Ross, "Taguchi Techniques for Quality Engineering", Tata McGraw-Hill, India, 2005.
2. Box, G. E., Hunter,W.G., Hunter, J.S., Hunter,W.G., "Statistics for Experimenters: Design, Innovation, and Discovery", 2nd Edition, Wiley, 2005.

IE8711 COMPREHENSION L T P C

0 0 2 1

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

IE8712 DATA ANALYTICS LAB L T P C

0 0 3 2

OBJECTIVE:

To carry out exercises with the help of software packages in the areas of linear and multivariate regression, factor analysis, discriminant analysis, reliability and design of experiments

1. Determine the linear regression model for fitting a straight line and calculate the least squares estimates, the residuals and the residual sum of squares.
2. Determine the multivariate regression model for fitting the straight line.
3. Perform the Correlation analysis to determine the relationships among the variables.
4. Perform the factor analysis for the given set of model data using both Exploratory and Confirmatory methods and evaluate the model adequacy.
5. Determine which continuous variable is discriminate among the given group and

determine which variable is the best predictor.

6. Determine the process is within the control or not by developing the control charts for attributes and variables and estimate the process capability.
7. Estimate the parameters (MTTF, MTBF, failure rate, bathtub curve etc) of components and systems to predict its reliability. (use Reliasoft)
8. Develop the single factor and two factor design of experiment model to predict the significance factor.
9. Develop 2^k factorial and 2^{k-p} fractional factorial experiment to determine the parameters which affect the system.

TOTAL : 45 PERIODS

Usage of Minitab for:

Linear and multivariate regression
Correlation Factor
analysis Discriminant
analysis Control
charts Process
capability Factorial
experiments

OUTCOMES

- Upon completion of this laboratory course, the students willgain confidence in the use of statistical methods and accomplish the ability to extract meaningful information from data sets forbetter decision-making.

IE8713 DISCRETE SIMULATION LAB 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,Poker

4-5. Monte Carlo Simulation
   Random Walk Problem with graphical application
   Paper Boy Problem

6-7. Queuing Models

Single, Multi Server

8-9 Other IE oriented Models

Inventory, Replacement, Production system etc.

10-11. Use of Simulation Language/Package

TOTAL : 45 PERIODS

OUTCOMES:

- The students would gain knowledge on computer based discrete system simulation experiments

IE8811 PROJECT WORK L T P C

0 0 1 2

A project topic must be selected either from published lists or the students themselves may propose suitable topics in consultation with the faculty/guide. It can be a theoretical research project or industry oriented. The objective is to apply the principles/ techniques they have learnt to a new or existing problem situation leading to a solution. Generally it is a group project.

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

A project report is to be submitted towards the end of the semester. It will be evaluated jointly by the external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

IE8001 ACCOUNTING AND FINANCE FOR MANAGEMENT L T P C

3 0 0 3

OBJECTIVE

To enable students to understand the accounting procedure, interpretation of financial accounting with cost account.

UNIT I INTRODUCTION 9

Basics of accounting – Management Accounting – Financial accounting – cost accounting – comparison of Financial accounting, cost accounting and management Accounting – generally accepted Accounting principles – Accounting standards – Accounting cycle.

UNIT II FINANCIAL ACCOUNTING 9

Salient features of Balance Sheet and Profit and Loss statement, cash flow and Fund flow analysis (Elementary), working capital management, ratio analysis – Depreciation.

UNTIII COST ACCOUNTING **9**

Cost accounting systems : Job Costing, process costing, allocation of overheads, Activity based costing, variance analysis – marginal costing – Break even analysis.

UNTI IV BUDGETING **9**

Requirements for a sound budget, fixed budget – preparation of sales and production budget, flexible budgets, zero based budgets and budgetary control.

UNIT V FINANCIAL MANAGEMENT **9**

Investment decisions – Investment appraisal techniques – payback period method, accounting rate of return, net present value method, internal rate of return and profitability index method-cost of capital.

TOTAL: 45 PERIODS

OUTCOMES:

- To possess the principles and techniques of accounting and managing finance in an organization

REFERENCES :

1. Bhattacharya. S.K. and John Deardon, “Accounting for Management – Text and cases”, Vikas publishing House, New Delhi, 1996.
2. James, C.Van Horne, “Fundamental of Financial Management” Dearson Education, 12th Edition, 2002
3. V.R.Palanivelu, “Accounting for Management”, Lexmi Publication (P) Ltd., 2007.

IE8002 ADVANCED OPTIMIZATION TECHNIQUES **L T P C**
3 0 0 3

OBJECTIVES :

- Understand the nonlinear problem.
- Know about multi-objective problem.
- To create awareness of meta heuristic algorithms.

