B.E. MECHANICAL ENGINEERING

First Semester					
Code No.	**Course**	**L**	**T**	**P**	**C**
07G101	Engineering Mathematics – I*	3	2	0	4
07G102	Engineering Physics*	3	0	0	3
07G103	Engineering Chemistry*	3	0	0	3
07G104	'C' Programming*	3	0	0	3
07M105	Basics of Electrical and Electronics Engineering♦	3	1	0	4
07M106	Basics of Civil Engineering	3	1	0	4
07G001	Communication Skills - I*	3	0	0	3
07G108	'C' Programming Laboratory*	0	0	3	2
07M109	Engineering Physics Laboratory$	0	0	2	1
07M110	Engineering Chemistry Laboratory$	0	0	2	1
	Total	**21**	**4**	**7**	**28**

Second Semester					
Code No.	**Course**	**L**	**T**	**P**	**C**
07G201	Engineering Mathematics – II*	3	2	0	4
07G202	Environmental Science & Engineering*	3	0	0	3
07G203	Object Oriented Programming*	3	0	0	3
07M204	Applied Materials Science	3	0	0	3
07M205	Engineering Mechanics	3	2	0	4
07M206	Concepts in Engineering Design	3	0	0	3
07G002	Communication Skills – II**	3	0	0	3
07G208	Object Oriented Programming Laboratory*	0	0	3	2
07M209	Engineering Graphics#	2	0	3	4
07M210	Workshop Practice#	0	0	2	1
	Total	**23**	**4**	**8**	**30**

* Common to all branches of B.E./B.Tech.
♦ Common to FT, BT, IT, ME & CE
$ Common to FT, CE, BT, CSE, TT & ME (first semester); ECE, EEE, EIE, IT (second semester)
# Common to ECE, EEE, EIE, IT (first semester); FT, CE, BT, CSE, TT & ME (second semester)
** Common to all branches of B. E./B. Tech and evaluation by continuous assessment

Third Semester					
Code No.	**Course**	**L**	**T**	**P**	**C**
07G301	Engineering Mathematics - III*	3	2	0	4
07M302	Engineering Materials and Metallurgy	3	1	0	4
07M303	Electrical Machines and Drives	3	0	0	3
07M304	Engineering Thermodynamics	3	1	0	4
07M305	Fluid Mechanics and Machinery	3	1	0	4
07M306	Manufacturing Technology - I	3	0	0	3
07G003	Professional Communication^	2	0	2	3
07M308	Fluid Mechanics and Machinery Laboratory	0	0	3	2
07M309	Electrical Machines Laboratory	0	0	3	2
07M310	Manufacturing Technology Laboratory – 1	0	0	3	2
	Total	**20**	**5**	**11**	**31**

Fourth Semester					
Code No.	**Course**	**L**	**T**	**P**	**C**
07M401	Numerical Methods	3	2	0	4
07M402	Theory of Machines – I	3	1	0	4
07M403	Engineering Metrology & Quality Assurance	3	0	0	3
07M404	Manufacturing Technology - II	3	0	0	3
07M405	Thermal Engineering	3	1	0	4
07M406	Strength of Materials	3	1	0	4
07G004	Professional Ethics♥	3	0	0	3
07M408	Thermal Engineering Laboratory – I	0	0	3	2
07M409	Strength of Materials Laboratory	0	0	3	2
07M410	Metrology and Metallurgy Laboratory	0	0	3	2
	Total	**21**	**5**	**9**	**31**

* Common to all branches of B.E./B. Tech.

^ Common for Civil, Mechanical, ECE, TT and BT (third semester); CSE, EEE, EIE, IT and FT (fourth semester)

♥ Common for Civil, Mechanical, ECE, TT and BT (fourth semester); CSE, EEE, EIE, IT and FT (third semester)

** Common to all branches of B. E./B. Tech and evaluation by continuous assessment

Fifth Semester					
Code No.	**Course**	**L**	**T**	**P**	**C**
07M501	Computer Aided Design	3	0	0	3
07M502	Theory of Machines – II	3	2	0	4
07M503	Gas Dynamics and Jet Propulsion	3	1	0	4
07M504	Instrumentation and Control Engineering	3	0	0	3
07M505	Design of Machine Elements	3	1	0	4
07M506	Heat and Mass Transfer	3	1	0	4
07G005	Engineering Economics	3	0	0	3
07M508	Instrumentation and Dynamics Laboratory	0	0	3	2
07M509	Machine Drawing and CAD Laboratory	0	0	3	2
07M510	Thermal Engineering Laboratory – II	0	0	3	2
	Total	**21**	**5**	**9**	**31**

Sixth Semesters					
Code No.	**Course**	**L**	**T**	**P**	**C**
07M601	CNC Machines & Robotics	3	0	0	3
07M602	Electronics and Microprocessors	3	0	0	3
07M603	Power Plant Engineering	3	1	0	4
07M604	Design of Transmission Systems	3	2	0	4
07M605	Automobile Engineering	3	0	0	3
	Elective	3	0	0	3
07G006	Total Quality Management	3	0	0	3
07M608	Manufacturing Technology Laboratory – II	0	0	3	2
07M609	Electronics and Microprocessors Laboratory	0	0	3	2
07M610	Technical Seminar	0	0	3	2
	Total	**21**	**3**	**9**	**29**

Seventh Semester					
Code No.	**Course**	**L**	**T**	**P**	**C**
07M701	Hydraulics Pneumatics	3	0	0	3
07M702	Mechatronics	3	0	0	3
07M703	Finite Element Methods	3	1	0	4
07M704	Operations Research	3	1	0	4
	Elective	3	0	0	3
	Elective	3	0	0	3
07G007	Creativity and Innovation	3	0	0	3
07M708	Computer Aided Engineering Laboratory	0	0	3	2
07M709	Mechatronics Laboratory	0	0	3	2
07M710	Mini Project	0	0	6	3
	Total	**21**	**2**	**12**	**30**

Eight Semester					
Code No.	**Course**	**L**	**T**	**P**	**C**
07M801	Industrial Engineering	3	0	0	3
	Elective	3	0	0	3
	Elective	3	0	0	3
07G008	Organizational Behavior and Management	3	0	0	3
07M805	Project Work	0	0	24	12
	Total	**12**	**0**	**24**	**24**

** Common to all branches of B. E./B. Tech and evaluation by continuous assessment

List of Electives

Electives for Semester VI

07M001 Internal Combustion Engines
07M002 Combustion Engineering
07M003 Design of Jigs and Fixtures and Press Tools
07M004 Composite materials and mechanics
07M005 Vibration and Conditions Monitoring

Electives for Semester VII

07M006 Advanced Casting Processes
07M007 Metal Forming
07M008 Processes Planning and Cost Estimation
07M009 Heat Recovery Systems
07M010 Design of Heat Exchangers
07M011 Industrial Robotics
07M012 Direct Energy Conversion Techniques
07M013 Computational Fluid Dynamics

Electives for Semester VIII

07M014 Rapid prototyping
07M015 Renewable Energy sources
07M016 Cryogenics Engineering
07M017 Refrigeration and Air-conditioning
07M018 Welding Technology
07M019 Marketing Management
07M020 Nano Technology
07M021 Vibration Engineering
07M022 Industrial Safety Engineering
07M023 Non Traditional Machining Processes

Syllabi of

B.E. Mechanical Engineering

07G101 ENGINEERING MATHEMATICS – I

(Common to all branches) **3 2 0 4**

Unit I

Matrices

The characteristic equation - Eigen values and eigen vectors of a real matrix-Some properties of eigen values - Cayley–Hamilton theorem - Reduction of a real matrix to a diagonal form- Orthogonal matrices properties - Reduction of a quadratic form to a canonical form by orthogonal transformation. **12 Hours**

Unit II

Three Dimensional Analytical Geometry

Direction cosines and ratios- Angle between two lines- Equation of a plane- Equation of a straight line-Coplanar lines- Shortest distance between skew lines – Sphere - Tangent plane - Plane section of a sphere - Orthogonal spheres.

12 Hours

Unit III

Geometrical Applications of Differential Calculus

Curvature - Cartesian and polar coordinates - Circle of curvature - Involutes and Evolutes - Envelopes - Properties of the envelopes - Evolutes as envelopes of normal. **12 Hours**

Unit IV

Differential Equations

Simultaneous first order linear equations with constant coefficients - Linear equations of second and higher order with constant and variable coefficients - Homogeneous linear equations of Euler type - Equations reducible to homogeneous form - Method of reduction of order - Method of variation of parameters.

12 Hours

Unit V

Laplace Transforms

Transforms of simple functions - Basic operational properties - Transforms of derivatives and integrals - Initial and Final value theorems - Inverse transforms - Convolution theorems - Periodic functions - Applications of Laplace transforms for solving the ordinary differential equations up to second order with constant coefficients and simultaneous equations of first order with constant coefficients.

12 Hours

Total : 60 Hours

Textbooks:

1. Lakshminarayanan K.A. and et al, "Engineering Mathematics - I, 6th edition, Vikas Publishing House, New Delhi, 2006.
2. Veerarajan T., "Engineering Mathematics", 5th Edition, Tata McGraw Hill Publications, New Delhi, 2006.

References:

1. Kandasamy P. and et al., "Engineering Mathematics", Volumes I & II, S. Chand & Co., New Delhi 2001.
2. Narayanan S., Manicavachagam Pillai, Ramaiah. T.K "Advanced Mathematics for Engineering Students" Volume I, Viswanathan Printers & Publishers, 1993.
3. Grewal B.S "Higher Engineering Mathematics", Khanna Publications, New Delhi 2000.
4. Kreyszig E, "Advanced Engineering Mathematics" 8th Edition, John Wiley & Sons, Inc, Singapore, 2002.

07G102 ENGINEERING PHYSICS

(Common to all branches)

3 0 0 3

Unit I

Properties of Matter and Acoustics

Properties of Matter: Elasticity – Stress–Strain Diagram – Twisting couple on a wire – Shafts – Torsion pendulum – Depression of a cantilever – Young's Modulus by cantilever – Uniform and Nonuniform bending. Acoustics: Classification of sound – Characteristics of musical sound – Loudness – Weber – Fechner law – Decibel – Absorption coefficient – Reverberation – Reverberation time – Sabine's formula (growth & decay) – Factors affecting acoustics of buildings and their remedies.

10 Hours

Unit II

Crystallography and Ultrasonics

Crystal Physics: Lattice – Unit cell – Bravais lattices – Lattice planes – Miller indices – 'd' spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures. Ultrasonics: Ultrasonic production – Magnetostriction – Piezo electric methods – Applications – Determination of velocity of ultrasonic waves (acoustic grating) – SONAR.

10 Hours

Unit III

Waveoptics

Interference : Air wedge – Theory – Uses – Testing of flat surfaces – Thickness of a thin wire – Polarization: Expressions for plane, circularly and elliptically polarized light (derivation) – Quarter and Half wave plates – Uses – Production of plane, circularly and elliptically polarized light – Analysis of plane, circularly and elliptically polarized light. LASER: Types of lasers – Nd – YAG laser – CO_2 laser – semiconductor laser (homojunction) – Applications – Holography – Construction – Reconstruction – Uses.

10 Hours

Unit IV

Modern Physics

Quantum Physics: Development of quantum theory – de Broglie wavelength – Schrödinger's wave equation – Time dependent – Time independent wave equations – Physical significance – Applications – Particle in a box (1d). X-rays**:** Scattering of X-rays – Compton Effect – Theory and experimental verification – Diffraction – Laue's method – Powder crystal method.

10 Hours

Unit V

New Engineering Materials

Metallic glasses: Manufacturing – Properties – Uses. Shape Memory Alloys**:** Working Principle – Shape memory Effect – Applications. Nanomaterials**:** Preparation method – Sol gel technique – Mechanical – Magnetic characteristics – Uses. Ceramics**:** Classification – Crystalline – Non-crystalline – Bonded ceramics – Manufacturing methods – Slip casting – Isostatic pressing – Thermal and electrical properties. Bio-materials**:** Metals and alloys bio materials – Polymer bio materials – Ceramic bio material – Bio polymers.

10 Hours

Total: 50 Hours

Textbooks:

1. Arumugam M., "Engineering Physics", 5th Edition, Anuradha Publications, Kumbokonam, 2006.
2. Palanisami P.K., "Physics For Engineers", Volume1, 2nd Reprint, Scitech Publications (India), Pvt Ltd., Chennai, 2002.

07G101

References:

1. Avadhanulu M.N. and Kshirsagar P.G., "A Textbook: of Engineering Physics", 7th Enlarged Revised Edition, S.Chand & Company Ltd., New Delhi, 2005.
2. Pillai S.O., "Solid State Physics", Fifth Edition, New Age International Publication, New Delhi, 2003.
3. Rajendran V. and Marikani A., "Physics I", First Reprint, Tata McGraw Hill Publishers Company Ltd., New Delhi, 2004.
4. Arthur Beiser, "Concepts of Modern Physics", Tata McGraw Hill Co. New Delhi, 1995.
5. Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai Publishers, New Delhi, 2001.

07G103 ENGINEERING CHEMISTRY

(Common to all branches) **3 0 0 3**

Unit I

Chemistry of Water and its Industrial Applications

Hardness of water: Equivalents of calcium carbonate - Units of hardness- Degree of hardness and its estimation (EDTA method)-numerical problems on degree of hardness- pH value of water. Use of water for industrial purposes: boiler feed water-scale-sludge-caustic embitterment. Softening of hard water: external conditioning – zeolite - ion

exchange methods - internal conditioning- calgon- phosphate methods. Use of water for domestic purposes: domestic water treatment - disinfection of water-break point chlorination.

10 Hours

Unit II

Electrochemistry for Materials Processing

Electrolytic conductance: Kohlrausch's law and its applications: problems - emf. Electrodics: single electrode potential - Nernst equation - problems - Hydrogen electrode - Calomel electrode - Glass electrode - pH measurement using glass electrode - Electrochemical series. Cells: electrochemical cells - Cell reactions- Daniel cell - standard Weston cadmium cell - electrode concentration cells, electrolytic concentration cells - reversible cells - irreversible cells - Electrolytic cells - concept of electroplating - electrode reactions of electroplating of Ni.

10 Hours

Unit III

Chemistry of Corrosion and its Control

Corrosion: theories of corrosion - chemical (Pilling-Bed worth rule) - electrochemical (oxygen absorption - hydrogen evolution) - Galvanic series. Types of corrosion: galvanic corrosion - differential aeration corrosion - stress corrosion - pitting corrosion - waterline corrosion - Factors affecting corrosion. Methods of corrosion control: sacrificial anodic protection - impressed current method - Protective coatings - metallic coating – galvanizing - tinning.

10 Hours

Unit IV

Introduction to Polymer and Nanotechnology

Polymers: Monomer - Functionality - Degree of polymerization - Classification based on source- applications. Types of polymerization: Addition - condensation - copolymerization - addition polymerization by free radical mechanism only. Thermoplastic and thermosetting resins: Preparation - properties and applications of epoxy resins-TEFLON- nylon - bakelite. Nanomaterials: introduction-Bulk nano structured materials-Nano electrodes-Nanoclusters-Carbon nano tubes - nano polymers - applications.

10 Hours

Unit V

Instrumental Techniques of Chemical Analysis

Beer–Lambert's law - problems. UV visible and IR spectroscopy: principle- instrumentation (block diagram only) - applications. Colorimetry: principle – instrumentation (block diagram only) - estimation of iron by colorimetry. Flame photometry: principle - instrumentation (block diagram) - estimation of Na by flame photometry. Atomic absorption spectroscopy: principle - instrumentation (block diagram) - estimation of Ni by atomic absorption spectroscopy.

10 Hours

Total: 50 Hours

Textbooks:

1. Puri B.R., Sharma L.R., and Madan S. Pathania, "Principles of Physical Chemistry", Thirty eighth Edition, Shoban Lal Nagin Chand & Co., Jalandhar, 2000.
2. Jain P.C., and Monika Jain, "Engineering Chemistry", Fourteenth Edition, Dhanpat Rai Publishing Company PVT Ltd, New Delhi. 2005.

References:

1. Bahl B.S., Tuli G.D., and Arun Bahl, "Essentials of Physical Chemistry", Twenty fourth Edition, S.Chand & Company Ltd., New Delhi, 2004.
2. Kuriacose J.C., and Rajaram J., "Chemistry in Engineering & Technology", Vol. 1&2, Tata McGraw Hill publishing company, New Delhi, 1996.
3. Kenneth J. Klabunde, "Nanoscale Materials in Chemistry", Wiley Inter science, 2001.
4. Andre Arsenault and Geoffrey A. Ozin, "Nanochemistry: A Chemical Approach to Nanomaterials", First Edition, Royal Society of Chemistry, 2005.
5. Skoog and West, "Fundamentals of Analytical Chemistry", Seventh Edition, Wiley, New York, 1996.

07G104 C PROGRAMMING
(Common to all branches)

3 0 0 3

Unit I

Introduction to C

About ANSI C Standard – Overview of compilers and interpreters – structure of a C program – programming rules. Executing the program The C Character Set – Delimiters – The C Keywords – Identifiers – Constants – Variables – Rules for Defining Variables – Data Types – Declaring Variables – Initializing Variables – Type Conversion – Constant and Volatile Variables

Operators and Expressions

Priority of Operators and their Clubbing – Comma and Conditional Operators – Arithmetic Operators – Relational Operators – Logical Operators – Bitwise Operators

Input and Output in C

Formatted Functions - Unformatted Functions – Commonly used Library Functions

10 Hours

Unit II

Decision Statements

The if Statement - The if…..else Statement – Nested if-else Statement – The break Statement – The Continue Statement - The goto Statement -– The switch Statement – Nested Switch () Case– The Switch () Case and Nested Ifs

Loop Control Statements

The for Loop – Nested for Loops – The While loop – The do-while – The do-while Statement with while Loop

Arrays

Array Initialization – Definition of Array – Characteristic of Array – One-Dimensional Array – Predefined Streams – Two-Dimensional Array – Three or Multi Dimensional Arrays – The sscanf ( ) and sprintf ( ) Functions

10 Hours

Unit III

Working with strings and standard functions

Declaration and Initialization of string – Display of strings with Different Formats – String Standard Functions – Applications of Strings

Pointers

Features of Pointers – Pointer Declaration – Arithmetic Operations with Pointers – Pointers and Arrays – Pointers and Two-Dimensional Arrays – Array of Pointers – Pointers to Pointers – Pointers and Strings – Void Pointers

Additional In C

Dynamic Memory Allocation – Memory Models – Linked Lists - Graphics

10 Hours

Unit IV

Functions

Definition of Function – Declaration of Function and Function Prototypes – The return Statement – Types of Functions – Call by Value and Reference: – Functions Returning More Values – Function as an Argument – Function with Operators – Function and Decision Statement - Function and Loop Statements – Function with Arrays and Pointers – Recursion – Pointer to Function

Storage class

Automatic Variables – External Variables – Static Variables – Register Variables

Preprocessor Directives

The #define Directive – Undefining a Macro – Token Pasting a Stringizing Operators – The #include Directive – Conditional Compilation – The #ifndef Directive – The #error Directive – The #line Directive – Inline Directive – The #pragma Saveregs – The #pragma Directive – The predefined Macros in ANSI and Turbo C – Standard I/O Predefined Streams in stdio.h – The Predefined Macros in ctype.h

10 Hours

Unit V

Structure and Union

Features of Structures – Declaration and Initialization of Structures – Structure within Structure – Array of Structures – Pointer to Structures – Structure and Functions – typedef – Bit Fields – Enumerated Data Type – Union – Calling BIOS and DOS Services – Union of Structures

Files

Streams and File Types – Steps for File Operations – File I/O – Structures Read and Write – Other File Functions – Searching Errors in Reading\Writing Files – Low Level Disk I/O – Command Line Arguments – Environment Variables – I/O Redirection

10 Hours

Total: 50 Hours

Textbook:

Ashok N Kamthane "Programming with ANSI and Turbo C", 1st edition Pearson, 2006.

References:

1. Byron S. Gottfried "Schaum's Outline of Programming with C" 2nd edition, McGraw Hill, 1996.
2. Ritchie D.M, Kernighan B.W, "C Programming Language", PHI, 2000.
3. Deitel & Deitel, "C How to program", Pearson Education, 2001.
4. Herbert Schidt, "C- The complete Reference:" McGraw Hill, 2002.
5. Gary J Bronson, "First book of ANSI C", Third Edition, Thomson Learning, 2001.

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING 3 1 0 4

(07C105, 07M105, 07B106, 07I106 & 07F106)

Unit I

Electric Circuits

Definition of Voltage, Current, Power & Energy, Ohm's law, Kirchoff's Law & its applications – simple problems, division of current in series & parallel circuits, generation of alternating EMF, definition of RMS value, average value, peak factor, form factor. Power in single phase AC – three phase system.

10 Hours

Unit II

Magnetic Circuits

Definition of MMF, Flux, Reluctance, Properties of Flux lines, Self & Mutual Inductance, Ampere Turns, Series & parallel magnetic circuits, Comparison between Electric & magnetic circuits, Law of Electromagnetic induction, Fleming's Right & Left hand rule.

10 Hours

Unit III

Electrical Machines

Construction, Type, Principle of Operation & Working Principle of DC Generator, DC Motor, Transformer, Induction Motor, Induction type single phase energy meter, Domestic wiring practice, Tube light circuit, Earthing & earthing methods. **10 Hours**

Unit IV

Electronics Engineering

PN Junction diode & Zener diode – Characteristics – Half wave and full wave rectifier – Bipolar junction transistors – CB,CE, CC Configurations and characteristics – basic concepts of amplifiers and oscillators – Logic gates – Inverting, Non inverting amplifiers and Operational amplifiers- Basic Computer organization – Block diagram of Microprocessors (8085) **10 Hours**

Unit V

Communication Engineering

Introduction to communication systems – Need for modulation – Types- Block Diagram representation only– Block diagram of TV system – Introduction to cellular & mobile telephony- Block diagram of Optical and Satellite communication systems.

10 Hours

Total: 50 Hours

Textbooks:

1. Nagsarkar T K & Sukhija M S, "Basic of Electrical Engineering", Oxford Press 2005.
2. Muthusubramaninan R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition 2004.

References:

1. Edminister J A, "Electric Circuits", Schaum's Series. McGraw Hill, 2005
2. Van Valkenbergm, "Electric Circuits and Network Analysis", Prentice Hall (India) Pvt, Ltd, 2005.
3. Smarjith Ghosh, "Fundamentals of Electrical and Electronics Engineering", Prentice Hall (India) Pvt, Ltd, 2005.

07M106 BASICS OF CIVIL ENGINEERING 3 1 0 4

Unit I

Introduction

Introduction : Engineering – Civil Engineering – History and development of Civil Engineering – Scope of Civil Engineering – Functions of Civil Engineers. Construction Materials : Characteristics of good building materials such as stones, bricks, A.C. sheets, G.I. sheets and Ceramic tiles, timber, cement, aggregates and concrete. Surveying : Definition and purpose – classification – Basic principles – Measurement of length by chains and tapes – Calculation of area of a plot – Measurement of bearings and angles using a prismatic compass – Levelling – Contours and their applications – Use of transit theodolite.

10 Hours

Unit II

Foundations

General concepts relating to Buildings: Selection of site – Basic functions of buildings – Major components of buildings. Foundations: Purpose of a foundation – Bearing capacity of soils – types of foundations. Proper methods of construction of Brick masonry – Stone masonry – hollow Block masonry. Beams – Lintels – Columns – Flooring – Damp proof course – surface finishes – Doors and windows – Roofing. Valuation of buildings : Definition – Purpose of valuation – Factors which govern value of a building – Valuation of a building by plinth area method – Valuation of old buildings.

10 Hours

Unit III

Water Supply and Sanitary Engineering

Water supply Engineering : Sources of water supply – Quantity of water requirements – Purification of water involving sedimentation, filtration and disinfection. Sanitary Engineering : Definition of terms – Collection and disposal of solid wastes – Sewage systems – Septic tank – Oxidation pond.

10 Hours

Unit IV

Transportation Engineering

Transportation Engineering : Importance of roads – Classification of Highways – Cross sections of water bound macadam, bituminous and cement concrete roads – Traffic signs and signals.Railways : Importance of railways – Gauges – Components of a permanent way. Bridges: Components of Culverts – Causeway, Slab Bridge, T beam and Slab Bridge, Suspension Bridge.

10 Hours

Unit V

Important Infrastructures

Functions and general layout of an airport - Functions and general layout of a harbour Dams : Purpose of Dams – Types of dams – Earth, masonry and concrete, arch and buttress dams – Selection of site for a dam. Irrigation Engineering : Definition of irrigation – Types of irrigation – Canal irrigation system. Remote sensing – Principles – Concepts of Reflectance – sensors - GIS – Introduction – Advantages – Applications**.**

10 Hours

Total: 50 Hours

Textbooks:

1 Arunachalam N., 'Basic Civil Engineering', Pratheeba Publishers, Coimbatore, 2000.
2 Ramesh Babu V., 'Basic Civil Engineering', Anuradha Agencies, Kumbakonam, 2001

References:

1 Birdie G.S., Birdie J.S., "Basic Civil Engineering", First Edition, Dhanpat Rai & Sons, Delhi, 1991.

2 Natrajan K.V., "Basic Civil Engineering", Eighth Edition, Mrs.Dhanalakshmi, Chennai, 1998.

07G001 COMMUNICATION SKILLS – I
(Common to all branches)

3 0 0 3

Unit I

Grammar and Vocabulary

Word formation with prefixes and suffixes - synonyms and antonyms – verb patterns – tenses – subject-verb agreement – modal auxiliaries – prepositions – conditionals – use of articles – commonly confused, mispronounced and misspelt words – British and American vocabulary – formal and informal English – Vocabulary building activities such as crossword, mind mapping, etc.

10 Hours

Unit II

Listening

Listening for and noting specific information, listening to identify topic, context, function, speaker's opinion, attitude, etc. – Extensive listening – listening for general content – listening to short conversations to fill up gapped texts – intensive listening – listening for specific information – note-taking (guided and unguided).

10 Hours

Unit III

Speaking

Speech sounds – syllables – Word stress – Sentence stress – Content words and Function words – Intonation and pause – Pronunciation of ed-words – first language intrusions – Accent neutralisation – Pronunciation drills / tongue twisters

10 Hours

Unit IV

Reading

Using dictionaries & Thesaurus – Predicting the content – skimming the text – understanding the gist – identifying the topic sentence and its role in each paragraph – scanning – inferring / identifying lexical and contextual meanings – transfer of information / note-making – understanding discourse coherence – sequencing of sentences.