UNIT I DECISION ANALYSIS **9**

Decision Trees, Utility theory, Game theory, MCDM – Goal programming, AHP and ANP; Markov Decision processes

UNIT II NON-LINEAR OPTIMIZATION - I **9**

Types of Non-linear programming problems, Unconstrained optimization, KKT conditions for constrained optimization, Quadratic programming

UNIT III NON-LINEAR OPTIMIZATION - II **9**

Separable programming, Convex programming, Non-convex programming, Geometric programming, Stochastic programming

UNIT IV NON-TRADITIONAL OPTIMIZATION - I **9**

An over view of Genetic Algorithms, Simulated annealing, Tabu search, Ant Colony Optimization

UNIT V NON-TRADITIONAL OPTIMIZATION - II **9**

Neural network based optimization, Optimization of Fuzzy systems

TOTAL : 45 PERIODS

- c

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.

IE8003 APPLIED MULTI-VARIATE ANALYSIS **L T P C**
3 0 0 3

OBJECTIVE:

To impart knowledge on the applications of multivariate statistical analysis

UNIT I MULTIVARIATE METHODS **9**

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

UNIT II REGRESSION **9**

Simple Regression, and Correlation – Estimation using the regression line, correlation analysis, Multiple Regression and Canonical Correlation analysis – Inferences about population parameters.

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.

UNIT V CLUSTER ANALYSIS **9**

Cluster analysis – Clustering methods, Multivariate analysis of variance.

TOTAL : 45 PERIODS

OUTCOMES:

- Can apply the multivariate, regression, factor, discriminent and cluster analysis techniques for statistical analysis.

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.

IE8004 COMPUTATIONAL METHODS AND ALGORITHMS L T P C

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 - Networks – Scheduling – Optimization models – IE applications

TOTAL: 45 PERIODS

OUTCOMES:

- Student must be able to design algorithm computational tools used in manufacturing process.

REFERENCES:

1. Goodman S F and 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, K Jeffrey D. Ullman and John E. Hopcroft, “Data Structures and Algorithms”, Addison-Wesley, 1993.

IE8005 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

OUTCOMES:

- The students will be able to make decisions in the semi structured and unstructured problem situations using systems and semantic networks.

REFERENCES :

1. Efraim Turban and Jay E Aronson, “Decision Support and Business Intelligent Systems”, PHI, Eighth edition, 2010.
2. S S Mitra, “Decision support systems, tools and techniques”, John Wiley, 1996.
3. Elain Rich and Kevin Knight, “Artificial intelligence”, TMH,1993.

IE8006 EVOLUTIONARY OPTIMIZATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce different evolutionary optimization techniques for the problems related to the manufacturing systems

UNIT I **9**

Conventional Optimization techniques, Overview of evolutionary computation, Historical branches of evolutionary computation

UNIT II **9**

Search operators, Selection schemes, Ranking methods, Importance of representation

UNIT III **9**

Evolutionary combinatorial optimization: evolutionary algorithms, Constrained optimization, Evolutionary multi-objective optimization.

UNIT IV **9**

Genetic programming – Steps, Search operators on trees, examples, Hybrid genetic algorithms, Combining choices of heuristics

UNIT V **9**

Pareto optimality, Analysis of evolutionary algorithms

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be able to make decisions in the semi structured and unstructured problem situations.

REFERENCES :

1. W Banzhaf et al , “Genetic Programming – An introduction”, Morgan Kanfmann 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.
5. Ruhul sarker, Masoud Mohammadian, Yao, Evolutionary Optimization, Kluwers’s Academic Publishers, 2002.

IE8007 INFORMATION SYSTEMS ANALYSIS AND DESIGN **L T P C**

3 0 0 3

OBJECTIVES:

- To describe the design data flow and ER diagrams Management Information Systems to business organisation

UNIT I OVERVIEW **6**

Information concepts, System concepts, Examples of Information systems, Information Systems analysis overview, Information gathering – sources.

UNIT II DATA FLOW DIAGRAMS and ER DIAGRAMS 10

System Requirements specifications, Feasibility analysis, Data flow diagrams – logical and physical DFDs, Process specification methods, Decision tables.
Logical database design – ER model, Normalizing relations; Data input methods; Structured Systems Analysis and Design.

UNIT III MANAGEMENT INFORMATION SYSTEMS 10

Development of MIS, Choice of Information technology, Applications in manufacturing and service sector, Enterprise management systems.

UNIT IV TECHNOLOGY and INFORMATION SYSTEMS 10

Database management systems, Object oriented technology, Client-server architecture, Local area network, network topology.

UNIT V APPLICATIONS 9

Data warehouse design and implementation, Models of E-business, MIS and E-business, Web enabled business management, Introduction to ERP , Case studies.

TOTAL : 45 PERIODS

OUTCOMES:

- The Student must be able to design data flow and ER diagrams, manage information system and apply modern concepts to business organizations.

REFERENCES:

1. V. Rajaraman, “Analysis and Design of Information Systems”, PHI, 2004.
2. Jeffrey L Whitten et al, “Systems Analysis and Design Methods”, McGraHill, 2003.

IE8008 MAINTENANCE ENGINEERING AND MANAGEMENT L T P C

3 0 0 3

OBJECTIVE:

- To provide maintenance concepts and maintenance policies with maintenance management tools and techniques.

UNIT I MAINTENANCE CONCEPT 7

Maintenance definition – Maintenance objectives – Maintenance challenges – Tero Technology –Maintenance costs - Scope of maintenance department.