10 Hours

Unit V

Writing

Writing definitions and descriptions – paragraph writing (unity, coherence and use of cohesive expressions) – Formal and Informal letter writing – process description (use of sequencing connectives) – comparison and contrast – Reports – Proposals

10 Hours

Total: 50 Hours

Textbook:

Rizvi M Ashraf, "Effective Communication", Tata McGraw – Hill Publishing Company Ltd., New Delhi, 2005.

References:

1. Sharon J. Gerson, Steven M. Gerson, "Technical Writing – Process and Product", 3rd Edition, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2004.
2. Andrea J. Rutherford, "Basic Communication Skills for Technology", 1st Edition, Pearson Education Asia (Singapore) Pvt. Ltd., Bangalore, 2001.
3. Nell Ann Pickett, Ann A. Laster, Katherine E. Staples, "Technical English (Writing, Reading and Speaking)", 8th Edition, Pearson Education, USA, Addison Wesley Longman Inc., 2001.
4. Stevenson, Susan and Steve Whitmore, "Strategies for Engineering Communication", Wiley Edition, 2002.
5. Mitra K. Barun, "Effective Technical Communication – A Guide for Scientists and Engineers", Oxford University Press, New Delhi, 2006.

07G108 C PROGRAMMING LABORATORY
(Common to all branches)

0 0 3 2

Programs Using Decision-Making and Looping Statements:

1. Write a program to calculate the simple interest, given the principle, period and rate of interest (Simple Interest = PNR /100)
2. Write a program to convert the temperature from Fahrenheit to Centigrade and vice versa. (F = 1.8 x (C +32)) ; C = (F- 32) /1.8)
3. Write a program to find the largest of 3 numbers using the minimum possible checks. (Simple if)
4. Write a program to convert binary to decimal number using while loop.
5. Write a program to find all possible roots of quadratic equation using switch case.
6. Write a program to read a particular number and to check whether it is a prime number or not.
7. The Electricity Production company has to print up the bills for its customers at the following rate:

For the 1st 50 KWH	rate is Rs.2
For the next 100 KWH	rate is Rs.6
For the next 200 KWH	rate is Rs.7
For more than 350 KWH	rate is Rs.8

Write a program to do the above and the output should be in the following order Customer name, Number of Units and the Total Bill.

Programs Using Functions:

8. Write a program using function that will round a floating point number to an indicated decimal place. For example, the number 12.758
9. Would Yield the value 12.76 when it is rounded off to two decimal places.
10. Write a function exchange to interchange the values of two variables say X and Y
11. Write a recursive function that will generate and print first n Fibonacci series.

Programs Using Arrays:

12. Write a program to merge two different sized arrays and eliminate the duplicate from the merged array.
13. Write a menu driven program for inserting an element into an array and for deleting an element from the array. Program should also have the provision for deleting the duplicates in an array.
14. Write a program to multiply two matrices. Use separate functions to read, process and print the data in matrix form. Also find the trace and transpose of the given matrix.
15. A list of N numbers is given. Write a program to find:
    a. Their average and standard deviation.
    b. The number of integers, which are greater than equal to a specified number in the list.
16. Using arrays write a program to arrange the given set of N numbers in ascending order and hence to pick the greatest and the smallest number. And also find the presence of a specified number

String Handling Programs:

17. Write a program to count number of vowels, consonants, words, white spaces and other characters in a given line of text.
18. Write a program to check whether the given string is a palindrome or not.
19. Write a program to find the occurrence of a sub string in a main string and if found replace it with new string.
20. Write a program to sort the set of names in alphabetical order.
21. Write a program using gets O(Capital) and puts o (Small) which converts a given 'C' program typed in uppercase to a program in lowercase

Programs Using Structures:

22. Create a structure to store the following details:

Rollno, Name, Mark1, Mark2, Mark3, Total, Average, Result and Class.

Write a program to read Rollno, name and 3 subject marks. Find out the total, result and class as follows:

a. Total is the addition of 3 subject marks.

b Result is "Pass" if all subject marks are greater than or equal to 50 else "Fail".

c. Class will be awarded for students who have cleared 3 subjects

i) Class "Distinction" if average >=75

ii) Class "First" if average lies between 60 to 74 (both inclusive)

iii) Class "Second" if average lies between 50 & 59 (both inclusive)

d. Repeat the above program to manipulate 10 students' details and sort the structures as per rank obtained by them

23. Define a structure that can describe the employees with the fields Eno, Ename. Basic. Write a program to calculate DA = 32% of Basic. HRA = 15% of Basic. CCA = 10% of BASIC, PF = 150,0 of Basic and print all details with Net pay All processing should be using pointer notation.

Programs Using Pointers:

24. Write a program to count the number of consonants, vowels, digits, white spaces and other characters in a line of text using pointers
25. Write menu driven program to perform all string handling operations using pointers.
26. Write a program to sort a list of strings in an alphabetical order (using pointers with DMA)
27. Write a menu driven program to perform addition, subtraction and multiplication of matrices using pointers.
28. Write a program to search for an element using binary search.
29. Write a program for encryption of a given sentence and decryption of the same sentence.

ENGINEERING PHYSICS LABORATORY

(07C109, 07M109, 07T109, 07Z109, 07F109 & 07B109) / (07I209, 07E209, 07L209 & 07N209)

0 0 2 1

List of Experiments:

1. Torsion Pendulum – Determination of Moment of Inertia of a disc and Rigidity modulus of a wire.
2. Young's Modulus- Non uniform bending.
3. Lee's disc – Thermal conductivity of a bad conductor.
4. Melde's Apparatus – Frequency determination.
5. Single Optic Lever – Determination of Thickness.
6. Air wedge – Interference-Thickness of a thin wire.
7. Spectrometer- Dispersive power of prism.
8. Traveling microscope - Refractive index of liquid and solid.
9. Energy Band Gap Apparatus – Determination of E_g of semiconductor diode.
1. LASER- Determination of Wavelength and Particle Size.

Total Experiments - 10
Total Hours - 20

References:

1. Srinivasan. M.N., .etal " A Text Book of Practical Physics" Sultan Chand & Sons.
2. William Charles.J and Sadasivam . K. "A Concise Laboratory Manual on Engineering Physics" Vijay Nicole, Chennai, 2006.

ENGINEERING CHEMISTRY LABORATORY

[First Semester (07C110, 07M110, 07T110, 07F110, 07Z110 & 07B110) /
Second Semester (07I210, 07E210, 07L210 & 07N210)]

0 0 2 1

1. **Weighing and preparation of standard solutions**
   Preparation of molar and normal solutions of the following substances - oxalic acid, sodium carbonate, sodium hydroxide, hydrochloric acid.
2. **Water Analysis**

i. Determination of total hardness, temporary & permanent hardness of water by EDTA method.
ii. Determination of alkalinity in a water sample.

3. **pH**
   To find out the strength of given hydrochloric acid by sodium hydroxide.
4. **Conductometry**
   Conductometric titration of mixture of acids.
5. **Potentiometry**
   Redox titration – Iron Vs. dichromate.
6. **Spectrophotometry**
   To determine the iron content of an unknown solution by thiocyanate method
7. **Flame photometry**
   To determine sodium and potassium in water
8. **Viscometry**
   Determination of molecular weight of a polymer.
9. **Corrosion**
   Determination of corrosion rate by weight loss measurements.

Total: 20 Hours

References:

1. Vogel A.I., "A Text of Quantitative Inorganic Analysis", Seventh Edition, ELBS, London, 2004.
2. Shoemaker D.P., and Garland C.W., "Experiments in Physical Chemistry", First Edition, Mc-Graw Hill, London, 1988.
3. Sivakumar R., and Jayaprakasam R., "A concise laboratory manual on engineering chemistry", Second Edition, Vijay Nicole, Chennai, 2006.

07G201 ENGINEERING MATHEMATICS – II
(Common to all branches)

3 2 0 4

Unit I

Functions of Several Variables

Functions of two variables-Partial derivatives - Total differential - Derivative of implicit functions -Taylor's expansion - Maxima and minima - Constrained Maxima and Minima by Lagrangian Multiplier method -Jacobians.

12 Hours

Unit II

Multiple Integrals

Double integration in polar and Cartesian Co-ordinates - Change of order of integration - Area as a double integral - Volume as triple integral in Cartesian Co-ordinates - Change of variables.

12 Hours

Unit III

Vector Calculus

Curvilinear coordinates – Gradient – Divergence – curl – Line - Surface and surface integrals - Statement of Green's - Gauss divergence and Stokes theorems - Verification and applications.

12 Hours

Unit IV

Analytic Functions

Cauchy - Riemann equations - Properties and analytic functions - Determination of harmonic conjugates - Milne's Thomson's method - Conformal mappings - Mappings of $w = z + a$, $1/z$, az , z^2 - Bilinear transformation.

12 Hours

Unit V

Complex Integration

Cauchy's theorem - statement and application of Cauchy's integral formula - Taylor and Laurent's series – Singularities – Classification – Residues - Cauchy's residue theorem - Contour integration - Circular and semi circular contours (excluding poles on the real axis). **12 Hours**

Total: 60 Hours

Textbooks

1. Lakshminarayanan K.A. *et al*., "Engineering Mathematics - II, 6th edition, Vikas Publishing House, New Delhi 2006.
2. Veerarajan T., "Engineering Mathematics", 5th Edition, Tata McGraw Hill Publications, New Delhi, 2007.

References

1. Kandasamy P., *et al*., "Engineering Mathematics", Volume I & II, S. Chand & Co., New Delhi 2000.
2. Narayanan S., Manicavachagam Pillai, Ramaiah.T.K, "Advanced Mathematics for Engineering Students", Volume I, Viswanathan Printers & Publishers, 2002.
3. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publications, New Delhi 2000.
4. Kreyszig, E, "Advanced Engineering Mathematics", 8th Edition, John Wiley & Sons, Inc, Singapore, 2002.

07G202 ENVIRONMENTAL SCIENCE AND ENGINEERING
(Common to all branches)

3 0 0 3

Unit I

Introduction to Environmental Studies and Natural Resources

Environment: Definition – scope – importance – Need for public awareness. Forest resources: Use – over exploitation – deforestation – case studies- mining – effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water – floods – drought – conflicts over water. Mineral resources: Use – 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.

10 Hours

Unit II

Ecosystems and Biodiversity

Concept of an ecosystem: Structure and function of an ecosystem – Producers – consumers – decomposers – Energy flow in the ecosystem – Ecological succession – Food chains – food webs and ecological pyramids. Types of ecosystem: Introduction – characteristic features – Forest ecosystem – Grassland ecosystem – Desert ecosystem – Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Introduction – Definition (genetic – species –ecosystem) diversity. Value of biodiversity: consumptive use – productive use – social values – ethical values – aesthetic values. Biodiversity level: global – National – local levels. India as a mega diversity nation. Hotspots 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.

10 Hours

Unit III

Environmental Pollution

Pollution: Definition – Air pollution – Water pollution – Soil pollution – Marine pollution – Noise pollution – Thermal pollution – Nuclear hazards. Soil waste management: Causes – effects – control measures of urban and industrial wastes. Role of an individual in prevention of pollution - Pollution case studies. Disaster management: floods – earthquake – cyclone – landslides. Field study of local polluted site – Urban – Rural – Industrial – Agricultural.

10 Hours

Unit IV

Social Issues and the Environment

Sustainable development – from unsustainable to sustainable development – Urban problems related to energy. Water conservation – rain water harvesting – watershed management. Resettlement and rehabilitation of people: its problems – concerns – case studies. Environmental ethics: Issues – possible solutions – Climate change – global warming – acid rain – ozone layer depletion – nuclear accidents – nuclear 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 – Issues involved in enforcement of environmental legislation – Public awareness. **10 Hours**

Unit V

Human Population and the Environment

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. Field study of local area to document environmental assets: river – forest – grassland – hill – mountain. Field study: common plants – insects – birds. Field study of simple ecosystems – pond – river – hill slopes. **10 Hours**

Total: 50 Hours

Textbooks:

1. Miller T.G. Jr., **"**Environmental Science", Tenth Edition, Wadsworth Publishing Co., 2004.
2. Raman Sivakumar, "Introduction to Environmental Science and Engineering" Second Edition, Vijay Nicole Imprints, Chennai, 2006.

References:

1. Bharucha Erach, "The Biodiversity of India", Mapin Publishing Pvt. Ltd., Ahmedabad India. 2003.
2. Divan S., "Environmental Law and Policy in India" Oxford University Press, New Delhi 2001.
3. Wager K.D., "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998.
4. Cunningham W.P., "Environmental Encyclopedia", Jaico Publising House, Mumbai, 2004.
5. Santosh Kumar Garg, Rajeshwari garg, smf Ranjni Garg "Ecological & Environmental Studies" Khanna Publishers, Nai Sarak, Delhi, 2006.

07G203 OBJECT ORIENTED PROGRAMMING
(Common to all branches)

3 0 0 3

Unit I

Introduction

Need for object oriented programming – difference between procedural languages and the object oriented approach – characteristics of object oriented languages – C and C++. C++ Basics: Basic programming construction – output using cout – input using cin –variables –integer variables – character variables –float variables – manipulators – type conversion.

9 Hours

Unit II

Objects and Classes

A Simple Class – C++ Objects as Physical Objects – C++ Object as Data Types – Constructors – Object as Function Arguments – Returning Objects from Functions – A Card Game Example – Structure and Classes – Classes, Objects and Memory – Static Class Data. Arrays: Array Fundamentals – Arrays as Class Member Data - Arrays of Objects – Strings.

9 Hours

Unit III

Operator Overloading

Overloading Unary Operators – Overloading Binary Operators – Data Conversion – Pitfalls of Operator Overloading and Conversion. Inheritance : Derived Class and Base Class – Derived Class Constructors – Overriding Member Functions – Inheritance in the English Distance Class – Class Hierarchies – Public and Private Inheritance – Levels of Inheritance – Multiple Inheritance – Ambiguity in Multiple Inheritance – Containership : Classes within Classes – Inheritance and Program Development.

9 Hours

Unit IV

Pointers

Addresses and Pointers – Pointers and Arrays – Pointers and Functions – Pointers and Strings – Memory Management: new and delete – Pointers to Objects – A Linked List Example – Pointers to Pointers – Debugging Pointers. Virtual Functions and Other Subtleties: Virtual Functions – Friend Function – Static Functions – Assignment and Copy-Initialization – The this Pointer.

9 Hours

Unit V

Files and Streams

Streams – String I/O – Character I/O – Object I/O – I/O with Multiple Objects – File Pointers – Disk I/O with Member Functions – Error Handling – Redirection – Command-Line Arguments – Printer Output – Overloading the Extraction and Insertion Operators. Exception: Throwing an Exception – The Try Block – Catching an Exception – Exception Specifications – Exceptions and Design Issues Class Templates : Class Template Definition – Class Template Instantiation – Member Function of Class Templates – Friend Declarations in Class Templates – Static Data Members of Class Templates – Nested Types of Class Templates – Members Templates – Class Templates and Compilation Model – Class Templates Specialization – Name Resolution in Class Templates – Namespaces and Class Templates – A Template Array Class.

9 Hours

Total: 45 Hours

Textbooks:

1. Robert Lafore, "Object-Oriented Programming in C++", Galgotia Publications, 2000.
2. Stanley B. Lippman, Josée Lajoie, "C ++ Primer", Third Edition, Addison Wesley, 1998.

References:

1. Malik D.S., "C++ Programming", Third Edition, Thomson, 2007.
2. Ashok N. Kamthane, "Object-Oriented Programming with ANSI & Turbo C++", Pearson Education, 2004.
3. Venugopal K.R. and Rajkumar, Ravishankar T., "Mastering C++", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2006.

07C204 APPLIED MATERIAL SCIENCE
(Common to 07F204, 07M204, 07T204)

3 0 0 3

Unit I

Conducting and Superconducting Materials

Classical theory: Drude-Lorentz theory - Electrical conductivity - Thermal conductivity - Wiedemann-Franz law - Drawbacks of Classical theory- Quantum theory - Fermi distribution function - Density of energy states. Superconductivity**:** Superconducting phenomena - Properties of superconductors - Type I and Type II superconductors - High temperature superconductors - Applications. **10 Hours**

Unit II

Semiconducting Materials

Intrinsic Semiconductors: Carrier concentration - Calculation of density of holes and electrons - Fermi level and its variation with temperature - Mobility and conductivity - Determination of band gap. Extrinsic Semiconductors: Expression for carrier concentration - N-type and P-type semiconductors - Variation of Fermi level with temperature and impurity concentration - Hall effect - Theory - Determination of Hall coefficient - Uses. **10 Hours**

Unit III

Dielectrics and Magnetic Materials

Dielectrics: Basic Definitions - Electrical susceptibility - Dielectric constant - Electronic, ionic, orientation and space charge polarizations - Frequency and temperature dependence of polarization - Internal field, Claussius-Mosotti relation (derivation) - Dielectric loss - Dielectric breakdown - Uses. Magnetic Materials: Origin of magnetic moment - Bohr magneton - Ferromagnetism - Hysteresis - Soft and Hard magnetic materials-Ferrites-Applications.

10 Hours

Unit IV

Thermal Physics

Thermal conduction: Mode of heat transfer - Coefficient of thermal conductivity - Thermal diffusivity - Rectilinear flow of heat along a bar (derivation) - Radial flow of heat - spherical shell method - Thermal conductivity of Rubber tube - Thermal conductivity of powder materials - Thermal Insulation: Thermal insulation in the buildings - Practical application of heat conduction and convection - Ventilation - Radiators.

10 Hours

Unit V

Photo elasticity and NDT

Photo elasticity: Photo elastic effect - Induced Birefringence - Stress-optic law - Effect of a stressed model in a plane polariscope - Isoclinic - Iso-chromatic fringes (definitions) - Photo elastic bench. Non Destructive Testing: Liquid penetrant method - Ultrasonic flaw detection - Ultrasonic flaw detector (block diagram) - X-ray Radiography - displacement method - X-Ray Fluoroscopy - Thermography - Merits and Demerits of each method.

10 Hours

Total: 50 Hours

Textbooks:

1. Arumugam M., "Physics I", Fifth Revised Edition, Anuradha Publications, Kumbokonam, 2005.
2. Rajendran V. and Marikani A., "Physics I", First Reprint, Tata Mc Graw Hill Publishers Company Ltd., New Delhi, 2004.

References:

1. Pillai S.O., "Solid State Physics", Fifth Edition, New Age International Publications, New Delhi, 2003.
2. Avadhanulu M.N. and Kshirsagar P.G., "A Text Book of Engineering Physics", 7th Enlarged Revised Edition S.Chand & Company Ltd., New Delhi, 2005.
3. Raghavan V., "Materials Science & Engineering," A first course, Prentice Hall of India, New Delhi, 2001.
4. Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai Publishers, New Delhi, 2001.
5. Wahab M.A, "Solild State Physics**"**, Narosa Publishing House, New Delhi, 1999.

07M204 APPLIED MATERIALS SCIENCE

3 0 0 3

Unit I

Conducting and Superconducting Materials

Classical theory: Drude-Lorentz theory - Electrical conductivity - Thermal conductivity - Wiedemann-Franz law - Drawbacks of Classical theory- Quantum theory - Fermi distribution function - Density of energy states. Superconductivity**:** Superconducting phenomena - Properties of superconductors - Type I and Type II superconductors - High temperature superconductors – Applications.

10 Hours

Unit II

Semi Conducting Materials

Intrinsic Semiconductors: Carrier concentration - Calculation of density of holes and electrons - Fermi level and its variation with temperature - Mobility and conductivity – Determination of band gap. Extrinsic Semiconductors: Expression for carrier concentration - N-type and P-type semiconductors - Variation of Fermi level with temperature and impurity concentration - Hall effect – Theory - Determination of Hall coefficient - Uses.

10 Hours

Unit III

Dielectrics and Magnetic Materials

Dielectrics: Basic Definitions - Electrical susceptibility - Dielectric constant – Electronic, ionic, orientation and space charge polarizations - Frequency and temperature dependence of polarization - Internal field, Claussius-Mosotti relation (derivation) - Dielectric loss - Dielectric breakdown – Uses. Magnetic Materials: Origin of magnetic moment - Bohr magneton - Ferromagnetism - Hysteresis - Soft and Hard magnetic materials – Ferrites – Applications

10 Hours

Unit IV

Thermal Physics

Thermal conduction: Mode of heat transfer - Coefficient of thermal conductivity - Thermal diffusivity - Rectilinear flow of heat along a bar (derivation) - Radial flow of heat - spherical shell method - Thermal conductivity of Rubber tube - Thermal conductivity of powder materials - Thermal Insulation: Thermal insulation in the buildings - Practical application of heat conduction and convection -– Ventilation – Radiators

10 Hours

Unit V

Photoelasticity and NDT

Photo elasticity: Photo elastic effect - Induced Birefringence - Stress-optic law - Effect of a stressed model in a plane polariscope – Isoclinic - Iso chromatic fringes (definitions) - Photo elastic bench.Non Destructive Testing: Liquid penetrant method - Ultrasonic flaw detection - Ultrasonic flaw detector (block diagram) - X-ray Radiography - displacement method - X-Ray Fluoroscopy – Thermography - Merits and Demerits of each method.

10 Hours

Total: 50 Hours

Textbooks:

1. Arumugam.M., " Physics I ", Fiftht Revised Edition ,Anuradha Publications, Kumbokonam, 2005.
2. Rajendran.V and Marikani.A., "Physics I", First Reprint, Tata Mc Graw Hill Publishers Company Ltd, New Delhi, 2004.

References:

1. Pillai S. O., "Solid State Physics", Fifth Edition, New Age International Publications, New Delhi, 2003.
2. Avadhanulu M.N. and Kshirsagar P.G., "A Text Book of EngineeringPhysics", 7th Enlarged Revised Edition S.Chand&Company Ltd., New Delhi, 2005.
3. Raghavan V., "Materials Science & Engineering," A first course, Prentice Hall of India,New Delhi, 2001.
4. Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai Publishers ,New Delhi, 2001. Wahab. M.A, " Solild State Physics ", Narosa Publishing House,New Delhi, 1999.

07M205 ENGINEERING MECHANICS

3 2 0 4

Unit I

Basics and Statics of Particles

Introduction - Units and Dimensions - Laws of Mechanics – Parallelogram Law of forces – Vectors – Vectorial representation of forces -Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle under coplanar forces – Forces in space - Equilibrium of a particle in space.

10 Hours

Unit II

Equilibrium of Rigid Bodies

Free body diagram – Types of supports and their reactions – Moments and Couples – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – resolution of a given force into a force acting at a given point and a couple – reduction of a system of coplanar forces acting on a rigid body into a single force and a single couple - Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions.

10 Hours

Unit III

Friction

Frictional force – Laws of Coulomb friction – Angle of friction – cone of friction - Simple contact friction – Ladder friction - Belt friction –Transmission of power through belts – Wedge Friction – Screw Jack – Self locking - Rolling Resistance – Problems involving the equilibrium of a rigid bodies with frictional forces.

10 Hours

Unit IV

Properties of Surfaces and Solids

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

10 Hours

Unit V

Dynamics of Particles

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

10 Hours

Total: 50 Hours

Textbook:

Beer, F. P. and Johnston Jr. E.R., "Vector Mechanics for Engineers – Statics and Dynamics", 7th Edition, Tata McGraw-Hill Publishing Company, New Delhi, 2005.

References:

1. Hibbeller, R.C., "Engineering Mechanics – Statics (Vol. I), Dynamics (Vol. II)", Pearson Education Asia Pvt. Ltd., 2000.
2. Andrew Pytel and Jaan Kiusalaas, "Engineering Mechanics – Statics (vol I), Dynamics (vol II)" – 2nd Edition, Brooks / Cole publishing company, 1999.
3. Irving H. Shames, "Engineering Mechanics - Statics and Dynamics", IV Edition Pearson Education Asia Pvt. Ltd., 2004.
4. Palanichamy, M.S. and Nagan, S., "Engineering Mechanics – Statics and Dynamics" - 3rd Edition, Tata McGraw-Hill, New Delhi, 2005.
5. Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", 3rd Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2005.

07M206 / 08A206 CONCEPTS IN ENGINEERING DESIGN

2 0 1 3

Unit I

Philosophy of Engineering Design & Design Process

Engineering profession, Importance of product design – Design process – a problem solving methodology – consideration of a good design – detailed description of design process – Technological innovation- product and process cycles – societal considerations in engineering **10 Hours**

Unit II

Identification and Analysis of needs

Identifying customer needs – bench marking – Customer requirements – Need analysis Organization of Design Concept & Design Methods: Creativity and problem solving – creativity methods – parametric design – Industrial design – human factors design– Ergonomics in Engineering design – design for the environment – design for X.

10 Hours

Unit III

Design decisions & Development of Design

Material selection process – sources of information – economics of materials – material substitution. Decision making – Behavioral aspects – decision theory – utility – decision trees – Break even analysis – CAE – detail design – detail drawings – BOM – impact of CAE in detail design – final design review. FMECA (Failure Mode Effect Criticality Analysis) – Bad designs.

10 Hours

Unit IV

Engineering Optimisation

Economic decision making, time value of money, depreciation, profitability of investments, break even analysis, cost evaluation, Elements of cost, cost estimation, manufacturing cost, learning curve, pricing a product, life cycle costing.

10 Hours

Unit V

Laboratory Exercises: All the facilities available in the campus can be used for this purpose. Like Acquiring data and communicating with an instrument, Interfacing using LabView, virtual instrumentation based machine control design, Use of CMM for measuring, Use FMS for automation, Experiments on study of product component from design, fabrication and testing etc.

10 Hours

Total: 50 Hours

Note:-

- Open ended problems to be given.
- **Lab classes** – give more hours for practical – Teacher involvement should be 100%
  - should be with students till the session ends. Dissection exercises of various gadgets should be provided.
- Make a batch size with 22 students only for Lab sessions.
- All Drawing to be free hand sketch.
- Physical model making to be given importance (30% weightage).
- Model making : Topics (moderated) from ASME and IEEE resources could be accessed (ASME students competition and IEEE students competition)

Textbooks:

1. George E Dieter, "Engineering Design, A Materials and Processing Approach", McGraw Hill International Book Co., (52:744) DIE (148 532) 1983,
2. Morris Asimov. "Introduction in Design". Prentice Hall, (82: 744 ASI 23501), 1962.
3. Design and Production process, R K Jain, Khanna Publishers., Latest edition.