UNIT II MAINTENANCE MODELS 11

Proactive/reactive maintenance – Maintenance policies – Imperfect maintenance – PM versus b/d maintenance – Optimal PM schedule and product characteristics – Inspection decisions: Maximizing profit - Minimizing downtime – Replacement decisions.

UNIT III MAINTENANCE QUALITY 8

Five zero concept – FMECA – Root cause analysis – Repair time distribution – Analysis of downtime – Maintainability prediction – Design for maintainability – RCM.

UNIT IV V MAINTENANCE MANAGEMENT 11

Human factors – Maintenance staffing: Learning curves – Simulation – Optimal size of service facility – Optimal repair effort – Spare parts management – Maintenance planning – Maintenance scheduling.

UNIT V TOTAL PRODUCTIVE MAINTENANCE 8

TPM philosophy – Chronic and sporadic losses – Equipment defects – Six major losses – Overall equipment effectiveness – TPM pillars – Autonomous maintenance.

TOTAL : 45 PERIODS

OUTCOMES:

- The students would gain knowledge on maintenance logistics, fault diagnosis and TP M.

REFERENCES:

1. Andrew K.S.Jardine & Albert H.C. Tsang, “Maintenance, Replacement and Reliability”. Taylor and Francis, 2006.
2. Bikas Badhury & S.K.Basu, “Tero Technology: Reliability Engineering and Maintenance Management”, Asian Books, 2003.
3. Seichi Nakajima, “Total Productive Maintenance”, Productivity Press, 1993.

IE8009 METROLOGY AND INSPECTION L T P C

3 0 0 3

OBJECTIVE:

To impart knowledge about linear and angular measuring instruments.

UNIT I LINEAR MEASUREMENT AND ANGULAR MEASUREMENT 12

Accuracy, Precision, Readability, Sensitivity etc., Linear measuring instruments-vernier – micrometer-Gauge blocks- dial indicator-comparators – Angle standards – vernier bevel protrctor-sine bar – autocollimator.

UNIT II STANDARDS FOR LINEAR AND ANGULAR MEASUREMENTS 8

Shop floor standards and their calibration, light interference, Method of coincidence, Slip gauge calibration, Measurement errors, Limits, fits, Tolerance, Gauges, Gauge design.

UNIT III MEASUREMENT APPLICATION 8

Measurement of screw threads and gears – Radius measurement – surface finish measurement

-Measurement of straightness-flatness-parallelism – squareness- roundness – circularity

UNIT IV MODERN CONCEPTS 8

Image processing and its application in Metrology, Co-ordinate measuring machine, Types of CMM, Probes used, Application, Non-contact CMM using Electro-optical sensors for dimensional metrology.

UNIT V INTRODUCTION TO MEASUREMENT SYSTEMS 9

System configuration, basic characteristics of measuring devices, Displacement, force and torque measurement, standards, Calibration, Sensors, Basic principles and concepts of temperature, Pressure and flow measurement,Destructive testing – Nondestructive testing.

TOTAL: 45 PERIODS

OUTCOMES:

The student must be able to

- Apply various linear and angular measuring instruments.
- Apply measure linear, angular and surface profile using CMM.
- Apply non-destructive techniques.
- Students will be able to apply the maintenance philosophies and techniques to upkeep the systems with economic life cycle cost.

TEXT BOOK:

1. Galyer J.F. and Shotbolt C.R, “Metrology for Engineers” ELBS, 1992.

REFERENCES:

1. Hune, K.J, “Engineering Metrology”, Kalyani Publishers, India, 1980.
2. Robinson, S.L. and Miller R.K, “Automated Inspection and Quality Assurance”, Marcel Dekker Inc.1989.
3. Stout, K. “Quality Control in Automation”, Prentice Hall, 1986.

IE8010 MODELING OF MANUFACTURING SYSTEMS L T P C

3 0 0 3

OBJECTIVES:

- To introduce the students different models used to describe the manufacturing systems and use of them for effective operations of manufacturing industries.

UNIT I INTRODUCTION 9

Manufacturing systems types and concepts, manufacturing automation, performance measures types, classification and uses of manufacturing system models

UNIT II FOCUSSED FACTORIES 9

Focused flow lines – Work cells- work centers, Group technology, Process planning types, General serial systems – Analysis of paced and unpaced lines, system effectiveness, impact of random processing times, FMS planning and scheduling – Part selection and loading

problems.

UNIT III MARKOV AND PETRINET MODELS 9

Stochastic processes in manufacturing, Markov chain models – DTMC and CTMC, steady state analysis, Petrinets in manufacturing – Basic concepts, stochastic petrinets.

UNIT IV QUEUING MODELS OF MANUFACTURING 9

Basic queuing models, Queuing networks in manufacturing – Jackson and Gordon Newell, product form solution

UNIT V LEAN SYSTEMS 9

Characteristics of lean systems, Pull method of work flow, lot size reduction, Kanban system, Value stream mapping, JIT principles

TOTAL : 45 PERIODS

OUTCOMES:

- The Student must be able to apply the principles behind focused factory, Markov and Petrinet Models, Queuing models, lean system to model modern manufacturing systems.