References:

1. Hill Percy J, "The Science of Engineering Design", Hot Reinhart and Winston Inc, (52:744 Hill) 1970.
2. Saeema Ahmed, "An Industrial Case Study: Identification of Competencies of Design Engineers", ASME, Journal Mechanical Design, July 2007, Vol.128, pp.709, 716.
3. Bratt F Robertson, Josohim Walther and David F Radcliffe, "Creativity and the use of CAD Tools: Lessons for Engineering Design Educatin from Industry", ASME Journal of Mechanical Design, July 2007, Vol 129, pp.753, 760.
4. Kazem Kazarounian and Stephany Foley, "Barriers to Creativity in Engineering Education: A Study of instructors and students perceptions", ASME, Journal of Mechanical Design, July 2007, Vol.129, pp.751, 768.
5. Zblgnlew Humlenny (Editor), "Geometrical Product Specifications Courses for Technical Universities", Warsaw Biolsko, Biala Erigen Huddersfield Talknn Vienna, 2001.
6. Gary W Johnson, Richard Jonninge, "Labview Graphical Programming: Practical Applications in instrumentation", Warsaw Bielsko, Biala Eriangen Hudderfield Talknn Vienna, 2001.
7. Jeffrey Travis, "LabVIEW for Everycne", Prentice Hall Inc, Second Edition, 2002
8. Danlei E Whitney, "Mechanical Assemblies: Design Manufacture and Role in Product Develop", Oxford University Press, 2004.
9. K OTTO,"PRODUCT DESIGN" Pearson Publications, 2005.
10. www.howstuffworks.com

07M306 MANUFACTURING TECHNOLOGY – I

3 0 0 3

Unit I

Metal Casting Processes

Sand casting – Sand moulds - Type of patterns – Pattern materials – Pattern allowances – Types of Moulding sand – Properties – Core making – Methods of Sand testing – Moulding machines – Types of moulding machines - Melting furnaces – Working principle of Special casting processes – Shell, investment casting – Ceramic mould – Lost Wax process – Pressure die casting – Centrifugal casting – CO_2 process – Sand Casting defects – Inspection methods.

10 Hours

Unit II

Fabrication Process

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

10 Hours

Unit III

Bulk Deformation Processes

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

10 Hours

Unit IV

Sheet Metal Forming Processes

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

10 Hours

Unit V

Forming and Shaping of Plastics

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

10 Hours

Total: 50 Hours

Textbooks:

1. Hajra Choudhury, "Elements of Workshop Technology", Vol. I and II, Media Promotors Pvt Ltd., Mumbai, 2001
2. Serope Kalpajian, Steven R.Schmid, "Manufacturing Engineering and Technology", Pearson Education, Inc. 2002(Second Indian Reprint).

References:

1. Elements of Manufacturing Processes, B.S. Magendran Parashar & R.K. Mittal, Prentice Hall of India, 2003.
2. Rao P.N., "Manufacturing Technology", Tata-McGraw-Hill Publishing Limited, II Edition, 2002.
3. Sharma P. C., "A text book of production technology", S. Chand and Company, IV Edition, 2003.
4. Begman, "Manufacturing Process" , John Wilely & Sons, VIII Edition, 1999.

07G002 COMMUNICATION SKILLS – II

(Common for all branches)

3 0 0 3

Unit I

Grammar and Vocabulary

Impersonal passive – cause and effect expressions – indicators of purpose and function – imperatives – question patterns - infinitives and gerunds – mechanics of writing – nominal compounds – common errors – vocabulary building strategies – business vocabulary – foreign words and phrases – common idioms and phrases.

10 Hours

Unit II

Listening

Listening practice – Active Listening - Listening to Short speeches/interviews -Comprehension tasks - listening to speech segments (pronunciation, accent & intonation) – listening to recorded telephonic conversation, TV / radio news in English (both American and British) – listening to short and long conversations in different domains of activity - discussing new inventions, products etc.

10 Hours

Unit III

Speaking

Discourse Management – Interactive Communication (turn taking & sustaining the interaction by initiating and responding) - Giving personal information and expressing opinions - Giving information and expressing and justifying opinions - speculating, comparing and contrasting - agreeing and disagreeing - Fielding /asking questions/question starters - Asking /giving directions - Essential Telephoning English - Giving logical reasons/ explanations - debates, extempore speeches - Tips on developing fluency.

10Hours

Unit IV

Reading

Reading for structure and detail (Understanding general points and specific details; vocabulary and structure; structure and discourse features; understanding sentence structure) Error identification – Cloze - Reading strategies

10 Hours

Unit V

Writing

Describing or comparing figures from graphic input – making inferences – Report (describing, summarising) – Correspondence (explaining, apologising, reassuring, complaining) – Project proposal (describing, summarising, recommending, persuading) – format, organization & register - Business letters – notices – agenda – minutes – memoranda.

10 Hours

Total: 50 Hours

Textbook:

Raman, Meenakshi and Sangeetha Sharma, "Technical Communication – Principles and Practice", Oxford University Press, New Delhi, 2004.

References:

1. Huckin N. Thomas and Leslie A. Olsen, "Technical Writing and Professional Communication for Nonnative Speakers of English", 2nd Ed., McGraw-Hill, Singapore, 1991.
2. Herbert A.J., "The Structure of Technical English", Longman, UK, 1965.
3. Pfeiffer, William Sanborn, "Technical Communication – A Practical Approach", 6th Ed., Pearson Prentice Hall, New Jersey, 2006.
4. Guffey, Mary Ellen, "Business Communication – Process and Product", 3rd Edition, Thamson South-Western, Bangalore, 2004.
5. Eisenberg, Anne. "Effective Technical Communication", Singapore: McGraw-Hill, 1993.

07G208 OBJECT ORIENTED PROGRAMMING LABORATORY
(Common to all branches)

0 0 3 2

List of Experiments:

1. Write a program to define a class to represent a BANKACCOUNT. Including the following members:
   Date members:
   Name of the depositor, Account Number, Type of account, Balance Amount in the account
   Member functions:
   To assign initial values (Use constructors to initialize the data)
   To deposit an amount
   To withdraw an account after checking the balance

To display the name and the balance
Note: Try to use all types of constructors

2. Write a program to add the two, three, four numbers of different data types using function overloading
3. Write a program to print a character string of a specified length using default argumented function
4. Write a program to computer tax using default arguments. A tax compute function takes two arguments amount and tax percentage. Default tax percent is 15% of income
5. Write a program to sort a set of numbers of generic data type using template function
6. Implement the above class with dynamic objects and use constructors and destructors
7. Implement the class STUDENT with necessary data members and member function to print the mark sheet of a student using array of object
8. Design three classes student exam and result the student class has data members such as those representing roll number name etc. Create a class exam by inheriting the student class. The exams add a subject marks as the data member. Derive the class result from the exam class and it has its data member as a total mark. Write an interactive program to implement this.
9. Consider an example of book shop which sells and books and video tapes. These two class books and tapes are inherited from the base class called media. The media class has data members for storing title and publication the book class has data members such as number of pages in a book and tape class has the playing time of a tape each class will have member function read( ) and show( ). In the base class these members have to be defined as virtual functions. Write a program which models the class hierarchy for book shop and processing objects for these classes using pointers to the base class.
10. Write a program to define the class STRING and overload the following operators:
    i. » to read the string
    ii. « to print the string
    iii. + to combine two strings
    iv. = to assign a string to another string
    v. - to search the substring within a string and to remove the same
11. Write a program to keep track of number of instances created and alive for the class using static data member and static member functions.
12. Write a program to add the private data member of two different classes using friend function and friend class.
13. Write a custom manipulator to print "Rs.". Using this manipulator print the amount which is read as input.
14. Write a program to copy the content of one file to a new file by removing unnecessary spaces between words.
15. Write an exception handler to handle the exception of underflow.

07M209 ENGINEERING GRAPHICS

2 0 3 4

Unit I

Concepts and Conventions

Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

Plane Curves and Projection of Points, Lines

Curves used in Engineering Practices

Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square, pentagon and circle.

Projection of Points and Lines

General principles of orthographic projection – First angle projection – Layout of views – Projection of points, located in all quadrant and straight lines located in the first quadrant – Determination of true lengths and true inclinations.

10 Hours

Unit II

Projection of Plane surfaces, Solids, and Section of solids

Projection of polygonal surface and circular lamina inclined to one reference plane. Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method. Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane – Obtaining true shape of section.

10 Hours

Unit III

Development of Surfaces and Intersection of solids

Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones. Development of lateral surfaces of solids with square and cylindrical cutouts, perpendicular to the axis. Development of lateral surfaces of two Intersecting solids – cylinder & cylinder – prism & cylinder – Axis at right angles with no offset.

10 Hours

Unit IV

Isometric and Perspective Projections

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids by visual ray method and vanishing point method.

10 Hours

Unit V

Computer Aided Drafting (AutoCAD)

Introduction to AutoCAD and Drawing Setup: Getting Started with AutoCAD, Introduction to AutoCAD and Drawing setup – Getting started with AutoCAD – Advanced sketching, Drawing aids – Edit Commands. Controlling the drawing display – Basic dimensioning - Edit dimensioning styles – Hatching – Blocks – Introduction to 3D – Simple exercises.

10 Hours

Total: 50 Hours

Textbooks:

1. K.Venugopal and V Prabhu Raja "Engineering Graphics", New Age International (P) Limited, Eight Edition (Revised) 2007
2. V Ramesh Babu, "Engineering Graphics", VRB Publishers Pvt. Ltd., 2007

References:

1. N.D. Bhatt "Engineering Drawing" Charotar publishing House 46th Edition, 2003.
2. K.V. Nataraajan "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2006.
3. K.R. Gopalakrishnana. "Engineering Drawing" (Vol. I & II) Subhas Publications
4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education, 2005
5. Sham Tickoo and Deepak Maini, "AutoCAD 2006 – for Engineers and Designers", Dreamtech Publishers , New Delhi 2005.

07M210 WORKSHOP PRACTICE

0 0 3 2

Carpentry

- Handling of carpentry tools – Practice in marking, sawing, planning, and chiseling to size – Making simple joints such as half lap joint, T joint, dovetail joint, and mortise & tenon joint.
- Use of modern materials like Plywood, Chip board, Nova-pan, and laminated sheets.
- Study of joints in door panels, wooden furniture, etc

Fitting

- Use of fitting tools – Practices in marking, filing and fitting to size.
- Making of simple mating – Preparing the joints like square joint, V - joint,

Basic Machining

- Simple Turning and Taper turning
- Drilling practice

Plumbing

- Preparation of plumbing line sketches for water supply and sewage lines
- Basic pipe connection using valves, taps, couplings, unions, reducers, and elbows in household fitting.
- Practice in mixed pipe connections: Metal, plastic, and flexible pipes used in house hold appliances.
- Study of pipe connections on the suction

Demonstration

- Domestic Refrigerator, Air conditioner, Centrifugal pump, Blower, and Single stage air compressor

07G301 ENGINEERING MATHEMATICS – III

(Common to all branches)

3 2 0 4

Unit I

Partial Differential Equations

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

9 Hours

Unit II

Fourier Series

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

9 Hours

Unit III

Boundary Value Problems

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

9 Hours

Unit IV

Fourier Transform

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

9 Hours

Unit V

Z -Transform and Difference Equations

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

9 Hours

Total: 60 Hours (L-45+T-15=60)

Textbook:

K.A.Lakshminarayanan and *et al*., Engineering Mathematics, Vol. 3, Vikas Publishing House, New Delhi, 2006.

References:

1. P.Kandasamy *et al*., "Engineering Mathematics", Vol. 1, S.Chand & Co., New Delhi, 2008.
2. S.Narayanan, Manicavachagam Pillai, T.K.Ramaiah, "Advanced Mathematics for Engineering Students", Vol.2, Viswanathan Printers & Publishers, Chennai, 2002.
3. T.Veerarajan, "Engineering Mathematics", Tata McGraw Hill Publications, New Delhi 1999.
4. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publications, New Delhi, 2000.

07M302 ENGINEERING MATERIALS AND METALLURGY

3 0 0 3

Unit I

Phase Diagrams and Ferrous Alloys

Phase diagram – Solid solutions – substitutional and interstitial– intermetallic compound – cooling curves, phase rule, lever rule, equilibrium diagrams– Isomorphous, eutectic, peritectic, and eutectoid reactions with examples – Iron – Iron carbide equilibrium diagram – Classification of steel and cast iron, microstructure, properties and application. Gray, White, Malleable, Spheroidal Graphite – alloy cast irons – Effect of alloy additions on steel (Mn, Si, Cr, Mo, V Ti & W) – Stainless and tool steels, HSLA, Maraging steels,

10 Hours

Unit II

Heat Treatment

Heat treatment of steel, annealing – stress relief, recrystallisation and spheroidizing – normalising, hardening and Tempering of steel – Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram, CCR – Austempering, martempering, ausforming – Hardenability, Jominy end quench test, Case hardening processes – Carburising, Nitriding, Cyaniding, Carbonitriding – Flame and Induction hardening.

10 Hours

Unit III

Non Ferrous Metals and Alloys

Alloys of copper, aluminium, magnesium, nickel and zinc – composition and their uses – Bearing materials – precipitation treatment – Alloys for brazing and soldering, metal matrix composites – fibers and matrices for metal matrix composites – manufacturing, properties and applications.

10 Hours

Unit IV

Non – Metallic Materials

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE Polymers – Urea and Phenol Formaldehydes Fiber and particulate reinforced polymer matrix composites – Engineering Ceramics – Properties and applications of Al_2O_3, SiC, SiN_3, PSZ and Sialon, ceramic composites.

10 Hours

Unit V

Mechanical Properties and Testing

Mechanical behaviour of materials, Mechanism of elastic and plastic deformation, slip and twinning – tensile test, stress strain curves for ductile and brittle materials, Types of fracture – compression test – Hardness tests – Impact test – Creep test. – fatigue test, endurance limit fatigue limit, S– N Curve, Fracture – ideal fracture stress, Fracture toughness, ductile failure, cup and cone type fracture.

10 Hours

Total: 50 Hours

Textbook:

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

References:

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

07M303 ELECTRICAL MACHINES AND DRIVES

3 0 0 3

Unit I

DC Machines

Constructional details of DC Generator – Emf equation – Self and separately excited generators – Types of DC Generators – Characteristics of shunt ,compound and series generators – Principle of operation of D.C. motor – Back emf and torque equation – Characteristics of shunt, compound and series motors - Starting of D.C. motors – Types of starters .

10 Hours

Unit II

AC Machines

Construction of AC machines – Types – Principle of operation of three phase induction motor – Equivalent circuit – Performance calculation –Speed torque characteristics– Single phase induction motors – Principle of operation – Starters for induction motor – Construction of synchronous machines-types – Induced emf – Voltage regulation – Principle of operation of synchronous motor– Starting of synchronous motor .

10 Hours

Unit III

Drive Characteristics

Types of electrical drives - factors influencing the choice of electrical drives, heating and cooling curves –Loading conditions and classes of duty–Braking-types of braking–Braking characteristics for DC drive, AC drive.

10 Hours

Unit IV

Conventional Speed Control Methods

Speed control of DC series and shunt motor and series motor using armature, field control and Ward - Leonard control system – Speed control characteristics – Speed control of three phase induction motor using stator voltage control and frequency control.

10 Hours

Unit V

Solid State Speed Control

Control of DC drives using controlled rectifiers and choppers – Control of three phase induction motors using Voltage/ Frequency control – Air gap flux control – Slip power recovery schemes static– Rotor resistance control – Static Scherbius control method – Power factor correction.

10 Hours

Total: 50 Hours

Textbooks:

1. Kothari D P and Nagrath I J, “Basic Electrical Engineering”, Tata McGraw Hill publishing company ltd, second edition, 2002.
2. Partab H., "Art and Science of Utilization of Electrical Energy ", Dhanpat Rai and Sons, Delhi, 1985.

References:

1. Pillai, S.K., “A First Course on Electrical Drives ", Wiley Eastern Ltd., New Delhi, 1982.
2. Nagsarkar T K & Sukhija M S, “Basic of Electrical Engineering”, Oxford Press 2005.

07M304 ENGINEERING THERMODYNAMICS

3 1 0 4

Unit I

First Law of Thermodynamics

Basic Concepts – concept of continuum – Macroscopic approach – Thermodynamic systems – Closed Open – Control volume – Thermodynamic properties and equilibrium state of a system – Path and process – Quasi Static process – Modes of work – Zeroth law of thermodynamics – Concept of temperature and heat – Concept of ideal and real gases. First law of thermodynamics – Applied to closed and open systems – Internal energy – Specific heat capacities C_v and C_p – Enthalpy.

10 Hours

Unit II

Second Law of Thermodynamics

Second law of thermodynamics – Kelvin Planck and Clausius statements – Reversibility and Irreversibility – Clausius inequality – Entropy concept efficiency – COP – Principle of increase of entropy – Carnot theorem – Absolute entropy – Availability.

10 Hours

Unit III

Properties of Pure Substances

Thermodynamic properties of pure substances in solid , liquid and vapour phases, P-V, P-T, T-V, T-S, H-S diagrams – Thermodynamic properties of steam – Calculations of work done and heat transfer in non – flow and flow process.

10 Hours

Unit IV

Properties of Gases, Thermodynamic Relations and Psychrometry

Properties of ideal and real gases - equation of state - Avagadro's law - Vander Waal's equation of states - Dalton's law of partial pressure - Properties of mixture of Gases - Maxwell relations - T- dS equation - Clausius Clayperon equations - Joule Thomson Coefficient. Psychrometric properties and processes - Psychrometric chart.

10 Hours

Unit V

Air Standard Cycles

Air standard cycles – Otto, Diesel and Dual – Calculation of mean effective pressure and Air standard efficiency.

10 Hours

Total: 50 Hours

Textbooks:

1. Rajput.P.K., "Engineering Thermodynamics", Laxmi Publications, New Delhi, 2006 Edition.
2. Cengel, "Thermodynamics - An Engineering Approach", Third Edition – 2003, Tata Mc Graw Hill, New Delhi.

References:

1. Holman.J.P., "Thermodynamics", 3rd Ed. McGraw-Hill, 1995.
2. Vanwylen and Sontag, "Classical Thermodynamics", Wiley Eastern, 1987
3. Arora C.P, " Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.
4. Merala C, Pother, Craig W, Somerton, " Thermodynamics for Engineers", Schaum Outline Series, Tata McGraw-Hill, New Delhi, 2004.

07M305 FLUID MECHANICS AND MACHINERY

3 1 0 4

Unit I

Basics

Elementary concepts – concepts of gauge and absolute pressure, measurement of pressure using manometer of different types, types of flow, definitions of unsteady, non – uniform, laminar and turbulent flows – Ideal flow – rotational & irrotational, stream function, potential function – path line streak line & stream line – Continuity equation – derivation of general three dimensional equation, application in one dimensional steady flow.

10 Hours

Unit II

Flow Concepts

Laminar flow through circular pipe – shear stress, pressure gradiant, velocity profile, Hagen – poiseulle equation, power calculations, laminar flow between parallel plates – Coueutte plane poiseulle flow.

10 Hours

Unit III

Flow and Pressure Measurement

Derivation of Bernoulli's energy equation and Euler's equation, examples, illustrating the use of energy equation. Flow meters – Venturi meter, orifice meter, nozzle, derivation of equations for discharge, pitot tubes –Momentum equation–impact of jet, momentum, force on blades–plane and curved.

10 Hours

Unit IV

Types of Flow

Flow through pipes – friction loss calculation, turbulent flow, Reynolds number, Darcy – weisbach equation, use of moody diagram, miner losses – Dimensional analysis and model testing - Reynolds and froude numbers and their use in model testing.

10 Hours

Unit V

Boundary Layer Theory

Boundary layer theory, boundary equations, Blasius solution, drag on a flat plate, boundary layer separation and its control, steam lines and bluffed bodies – flow around circular bodies and aerofoils, calculation of lift and drag. Reciprocating pumps, centrifugal pumps, fans, blowers, turbines

10 Hours

Total: 50 Hours

Textbooks:

1. Bansal.R.K.., "Fluid Mechanics and Hydraulic Machines" Lakshmi Publications, 1993.
2. Kothandaram,C.P.., and Rudramoorthy, R., "Basic Fluid Machines ", New age International,1998.

References:

1. Streeter, V.I., "Fluid Mechanics", McGraw Hill Book Company Ltd.,1985.
2. Kumar, k.L., "Engineering Fluid Machines", Eurasia Publishing House,1995.
3. Mathur, Sharma and Purohit, "Fluid Machanics and Fluid Machanics" Sathya Prakashan Pub,1984.
4. Robert, W.Fox, " Introduction to Fluid Machines", 4th ed., JohnWiley Eastern Pvt Ltd., 1994.

07M404 MANUFACTURING TECHNOLOGY – II

3 0 0 3

Unit I

Metal Cutting Theory

Introduction – Orthogonal & Oblique Cutting – chip formation – Mechanisms of metal cutting: Shear plane, Stress, Strain and cutting forces – Merchant's Circle – cutting tool materials, tool wear, tool life, cutting fluids – Machinability – Problems in Merchant's Circle and tool life

10 Hours

Unit II

Lathes

Centre lathe – Introduction – constructional features – various operations – nomenclature of single point tool – work holding devices – taper turning methods – thread cutting methods – Machining time calculations – Capstan and turret lathes – Indexing mechanism – Automats – single spindle & multi spindle – Bar feeding mechanism.

10 Hours

Unit III

Reciprocating Machine Tools

Shaper, Planer & Slotter – Introduction, types, specification & Mechanisms. Milling – Introduction – types – up milling & down milling, various operations – Milling cutter and its nomenclature – Indexing - types – simple, compound & differential – Introduction to hole making operations – drilling, reaming, boring, tapping.

10 Hours

Unit IV

Abrasive Process & Gear Cutting

Broaching -Introduction, types of broaching methods – nomenclature of broach tool. Grinding – Introduction, types of grinding process – Grinding wheel selection – honing, lapping, super finishing, polishing and buffing. Gear cutting – Introduction – forming, generation, shaping, and hobbing.

10 Hours

Unit V

CNC Machine Tools

NC/CNC Machine tools – Part programming fundamentals – manual programming – computer assisted part programming – APT language – Introduction to automation – FMS, AS/RS, AGV.

10 Hours

Total: 50 Hours

Textbooks:

1. S K Hajra Choudry, "Elements of Work Shop Technology – Vol. II", Media Promoters. 2002
2. Rao, P.N. "Manufacturing Technology- Metal Cutting and Machine Tools", Tata McGraw–Hill, New Delhi, 2003.

References:

1. HMT – "Production Technology", Tata McGraw-Hill, 1998.
2. P.C. Sharma, "A Text Book of Production Engineering", S. Chand and Co. Ltd, IV edition, 1993.
3. Serope Kalpajian, Steven R Schmid, "Manufacturing Engineering & Technology", Pearson Education, 2002.
4. Mickell P Groover, "Automation, Production Systems & Computer Integrated Manufacturing", Prentice Hall of India, 1999.

07G003 PROFESSIONAL COMMUNICATION

(Third semester: CSE, ECE, ME; Fourth semester : BT, CE, EEE, EIE, FT, IT, TT)

2 0
2 3

Unit I

Employment Communication & Interview Skills

Formal and Informal English – Common Errors in English – Business Vocabulary – E-mail etiquette- Curriculum Vitae and Job letters – Goals & Types of Interviews – Preparing for the interviews – Dos and Don'ts During an Interview – General Etiquette - Telephonic Interview Cues – Mock Interviews.

10 Hours

Unit II

Group Discussion & Presentation Skills

Definition of Group Discussion – Group Communication Strategies – Personality Development – Mock GDs – Mind Mapping – Presentation Strategies – Developing and Delivering Effective Presentations – Mock Presentations.

10 Hours

Unit III

Soft Skills

Assertiveness – Self Confidence – Intelligent Quotient and Emotional Quotient – Motivation – Self Motivation – Sympathy vs. Empathy – Interpersonal Communication Strategies – Time Management - Managing across cultures – Etiquette Grooming – Interpersonal skills – Body language.

10 Hours

Unit IV

Career Lab

Team Building –Decision Making – Positive Thinking – Manage Stress – Business Success: Planning and Organising – Business Etiquette – Successful Meeting Skills.

10 Hours

Unit V

English Lab

Issues in English – English Pronunciation – Effective Communication – Presentations and Public Speaking – Speak Fluent English – Business Correspondence.

10 Hours
Total: 50 Hours

Textbook:

Koneru Aruna, "Professional Communication", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008

References:

1. Raman Meenakshi, Sangeeta Sharma, "Technical Communication – Principles and Practice", Oxford University Press, New Delhi, 2004
2. Guffey Mary Ellen, "Business Communication – Process and Product", Thomson South – Western, Bangalore, 2000

Software

1. Effective Communication, Train2success, Zenith Global Consultants Limited, Mumbai
2. Business Etiquette, Train2success, Zenith Global Consultants Limited, Mumbai
3. Business Correspondence, Train2success, Zenith Global Consultants Limited, Mumbai
4. Team Building, Train2success, Zenith Global Consultants Limited, Mumbai
5. Positive Thinking, Train2success, Zenith Global Consultants Limited, Mumbai
6. Decision Making, Train2success, Zenith Global Consultants Limited, Mumbai
7. Speak Fluent English, Auralog, Global Software Publishing, Cambridgeshire

07M308 FLUID MECHANICS AND MACHINERY LABORATORY

0 0 3 2

List of Experiments

1. Buoyancy experiment – Metacentric height
2. Measurement of flow using pitot tube
3. Calibration of orifice meter and venturi meter

4. Determination of flow through pipes, losses in pipes
5. Flow through nozzles and weirs – Cd and Cc
6. Flow measurement using Rotameter and Water meter
7. Flow visualization – Reynolds apparatus
8. Pressure gauge and vacuum gauge calibration
9. Experiments on fluid jets – Force and efficiency calculation
10. Centrifugal pumps – Performance characteristics of a constant speed pump, specific speed – performance characteristics of multi stage pump.
11. Characteristics of Impulse turbine – Specific speed and unit quantities.
12. Characteristics of Reaction turbine – Specific speed and unit quantities.
13. Positive displacement pumps.

List of Equipments

1. Centrifugal pump.
2. Reciprocating pump.
3. Jet pump.
4. Submersible pump.
5. Gear and vane pump.
6. Pelton wheel turbine
7. Kaplan turbine.
8. Francis turbine.
9. Multistage Centrifugal pump with Notches.
10. Orfice and Venturimeter apparatus
11. Pipe Friction apparatus and Rotometer meter.