REFERENCES:

1. Ronald G Askin, “Modeling and Analysis of Manufacturing systems”, Wiley & sons, 1993.
2. Viswanadham and Narahari, “Performance modeling of automated manufacturing systems”, PHI, 1998
3. Nicholas J M, “Competitive Manufacturing Management”, TMH, 2001.
4. Buzacot and Shantikumar, “Queueing networks in Manufacturing”, Wiley Sons, 2000.
5. Reisig W, “System Design Using Petrinets”, Springer, 2000.

IE8011 OPERATIONS SCHEDULING L T P C

3 0 0 3

OBJECTIVE:

- To impart knowledge on various scheduling algorithms applicable to single machine, parallelmachines, flow shop and job shop models.

UNIT I SCHEDULING THEORY 8

Scheduling background - Scheduling function – Sequencing – Measures of performance – Scheduling theorems – Pure sequencing model assumptions.

UNIT II SINGLE MACHINE SCHEDULING 10

Hogdson’s algorithm – Smith’s application – Wilkerson-Irwin algorithm – Neighborhood search technique – Dynamic programming approach – Branch and Bound algorithm – Non simultaneous arrivals – Dependent job problems – Sequence dependent set up times.

UNIT III PARALLEL MACHINE SCHEDULING 9

Preemptive jobs: McNaughton's algorithm – Non preemptive jobs – Heuristic procedures – Minimizing weighted mean flow time: H1 & Hm heuristics – Dependent jobs: Hu's algorithm – Muntz Coffman algorithm.

UNIT IV FLOW SHOP SCHEDULING 9

Characteristics – Johnson's algorithm – Extension of Johnson's rule – Campbell Dudek Smith algorithm – Palmer's method – Start lag, Sop lag – Mitten's algorithm –Ignall Schrage algorithm – Despatch index heuristic.

UNIT V JOB SHOP SCHEDULING 9

Characteristics – Graphical tools – Jackson's algorithm – Feasible, Semi-active and active schedules – Single pass approach – Non delay schedule – Priority dispatching rules – Heuristic schedule generation – Open shop scheduling- Scheduling in services.

TOTAL: 45 PERODS

OUTCOMES:

- Students will be able to design, analyse and implement single machine, parallel machine, flow shop, and job shop scheduling algorithms.

REFERENCES:

1. Kenneth R.Baker, "Introduction to Sequencing and Scheduling", John Wiley & Sons, New York, 2000.
2. Dilip R. Sule, "Industrial Scheduling", PWS Publishing company, Boston, 1997.

IE8012 PRODUCT DESIGN AND VALUE ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- 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.

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 IDENTIFYING CUSTOMER NEEDS and PRODUCT SPECIFICATIONS 9

Product Development process – Product development organizations.Gather raw data – Interpret raw data- organize the needs into a hierarchy – Relative importance of the needs. Specifications – Refining specifications.

UNIT IV CONCEPT GENERATION, SELECTION AND PRODUCT ARCHITECTURE 9

Clarify the problem – Search internally – Search externally – Explore systematically. Concept Screening – Concept scoring. Product architecture – Implication of architecture – Establishing the architecture – Related system level design issues.

UNIT V INDUSTRIAL DESIGN, PROTOTYPING AND ECONOMICS OF PRODUCT DEVELOPMENT 9

Need for industrial design – Impact of industrial design – Industrial design process – Management of industrial design process – Assessing the quality of industrial design. Estimate the manufacturing cost – Reduce the component cost – Reduce the assembly cost – Reduce the support cost – Impact of DFM decisions on other factors. Principles of prototyping – Planning for prototypes.Elements of economic analysis – Base – Case financial model – Sensitivity analysis – Influence of the quantitative factors.

TOTAL : 45 PERIODS

OUTCOMES:

- 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.

TEXT BOOKS:

1. Karal, T.Ulrich Steven D.Eppinger, “Prodcut Design and Development”, McGraw Hill, International Editions, 2003.
2. Mudge, Arthur E. “Value Engineering”- A systematic approach, McGraw Hill, New York, 2000.

REFERENCES:

1. S.Rosenthal, “Effective Product Design and Development”, Irwin, 1992.
2. Charles Gevirtz, “Developing New products with TQM”, McGraw Hill, International Editions, 1994.

IE8013 PRODUCTIVITY MANAGEMENT AND RE-ENGINEERING L T P C

3 0 0 3

OBJECTIVE:

- To introduce the basic principles of Productivity Models and the applications of Re-EngineeringConcepts required for various organizations.

UNIT I INTRODUCTION 9

Basic concept and meaning of Productivity – Significance of Productivity – Factors affecting Productivity – Productivity cycle, Scope of Productivity Engineering and Management.

UNIT II PRODUCTIVITY MEASUREMENT AND EVALUATION 9

Productivity measurement in International, National and Industrial level – Total Productivity Model – Productivity measurement in Manufacturing and Service sectors – Performance Objective Productivity (POP) model – Need for Productivity Evaluation – Evaluation Methodology.