07M309 ELECTRICAL MACHINES LABORATORY

0 0 3 2

List of Equipments

1. Load test on DC Shut & DC Series motor
2. O.C.C & Load characteristics of DC Shunt and DC Series generator
3. Speed control of DC shunt ,motor (Armature, Field control)
4. Load test on single phase transformer
5. O.C & S.C Test on a single phase transformer
6. Regulation of an alternator by EMF & MMF methods.
7. Load test on single phase alternator
8. Load test on three phase squirrel cage Induction motor
9. Speed control of three phase slip ring Induction Motor
10. Load test on single phase induction Motor.
11. Study of DC & AC Starters

07M310 MANUFACTURING TECHNOLOGY LABORATORY – I

0 0 3 2

List of Equipments

1. Exercise on Simple Facing & Turning
2. Step Turning Model
3. Taper turning Model
4. Thread Cutting Operation
5. Exercise on Knurling & Grooving
6. Exercise on Boring & Chamfering
7. Eccentric Turning Model
8. Exercise on Drilling using lathe
9. Assembly of fits in lathe
10. One or more exercises on Capstan (or) Turret Lathe
11. Tool Wear measurement using Tool Maker's Microscope
12. Cutting Force measurement using dynamometer

13. Preparation of Mould with solid pattern
14. Preparation of Mould with split pattern
15. Preparation of Mould with core

Total: 45 Hours

List of Equipments

1. Centre Lathe	-	10 Nos
2. Capstan (or) Turret Lathe	-	1 No
3. Tool Maker's Microscope	-	1 No
4. Tool Dynamometer	-	2 Nos
5. Mould Flask	-	3 Nos

07M401 NUMERICAL METHODS

3 2 0 4

Unit I

Solution of Equations and Eigen Value Problems

Linear interpolation methods (method of false position) - Newton's method - Statement of Fixed Point Theorem - Fixed pointer iteration x=g(x) method - Solution of linear system of Gaussian elimination and Gauss-Jordan methods - Iterative methods: Gauss Jacobi and Gauss – Seidel methods- Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by power methods. **10 Hours**

Unit II

Interpolation and Approximation

Lagrangian Polynomials - Divided difference - Interpolation with a cubic spline - Newton forward and backward difference formulae.

10 Hours

Unit III

Numerical Differentiation and Integration

Derivatives from difference table - Divided difference and finite difference - Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules - Romberg's method - Two and three point Gaussian quadrature formulas - Double integrals using trapezoidal and Simpson's rules.

10 Hours

Unit IV

Initial Value Problems for Ordinary Differential Equations

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

10 Hours

Unit V

Boundary Value Problems

Finite difference solution for the second order ordinary differential equations. Finite difference solution for one dimensional heat equation by implict and explict methods - one dimensional wave equation and two dimensional Laplace and Poisson equations.

10 Hours

Total: 50 Hours

Textbooks:

1. Kandasamy, P.Thilakavthy, K and Gunavathy, K. "Numerical Methods". S.Chand and Co. New Delhi, 1999
2. Venkatraman M.K., "Numerical Methods" National Pub. Company, Chennai, 1991.

References:

1. Burden, R.L and Faries, T.D., "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Veerarajan. T., Ramachandran T "Numerical Methods", Tata McGraw-Hill Publications, First Reprint, New Delhi, 2008
3. Gerald, C.F, and Wheatley, P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi.2002.
4. Balagurusamy, E., "Numerical Methods", Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 1999.

07M402 THEORY OF MACHINES - I

3 1 0 4

Unit I

Basics of Mechanisms

Basic concepts of Link, Pair, Chain, Mechanism, Machine and Structure, Degree of freedom, Kutzback Criterian, Grashoff's Law. Inversions of Four bar and Slider Crank Mechanisms.

10 Hours

Unit II

Kinematics

Displacement, Velocity and Acceleration. Graphical Method of Velocity (Relative Velocity Method) and Acceleration diagrams for Simple Mechanisms. Analytical method and Klien's construction for Single Slider Crank Mechanism.

10 Hours

Unit III

Kinematics of CAM

Classifications of Cam and Follower – Displacement, Velocity and Acceleration diagrams of Uniform Velocity Motion, Simple Harmonic Motion, Uniform Acceleration and Retardation Motion and Cycloidal Motion. Construction of Cam Profile for a Radial Cam Pressure angle and undercutting.

10 Hours

Unit IV

Friction Drives

Belt Drives. Types of Belt dives, Velocity Ratio, Slip of Belt, Creep of Belt, Ratio of Driving Tensions for Flat Belt Drive, Determination of Angle of Contact, Centrifugal Tension, Maximum tension in the Belt, Condition for Maximum Power, Initial Tension in the Belt. V Belt Drive. Rope Drives.

10 Hours

Unit V

Friction Clutches and Bearings

Friction Clutches. Single Plate Clutches, Multiplate Clutches and Cone Clutches. Friction in Journal Bearings, Friction of Pivot and Collar Bearing. Flat Pivot Bearing, Conical Pivot Bearing, Trapezoidal Conical Pivot Bearing and Flat Collar Bearing.

10 Hours

Total: 50 Hours

Textbooks:

1. R S Khurmi, "Theory of Machines" S Chand & Company Ltd, New Delhi, 2008
2. Syad and R L Singal, "Kinematics of Machinery" Tech Mac Publishers, 2007.

Reference:

S.S. Rattan, "Theory of Machines", Tata Mc Graw hills Publications, New Delhi, 1993.

07M403 ENGINEERING METROLOGY AND QUALITY ASSURANCE

3 1 0 4

Unit I

Linear and Angular Measurement

Concept of Measurement – Definition of metrology– Fits and Tolerances - Linear measuring instruments – Vernier, micrometer, interval measurement – Slip gauges and classification – interferometer, optical flats, limit gauges – Comparators – Mechanical, pneumatic and electrical types – applications. Angular measurements – Sine bar, optical bevel protractor, angle Decker – Taper measurements.

10 Hours

Unit II

Form Measurement

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

10 Hours

Unit III

Laser and Advances in Metrology

Precision instruments based on laser – Principles - laser interferometer – application in linear – angular measurements and machine tool metrology – Coordinate measuring machine (CMM) – Constructional features – types, applications – digital devices– computer aided inspection – Machine Vision Systems.

10 Hours

Unit IV

Statistics & Quality

Sampling Theory and testing of Hypothesis – Population and Sample – influence of sample size – Random sampling – confidence intervals – Choice of sample size for estimation – Testing of hypothesis for large and small samples testing of hypothesis for mean, difference between means – F distribution – C-distribution – Goodness of fit – design experiments.

10 Hours

Unit V

Acceptance Sampling

Lot-by - lot sampling – types – probability of acceptance in single, double, multiple sampling Techniques – O.C.curves producers' Risk and consumer's Risk AQL, LTPD, AOQL concepts – standard sampling plans for AQL and LTPD – uses of standard sampling plans.

10 Hours

Total: 50 Hours

Textbooks:

1. Jain R.K., "Engineering Metrology", Khanna Publishers, 1994
2. Alan S. Morris, "The Essence of Measurement", Prentice Hall of India, 1997
3. Bester field D.H., "Quality Control ", Prentice Hall (1993) (Revised Eden).
4. Sharma S.C., " Inspection Quality Control and Reliability ", Khanna Publishers, New Delhi (1998).

References:

1. Gupta S.C, "Engineering Metrology", Dhanpat rai Publications, 1984
2. Jayal A.K, "Instrumentation and Mechanical Measurements", Galgotia Publications 2000
3. Beckwith T.G, and N. Lewis Buck, "Mechanical Measurements", Addison Wesley, 1991
4. Donald D Beckman, "Industrial Instrumentation", Wiley Eastern, 1985.
5. John Bank, "The Essence of Total Quality Management ", Prentice Hall of India (p) Ltd.,
6. New Delhi (1995).
7. Danny Samson, "Manufacturing & Operations strategy ", Prentice Hall, New York (1991).
8. Tapan P. Bagchi ISO9000, "concepts, methods and implementation ", Wheeler Publisher,
9. Allah bad (1994).
10. Connor, P.D.T.O., "Practical Reliability Engineering ", John Wiley (1993).
11. Green A.E., and Bourne A.J. "Reliability, Technology ", Wiley Nescience, 1991.

07M701 HYDRAULICS PNEUMATICS

3 0 0 3

Unit I

Fluid Power Systems and Fundamentals

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

10 Hours

Unit II

Hydraulic System & Components

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

10 Hours

Unit III

Design of Hydraulic Circuits

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

10 Hours

Unit IV

Pneumatic Systems And Components

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

10 Hours

Unit V

Design of Pneumatic Circuits

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

10 Hours

Total: 50 Hours

Textbooks:

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

References:

1. James L Johnson "Introduction to Fluid Power" Delmar Thomson Learning , 2003.
2. Majumdar S.R., "Pneumatic systems – Principles and maintenance", Tata McGraw Hill, 1995
3. Anthony Lal, "Oil hydraulics in the service of industry", Allied publishers, 1982.
4. Harry L. Stevart D.B, "Practical guide to fluid power", Taraoeala sons andPortLtd.Broadey,1976.
5. Michael J, Prinches and Ashby J. G, "Power Hydraulics", Prentice Hall, 1989.
6. Dudelyt, A. Pease and John T. Pippenger, "Basic Fluid Power", Prentice Hall, 1987.

07M405 THERMAL ENGINEERING

3 1 0 4

(Use of standard Tables and charts Permitted in the examination)

Unit I

Power Plant Cycles

Gas Turbine power plant cycle – Joule cycle - Expression for efficiency, work ratio – Modifications of Joule cycle with Intercooler, Reheater and Regenerator Steam Power Plant cycle – Rankine cycle – Modifications with Reheater and Regenerator. Problems solving using Mollier chart. **10 Hours**

Unit II

Internal Combustion Engines

Classification of IC engine- IC engine components and functions. Valve timing diagram and port timing diagram - Comparison of two stroke and four stroke engines. Fuel supply systems - Ignition Systems

Performance calculation – Heat balance sheet- Comparison of petrol & diesel engine. Fuels, Air-fuel ratio calculation - Knocking and Detonation. Lubrication system and cooling system. Exhaust gas analysis, pollution control norms.

10 Hours

Unit III

Steam Nozzles and Turbines

Flow of steam through nozzles-shapes of nozzles- Effect of friction- Critical pressure ratio, supersaturated flow. Impulse and reaction principles- Compounding of Turbines - velocity diagrams for simple and multistage turbines- Speed regulations- Governors.

10 Hours

Unit IV

Air Compressor

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

10 Hours

Unit V

Refrigeration and Air-Conditioning

Vapour compression Refrigeration cycle – Effect of superheat, subcooling of refrigerant - performance calculations. Working principle of vapour absorption system. Ammonia – water, Lithium bromide – water systems (Description only), Comparison between vapour compression and absorption systems.

Psychrometry- Psychometric chart, Cooling load calculations. Concept of RSHF, GSHF, ESHF, Air conditioning systems.

10 Hours

Total: 50 Hours

Textbooks:

1. Rajput, "Thermal Engineering", Laxmi publications, New Delhi, 6th Edition, 2006.
2. Kothandaraman.C.P., Domkundwar.S. and A.V.Domkundwar., "A course in Thermal Engineering", Dhanpat Rai & Sons, Fifth edition, 2002

Databooks:

1. Steam Tables with Mollier diagram
2. Refrigerant Tables with Psychometric Chart Property

References:

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

07M406 STRENGTH OF MATERIALS

3 1 0 4

Unit I

Stress, Strain and Deformation of Solids

Simple stress and strain – Stresses and strains due to axial force - Mechanical properties of materials – Stress-strain curve –- Hooke's law - Factor of safety – Stepped shafts – Uniformly varying sections – Stresses in composite sections - Temperature stresses – Poisson's ratio - Elastic constants and their relationship – Strain energy – Stresses due to different loadings – Stress concentration

10 Hours

Unit II

Analysis of Stresses in Two Dimensions

State of stresses at a point – Normal and tangential stresses on inclined planes - Principal planes and stresses – Plane of maximum shear stress - Mohr's circle for biaxial stresses - Strain energy in bending and torsion –Hoop and longitudinal stresses in thin cylindrical and spherical shells – Changes in dimensions and volume

10 Hours

Unit III

Beams - Loads and Stresses

Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever, Simply supported and Overhanging beams – Relationship between loading, shear force and bending moment – Point of contra flexure - Theory of simple bending - Stresses in beams: bending and shear - Stress variation along the length and in the beam section – Section modulus

10 Hours

Unit IV

Torsion in Shafts and Springs

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

10 Hours

Unit V

Deflection of Beams

Differential equation of elastic line – Statically determinant beams- Slope and Deflection of beams: Double integration method, Macaulay's method, Moment-area method, and Strain energy method for Cantilever, Simply supported and Overhanging beams – Columns – Buckling of long columns due to axial load - Equivalent length of a column – Euler's and Rankine's formulae for columns of different end conditions – Slenderness ratio

10 Hours

Total: 50 Hours

Textbooks:

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

References:

1. Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, New York, 1995.
2. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co, New Delhi, 1981.
3. Ryder G.H, "Strength of Materials", Macmillan India Ltd., Third Edition, 2002.
4. R K Bansal, " A text book of Strength of Materials", Lakshmi Publications (P) Limited, New Delhi,2007.
5. Singh D.K "Mechanics of Solids" Pearson Education 2002.
6. Timoshenko S.P, "Elements of Strength of Materials", Tata McGraw-Hill, New Delhi 1997.
7. R K Rajput, "Strength of Materials", S Chand & Co., New Delhi, 2006.
8. R Subramanian, "Strength of Materials", Oxford University Press, New Delhi, 2007.
9. S Ramachandran & Ajay Bhansali "Strength of Materials", Air Walk Publications, Chennai,2006.
10. B K Sarkar,"Strength of Materials", Tata Mc-Graw Hill, New Delhi, 2006.