UNIT III PRODUCTIVITY PLANNING AND IMPLEMENTATION 9

Need for Productivity Planning – Short term and long term productivity planning – Productivity improvement approaches, Principles - Productivity Improvement techniques – Technology based, Material based, Employee based, Product based techniques – Managerial aspects of Productivity Implementation schedule, Productivity audit and control.

UNIT IV REENGINEERING PROCESS 9

Definition, Fundamentals of process reengineering – Principles, Methodology and guidelines for Organization Transformation, DSMCQ and PMP organization Transformation models – Process Improvement Models like PMI, Edosomwan, LMICIP and NPRDC Models.

UNIT V BPR TOOLS AND IMPLEMENTATION 9

Analytical and Process Tools and Techniques - Role of Information and Communication Technology in BPR – Requirements and steps in BPR Implementation – Case studies.

TOTAL : 45 PERIODS

OUTCOMES:

The Student must be able to:

- Measure and evaluate productivity
- Plan and implement various productivity techniques.
- Reengineer the process for improving the productivity
- Implement BPR tools for improving the productivity.

REFERENCES:

1. Sumanth, D.J, “Productivity Engineering and Management”, TMH, New Delhi, 1990.
2. Edosomwan, J.A, “Organizational Transformation and Process re- Engineering”, British Cataloging in publications, 1996.
3. Premvrat, Sardana, G.D. and Sahay, B.S, “Productivity Management - A systems approach”, Narosa Publications, New Delhi, 1998.

IE8014 PROJECT MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To outline the need for Project Management
- To highlight different techniques of activity planning

UNIT I INTRODUCTION TO PROJECT MANAGEMENT AND PROJECT SELECTION 9

Objectives of Project Management- Importance of Project Management- Types of Projects- Project Management Life Cycle- Project Selection – Feasibility study: Types of feasibility- Steps in feasibility study.

UNIT II PROJECT PLANNING AND IMPLEMENTATION 9

Project Scope- Estimation of Project cost – Cost of Capital – Project Representation and Preliminary Manipulations - Basic Scheduling Concepts - Resource Levelling – Resource Allocation.

UNIT III PROJECT MONITORING AND CONTROL 9

Setting a base line- Project management Information System – Indices to monitor progress. Importance of Contracts in projects- Teamwork in Project Management - Attributes of a good project team – Formation of effective teams – stages of team formation.

UNIT IV PROJECT CLOSURE 9

Project evaluation- Project Auditing – Phases of project Audit- Project closure reports- Guidelines for closeout reports.

UNIT V SPECIAL TOPICS IN PROJECT MANAGEMENT 9

Computers, e- markets and their role in Project management- Risk management- Environmental Impact Assessment. Case studies in Project management.

TOTAL : 45 PERIODS

OUTCOMES:

- To apply project management principles in business situations to optimize time and resource utilization

REFERENCES :

1. Arun Kanda, “Project Management A Life Cycle Approach”, Prentice Hall of India, 2011.
2. R.Panneerselvam and P.Senthilkumar, “Project Management”, Prentice Hall of India, 2009.
3. R.B.Khanna, “Project Management”, Prentice Hall of India, 2011.

IE8015 SAFETY ENGINEERING AND MANAGEMENT L T P C

3 0 0 3

OBJECTIVE :

To impart knowledge on safety engineering fundamentals and safety management practices.

UNIT I INTRODUCTION **9**

Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

UNIT II CHEMICAL HAZARDS **9**

Chemical exposure – Toxic materials – Radiation Ionizing and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology.

UNIT III ENVIRONMENTAL CONTROL **9**

Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT IV HAZARD ANALYSIS **9**

System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment.

UNIT V SAFETY REGULATIONS **9**

Explosions – Disaster management – catastrophe control, hazard control , Factories Act, Safety regulations Product safety – case studies.

TOTAL : 45 PERIODS

OUTCOMES:

- Students must be able to identify and prevent chemical, environmental mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management.

REFERENCES:

1. John V.Grimaldi, “Safety Management”, AITB S Publishers, 2003.
2. Safety Manual, “EDEL Engineering Consultancy”, 2000.
3. David L.Goetsch, “Occupational Safety and Health for Technologists”, Engineers and Managers, Pearson Education Ltd. 5th Edition, 2005.

IE8016 SYSTEMS ENGINEERING **L T P C**

3 0 0 3

OBJECTIVES:

- To introduce system engineering concepts to design the manufacturing system for optimum utilization of source for effective functioning.

UNIT I INTRODUCTION **9**

Definitions of Systems Engineering, Systems Engineering Knowledge, Life cycles, Life-cycle phases, logical steps of systems engineering, Frame works for systems engineering.

UNIT II SYSTEMS ENGINEERING PROCESSES **9**

Formulation of issues with a case study, Value system design, Functional analysis, Business Process Reengineering, Quality function deployment, System synthesis, Approaches for generation of alternatives.

UNIT III ANALYSIS OF ALTERNATIVES - I 9

Cross-impact analysis, Structural modeling tools, System Dynamics models with case studies, Economic models: present value analysis – NPV, Benefits and costs over time, ROI, IRR; Work and Cost breakdown structure,

UNIT IV ANALYSIS OF ALTERNATIVES – II 9

Reliability, Availability, Maintainability, and Supportability models; Stochastic networks and Markov models, Queuing network optimization, Time series and Regression models, Evaluation of large scale models

UNIT V DECISION ASSESSMENT 9

Decision assessment types, Five types of decision assessment efforts, Utility theory, Group decision making and Voting approaches, Social welfare function; Systems Engineering methods for Systems Engineering Management,

TOTAL : 45 PERIODS

OUTCOMES:

- The Student must be able to apply systems engineering principles ot make decision for optimization.
- Hence an understanding of the systems engineering discipline and be able to use the core principles and processes for designing effective system.

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.

IE8017 TECHNOLOGY MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

Study of this subject provides an understanding of the Technology Management principles to the various organizations.

UNIT I 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 **9**

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

UNIT III **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 **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 **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

OUTCOMES:

Upon completion of the course, students will be able to

- Have clear understanding of managerial functions like planning, organizing, staffing, leading and controlling
- Have same basic knowledge on international aspect of management

REFERENCES:

1. Joseph M. Putti, “Management – A Functional Approach”, McGraw Hill, 1997
2. Kenneth C. Lauden, “MIS: Organisation and Technology”, Prentice Hall, 1995
3. James A.Senn, “Information technology in Business”, Prentice Hall, 1995
4. Ronald J. Jordan, “Security analysis and Portfolio Management”, Prentice Hall, 1995
5. Irvin M. Rubin, “Organisational behavior an experimental approach”, Prentice Hall, 1995
6. Gerard H. Gaynor, “Handbook of Technology Management”, McGraw-Hill Professional, 1996
7. Richard C. Dorf, “Technology Management Handbook”, CRC,1999

IE8071 **HUMAN RESOURCE MANAGEMENT** **L T P C**

3 0 0 3

OBJECTIVE:

To introduce the basic principles of group dynamics and associated concepts required for

Human resource management in organizations

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 and 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 – Employee retention.

TOTAL : 45 PERIODS

OUTCOMES:

- To understand the process of effective Human Resource Management.

TEXT BOOK:

1. 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.

MA8353 NUMERICAL METHODS L T P C

3 1 0 4

OBJECTIVES:

- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily

available.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9

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 9

Interpolation with unequal intervals - Lagrange interpolation –Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae – Least square method -Linear curve fitting.

UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION 9

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

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 - Multi-step 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

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.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS:

1. Grewal, B.S. and Grewal,J.S., "Numerical methods in Engineering and Science", Khanna Publishers, New Delhi, 9th Edition, 2007.
2. Sankara Rao, K, "Numerical methods for Scientists and Engineers', Prentice Hall of India Private Ltd., New Delhi, 3rd Edition,2007.

REFERENCES:

1. Brian Bradie, “A Friendly Introduction to Numerical Analysis”, Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Gerald, C.F. and Wheatley, P.O., “Applied Numerical Analysis”, Pearson Education Asia, New Delhi, 6th Edition, 2006.
3. Laurene V. Fausett, “Applied Numerical Analysis using MATLAB”, Pearson Education, New Delhi, 1st print, 2nd Edition, 2009.

GE8751 ENGINEERING ETHICS AND HUMAN VALUES L T P C

3 0 0 3

OBJECTIVES:

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

UNIT I HUMAN VALUES 10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality.

UNIT II 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 – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl Case Studies.

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

UNIT V GLOBAL ISSUES **8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Conduct.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

TEXT BOOK :

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

REFERENCES:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Thompson Wadsworth, A Division of Thomson Learning Inc., United States, 2000.
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

MG8653 PRINCIPLES OF MANAGEMENT **L T P C**

3 0 0 3

AIM :

To learn the different principles and techniques of management in planning, organizing, directing and controlling.

OBJECTIVES

- To study the Evolution of Management
- To study the functions and principles of management
- To learn the application of the principles in an organization

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

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

UNIT II PLANNING 9

Nature and purpose of planning – Planning process – Types of planning – Objectives – Setting objectives – Policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

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

UNIT IV DIRECTING 9

Foundations of individual and group behaviour– Motivation – Motivation theories – Motivational techniques – Job satisfaction – Job enrichment – Leadership – types and theories of leadership – Communication – Process of communication – Barrier in communication – Effective communication – Communication and IT.

UNIT V CONTROLLING 9

System and process of controlling – Budgetary and non - Budgetary control techniques – Use of computers and IT in Management control – Productivity problems and management – Control and performance – Direct and preventive control – Reporting.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

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

REFERENCES:

1. Stephen A. Robbins and David A. Decenzo and Mary Coulter, "Fundamentals of

Management" Pearson Education, 7th Edition, 2011.
2. Robert Kreitner and Mamata Mohapatra, " Management", Biztantra, 2008.
3. Harold Koontz and Heinz Weihrich "Essentials of management" Tata McGraw Hill,1998.
4. Tripathy PC and Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999.

ME8076 ENTREPRENEURSHIP DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES:

- 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 HOURS

OUTCOMES:

- Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

TEXT BOOKS :

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

REFERENCES :

1. Hisrich R D and Peters M P, “Entrepreneurship” 5th Edition Tata McGraw-Hill, 2002.
2. Mathew J Manimala,” Enterprenuership theory at cross roads: paradigms and praxis” Dream tech, 2nd edition 2006.
3. Rabindra N. Kanungo, “Entrepreneurship and innovation”, Sage Publications, New Delhi, 1998.
4. EDII “ Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development”, Institute of India, Ahmadabad, 1986.

IE8019 PRINCIPLES OF MARKETING MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To enable students to deal with newer concepts of marketing concepts like strategic marketing segmentation, pricing, advertisement and strategic formulation. The course will enable a student to take up marketing as a professional career.

UNIT I INTRODUCTION 9

Definition, Needs wants and Demands, Marketing Concepts, Environment, Mix, types, Philosophies, Selling Vs. Marketing, Consumer goods, Industrial goods, product hierarchy.

UNIT II MARKETING PLANNING AND STRATEGY FORMULATION 9

Value delivery process, Core Competencies, Strategy formulation and the marketing process - Strategy implementation – SWOT Analysis, Portfolio Analysis , BCG , GEC grids, Components Of a marketing plan.

UNIT III BUYING BEHAVIOUR AND MARKET SEGMENTATION 9

Building customer value, Consumer behavior – Influencing factors, motivation, perception, learning, buying decisions process. Segmentation - Levels, demographic, psychographic geographic and behavioural segmentation, process, patterns.

UNIT IV PRODUCT PRICING AND MARKETING RESEARCH 9

Pricing Objectives, decisions and methods, Pricing management, Marketing Research – Introduction, uses, system, process of marketing research.

UNIT V ADVERTISING, SALES PROMOTION & DISTRIBUTION 9

Advertising – objectives, types, developing Advertising campaign, Sales promotion, Retailing, Wholesaling, Market Logistics, Modern trends.

TOTAL: 45 PERIODS

OUTCOMES:

- To acquire the knowledge of analytical skills in solving marketing to related problems and create awareness about marketing management process.

TEXTBOOKS.

1. Philip Kotler and Keller, “Marketing Management”, Prentice Hall of India, XIII Edition, 2009.
2. Govindarajan, M., “Marketing Management - Concepts, Cases, Challenges and Trends”, Prentice Hall of India, Second edition, 2007.

REFERENCES :

1. Donald S. Tull and Hawkins, “Marketing Research”, Prentice Hall of India-1997.
2. Philip Kotler and Gary Armstrong “Principles of Marketing” Prentice Hall of India, XII Edition, 2000.
3. Ramasamy and Nama Kumari, “Marketing Environment: Planning, implementation and control - The Indian Context”, 1990.
4. Czinkota and Kotabe, “Marketing Management”, Thomson Learning, Indian edition 2007.
5. Adrain Palmer, “Introduction to Marketing Theory and Practice”, Oxford University Press,I, 2004.
6. Steven J. Skinner, “Marketing”, All India Publishers and Distributers Ltd., 1998

IE8018 COMPUTER INTEGRATED MANUFACTURING SYSTEMS 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 COMPUTER-AIDED DESIGN 9

Fundamentals of CAD – design process, manufacturing database – Computer graphics – functions, constructing the geometry, transformation, wire frame Vs solid modelling.

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

OUTCOMES:

- The students will gain knowledge and find placement in industries which uses hardware and software of CIM control systems.

REFERENCES:

1. Mickel P Groover, “Automation production systems and computer integrated manufacturing”, PHI, second edition, 2008.
2. S.Kant Vajpayee, “Principles of Computer-Integrated Manufacturing”, PHI, 2005.

MF8072 ELECTRONICS MANUFACTURING TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

- To understand wafer preparation and PCB fabrication, the types of Mounting Technologies and components for electronics assembly and SMT process in detail.
- To know various Defects, Inspection Equipments SMT assembly process and repair, rework and quality aspects of Electronics assemblies.

UNIT I INTRODUCTION TO ELECTRONICS MANUFACTURING 8

History, definition, wafer preparation by growing, machining, and polishing, diffusion, microlithography, etching and cleaning, Printed circuit boards, types- single sided, double sided, multi layer and flexible printed circuit board, design, materials, manufacturing, inspection.

UNIT II COMPONENTS AND PACKAGING 9

Introduction to packaging, types-Through hole technology(THT) and Surface mount technology(SMT), Through hole components – Axial, radial, multi leaded, odd form. Surface-mount components - Active, passive. Interconnections - Chip to lead interconnection, die bonding, wire bonding, TAB, flip chip, chip on board, multi chip module, direct chip array module, leaded, leadless, area array and embedded packaging, miniaturization and trends.

UNIT III SURFACE MOUNT TECHNOLOGY PROCESS 12

Introduction to the SMT Process, SMT equipment and material handling systems, handling of components and assemblies - Moisture sensitivity and ESD, safety and precautions needed, IPC and other standards, stencil printing process - Solder paste material, storage

and handling, stencils and squeegees, process parameters, quality control. Component placement- equipment type, flexibility, accuracy of placement, throughput, packaging of components for automated assembly, Cp and Cpk and process control. soldering- Reflow process, process parameters, profile generation and control, solder joint metallurgy, adhesive, underfill and encapsulation process - applications, materials, storage and handling, process and parameters.

UNIT IV INSPECTION AND TESTING 9

Inspection techniques, equipment and principle - AOI, X-ray. Defects and Corrective action - Stencil printing process, component placement process, reflow soldering process, underfill and encapsulation process, electrical testing of PCB assemblies- In circuit test, functional testing, fixtures and jigs.

UNIT V REPAIR, REWORK, QUALITY AND RELIABILITY OF ELECTRONICS ASSEMBLIES 7

Repair tools, methods, rework criteria and process, thermo-mechanical effects and thermal management, Reliability fundamentals, reliability testing, failure analysis, design for manufacturability, assembly, reworkability, testing, reliability, and environment.

TOTAL: 45 PERIODS

OUTCOMES:

- Perform fabrication of PCBs and use of mounting technology for electronic assemblies.
- Perform quality inspection on the PCBs

TEXT BOOKS:

1. Prasad R., “Surface Mount Technology – Principles and practice”, second Edition, Chapman and Hall, 1997, New York, ISBN 0-41-12921-3.
2. Tummala R.R., “Fundamentals of microsystem packaging”, Mc -Graw Hill, 2001, ISBN 00-71-37169-9.

REFERENCE BOOKS:

1. Puligandla Viswanadham and Pratap Singh, “Failure Modes and Mechanisms in Electronic Packages”, Chapman and Hall, New York, 1997, ISBN 0-412-105591-8.
2. Totta P., Puttlitz K. and Stalter K., “Area Array Interconnection Handbook”, Kluwer Academic Publishers, Norwell, MA, USA, 2001, ISBN 0-7923-7919-5.
3. Lee N.C., “Reflow Soldering Process and Trouble Shooting SMT,BGA,CSP and Flip Chip Technologies”, Elsevier Science, 2001.
4. Zarrow P. and Kopp D. “Surface Mount Technology Terms and Concepts”, Elsevier Science and Technology, 1997, ISBN 0750698756.
5. Harper C.A., “Electronic Packaging and Interconnection Handbook” Second Edition, McGraw Hill Inc., New York, 1997, ISBN 0-07-026694-8.
6. Martin B. and Jawitz W., “Printed Circuit board materials handbook”, McGraw-Hill Professional, 1997.
7. Lau J.H., “Ball Grid Array Technology”, McGraw-Hill Professional, 1997.
8. www.ipc.org.

MF8073 FLEXIBLE MANUFACTURING SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To understand the 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 MANUFACTURINGSYSTEMS 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

OUTCOMES:

- Ability to perform Planning, Scheduling and control of Flexible Manufacturing systems
- Perform simulation on software's use of group technology to product classification

TEXT BOOK:

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

REFERENCE BOOKS:

1. Radhakrishnan P. and Subramanyan S., “CAD/CAM/CIM”, Wiley Eastern Ltd., New Age International Ltd., 1994.
2. Raouf A. and Daya B.M., “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 S., “Manufacturing Engineering and Technology”, Addison-Wesley Publishsing Co., 1995.
5. Ohno T., “Toyota production system: beyond large-scale production”, Productivity Press (India) Pvt. Ltd., 1992.

IE8020 ROBOTICS ENGINEERING L T P C
3 0 0 3

OBJECTIVES :

- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots.
- To discuss about the various applications of robots, justification and implementation of robot.

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, Pay Load – Robot Parts and Their 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 all these 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

Sensory Devices - Non optical - Position sensors - Optical position sensors - Velocity sensors- Proximity sensors - Contact and noncontact type - Touel and slip sensors - Force and torque sensors - AI and Robotics.

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING 10

Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional)-Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effecter commands, and Simple programs.

UNIT V ROBOT CELL DESIGN, CONTROL AND ECONOMICS 8

Work cell Control - Robot and machine Interface - Robot cycle time Analysis - Economic

Analysis of Robots - Pay back Method, EUAC Method, Rate of Return Method.

TOTAL : 45 PERIODS

OUTCOMES:

- Able to suggest a suitable robot drive, gripper and sensors required for particular application.
- Able to analyze robot arm kinematics and understand simple programs.
- Able to analyze the robot cycle time and economics of robot implementation.

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.
4. Richard D. Klafter., Thomas A. Chmielewski, Michael Negin, "Robotic Engineering: An Integrated Approach", PHI.,1989.

GE8072 DISASTER MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-

holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.

TEXTBOOK:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

GE8073 **HUMAN RIGHTS** **L T P C**
3 0 0 3

OBJECTIVES :

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS

OUTCOME :

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.