07G004 PROFESSIONAL ETHICS

(Third semester: BT, CE, EEE, EIE, FT, IT, TT; Fourth semester: CSE, ECE and ME)

3 0 0 3

Unit I

Human Values

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

10 Hours

Unit II

Engineering Ethics

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.

10 Hours

Unit III

Engineering as Social Experimentation

Engineering as experimentation – Engineers as responsible experimenters – Codes of ethics – A balanced outlook on law – The Challenger case study – Experimentations by case studies.

10 Hours

Unit IV

Safety, Responsibilities and Rights

Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing risk – The Three Mile Island and Chernobyl case studies – Fundamental Rights, Responsibilities and Duties of Indian Citizens – Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Discrimination

10 Hours

Unit V

Global Issues

Multinational corporations – Environmental ethics and Environmental Protection Act – Computer ethics – Weapons development – Engineers as managers – Consulting engineers – Engineers as expert witnesses and advisors – Moral leadership – Sample code of ethics like IETE, ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management.

10 Hours

Total: 50 Hours

Textbook:

Mike W. Matrin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw-Hill, 3rd edition, New Delhi, 2003.

References:

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey, 2004 (Indian Reprint).
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available).
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

07M408 THERMAL ENGINEERING LABORATORY- I

0 0 3 2

List of Experiments

I.C. Engine Lab and Fuels Lab

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

35 Hours

Steam Lab

1. Study of Steam Generators and Turbines**.**
2. Study of Co-generation Plant.

10 Hours

Total: 45 Hours

List of Equipment

(For a batch of 30 students)

1.	I.C. Engine – 2 stroke and 4 stroke model	1 set
2.	Red Wood Viscometer	1 No.
3.	Saybolt Viscometer	1 No.

4. Apparatus for Flash and Fire Point 1 No.
5. 4-stroke Diesel Engine with mechanical loading. 1 No.
6. 4-stroke Diesel Engine with hydraulic loading. 1 No.
7. 4-stroke Diesel Engine with electrical loading. 1 No.
8. Multi-cylinder Petrol Engine 1 No.
9. Single cylinder Petrol Engine 1 No.
10. Data Acquisition system with any one of the above engines 1 No.
11. Steam Boiler with turbine setup 1 No.

07M409 STRENGTH OF MATERIALS LABORATORY

0 0 3 2

List of Experiments

1. Tension test on MS rod.
2. Tension test on thin wire.
3. Compression test – Bricks and Concrete cubes.
4. Double shear test in UTM.
5. Tests on spring – Tension and Compression.
6. Tests on wood – Compression, Tension and Impact.
7. Deflection test – Bench type verification of Maxwell theorem.
8. Hardness test on various machines.
9. Impact test – Charpy and Izod.
10. Testing the Mechanical properties under untreated and heat treated conditions.
11. Measurement using Rosette strain gauge.

Total: 45 Hours

List of Equipments

1. Universal testing machine : 2 Nos.
2. Compression testing machine : 1 No.
3. Torsion testing machine : 1 No.
4. Tensile testing machine : 1 No.
5. Deflection testing machine : 1 No.
6. Rockwell hardness tester : 1 No.
7. Vicker's hardness tester : 1 No.
8. Impact testing machine : 1 No.
9. Muffle furnace : 1 No.
10. Rosette strain gauge : 1 No.

07M410 METROLOGY AND METALLURGY LABORATORY

0 0 3 2

List of Experiments

Part –A Metrology Lab

1. Use of precision measuring instruments like micrometer, vernier, height and depth gauge and
2. surface plate etc.,
3. Calibration of Vernier / Micrometer / Dial Gauge
4. Checking Dimensions of part using slip gauges
5. Checking dimensions of a machined parts and squareness of a trysquare using slip gauges
6. Use of sine bar measuring angles and tapers
7. Measurement of angles between centre lines of holes drilled radially on a shaft.
8. Taper and bore measurement using spheres.
9. Measurements of Gear Tooth Dimensions using Gear Tooth vernier / Optical profile projector
10. Measurement of thread parameters using Tool Makers Microscope / Floating Carriage
11. Micrometer
12. Checking the limits of dimensional tolerances using Comparators (Mechanical / Pneumatic /

13. Electrical / Optical comparators)
14. Checking straightness of a surface plate using autocollimator / Spirit Level.

25 Hours

Part – B Metallurgy Lab

List of Experiments

1. Preparation of specimen for microscopic examination
2. Study and use of metallurgical microscope
3. Identification of low carbon and high carbon steels
4. Identification of stainless steel and HSS
5. Identification of Grey cast iron and white cast iron
6. Identification of malleable cast iron and SG iron
7. Annealing and normalizing – observation of hardness
8. Hardening and tempering – observation of hardness

25 Hours

Total: 50 Hours

List of Equipments (for a batch of 30 students)

Metrology Lab

1.	Micrometer	-	5 Nos.
2.	Vernier Caliper	-	5 Nos.
3.	Vernier Height Gauge	-	2 Nos.
4.	Vernier Depth Gauge	-	2 Nos.
5.	Slip Gauge Set	-	1 set
6.	Gear Tooth Vernier	-	1 No.
7.	Sine Bar	-	2 Nos.
8.	Bevel Protractor	-	1 No.
9.	Floating Carriage Micrometer	-	1 No.
10.	Profile Projector	-	1 No.
11.	Mechanical / Electrical / Pneumatic / Optical Comparator	-	1 No. each
12.	Autocollimator	-	1 No.
13.	Tool Makers Microscope	-	1 No.

Metallurgy Lab

1.	Junior Cut-off machine	-	1 No
2.	Specimen mounting press	-	1 No
3.	Linisher polisher	-	1 No
4.	Polishing stand	-	1 No.
5.	Single disc polisher	-	1 No.
6.	Metallurgical Microscope – Monocular	-	3 Nos.
7.	Metallurgical Microscope – Monocular	-	2 Nos.
8.	Muffle furnace	-	1 No

07M501 COMPUTER AIDED DESIGN

3 0 0 3

Unit 1

Fundamentals of CAD

Product design and life cycle, Role of CAD in engineering , Definitions of CAD tools, Input and Output devices, Data structure- Database, DBMS – Coordinate systems, Mechanical Applications and benefits of CAD.

10 Hours

Unit II

Computer Graphics Fundamentals

Introduction- Transformation of Geometric Models- Translation, scaling, reflection, rotation, Windowing, view port clipping, view port transformation.

10 Hours

Unit III

Visual Realism

Hidden -line, surface, solid removal algorithms, shading and coloring. Introduction to parametric and variation geometry based software's and their principles.

10 Hours

Unit IV

Geometric Modeling

Introduction to modeling and viewing- geometric modeling of solids, surface, wire frame, Assembly modeling- mating conditions. Computer Animation – Types.

10 Hours

Unit V

Data Exchange ,CAD in FEM

Exchange of CAD data between software packages, File types- IGES, PDES, PARASOLID, ACIS, DXF Files. Applications of CAD in FEM- Finite element Modeling- Interfaces

10 Hours

Total: 50 Hours

Textbook:

Ibrahim zied "CAD/CAM – Theory and Practice" - McGraw Hill, International Edition, 1998

References:

1. William M Neumann and Robert F.Sproul "Principles of Computer Graphics", Mc Graw Hill Book Co. Singapore, 1989.
2. Donald Hearn and M. Pauline Baker "Computer Graphics", Prentice Hall, Inc., 1992.
3. Mikell, P. Grooves and Emory W.Zimmers Jr. "CAD/CAM Computer – Aided Design and Manufacturing" Prentice Hall Inc., 1995.

07M502 THEORY OF MACHINES – II

3 2 0 4

Unit I

Gears and Gear Trains

Spur gear Terminology and Definitions. Gear Materials. Law of Gearing. Velocity Ratio. Length of Path of Contact and Length of Arc of Contact. Contact Ratio. Calculation of Number of Teeth on the Wheel and Pinion.

10 Hours

Unit II

Governors

Governors. Centrifugal, Watt, Porter and Proell Governor. Sensitiveness of Governors. Stability of Governors. Isochronous Governors. Hunting. Coefficient of Incentiveness.

10 Hours

Unit III

Turning Moment Diagram and Flywheel

Turning Movement Diagram for a Single Cylinder Double acting Steam Engine and Multi Cylinder Engine. Fluctuation of Energy. Flywheel and Flywheel in Punching Press. Balancing of masses – Basics only

10 Hours

Unit IV

Balancing

Single Rotating mass by a Single mass rotating in the Same plane and Two masses rotating in Different planes. Several masses rotating in the Same plane and Different planes. Partial Balancing of Unbalanced primary force in a Reciprocating Engine. Partial balancing of Locomotives. Variation of Tractive force. Swaying Couples. Hammer Blow. Coupled Locomotives. Primary and Secondary forces of Multi Cylinder In-line Engine. Radial and V Engines.

10 Hours

Unit V

Vibration

Free Vibration. Natural Frequency of free transverse vibration due to a point load, Uniformly distributed load acting over a Simply Supported beam and Shaft fixed at both ends carrying a Uniformly distributed load and a shaft subjected to a number of point loads. Critical speed at a shaft. Viscous Damping. Damping and Magnification

Factor. Vibration Isolation and Transmissibility. Free Torsional Vibrations of a Single, Two and Three Rotor System. Torsionally Equivalant Shaft.

10 Hours
Total: 50 Hours

Textbooks:

1. R S Khurmi, "Theory of Machines" S Chand & Company Ltd, New Delhi, 2008
2. Syad and R L Singal, "Kinematics of Machinery" Tech Mac Publishers, 2007.

Reference:

S.S. Rattan, "Theory of Machines", Tata Mc Graw hills Publications, New Delhi, 1993.

07M503 GAS DYNAMICS AND JET PROPULSION

3 1 0 4

Unit I

Compressible Flow -Fundamentals

Energy and momentum equations for compressible fluid flows- various regions of flows - reference velocities - stagnation state - Wave propagation in elastic medium – propagation of sound waves and derivation for velocity of sound - critical states, Mach number, critical Mach number - types of waves - Mach cone - Mach angle - effect of Mach number on compressibility .

10 Hours

Unit II

Flow Through Variable area and Constant area ducts

Isentropic flow through variable area ducts - T-s and h-s diagrams for nozzle and diffuser flows - area ratio as a function of Mach number - mass flow rate through nozzles and diffusers - effect of friction in flow through nozzles Flow in constant area ducts with friction (Fanno flow) – Fanno curves and Fanno flow equation - variation of flow properties - variation of Mach number with duct length - Flow in constant area ducts with heat transfer (Rayleigh flow) - Rayleigh line and Rayleigh flow equation - variation of flow properties - maximum heat transfer.

10 Hours

Unit III

Compressible Flow with Normal Shock

Governing equations - variation of flow parameters like static pressure, static temperature, density, stagnation pressure and entropy across the normal shock - Prandtl - Meyer equation - impossibility of shock in subsonic flows - flow in convergent and divergent nozzle with shock - normal shock in Fanno and Rayleigh flows - flow with oblique shock (elementary treatment only).

10 Hours

Unit IV

Air Craft Propulsion Systems

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

10 Hours

Unit V

Rocket Propulsion Systems

Rocket propulsion – Classification of rocket engines – Propellants: solid and liquid propellants, rocket engines thrust equation – effective jet velocity specific impulse – rocket engine performance - Flow through rocket nozzles – mass ratio and propellant mass fraction – Vertical flight of a rocket: powered flight and coasting flight – Rocket applications.

10 Hours
Total: 50 Hours

Textbook:

Yahya. S.M."Fundamental of compressible flow", New Age Internationa (p)Ltd., New Delhi, 2006(revised edition).

Databook:

Yahya. S.M "Gas Tables for compressible flow calculations", New Age International Pvt. Ltd., New Delhi, 2006(revised edition).

References:

1. Rathakrishnan.E, "Gas Dynamics", Prentice Hall of India, New Delhi, 2001
2. Patrich.H. Oosthvizen, William E.Carscallen, "Compressible fluid flow", McGraw-Hill, 1997
3. Cohen. H., Rogers R.E.C and Sravanamutoo, "Gas turbine theory", Addison Wesley Ltd.,1987
4. P Murugaperumal , " Gas Dynamics and Jet Propulsion" Scitech Publications Pvt. Ltd ., 2002

07M504 INSTRUMENTATION AND CONTROL ENGINEERING

3 0 0 3

Unit I

General Concepts of Measurements

Variables and measurement signals, the three stages of generalized measurement system, some common terms used in the measurement system, mechanical loading, impedance matching, frequency response. Factors considered in selection of instruments – error analysis and classification, sources of error. Transducers: Classification, displacement and velocity transducers, potentiometer, LVDT, variable reluctance transducers, capacitive transducers, tachometer, Types of Electric Strain Gauges – strain gauge bridges. Calibration of strain gauges, measurement of torque on rotating shaft, axial loading, bending using strain gauges, gauging techniques and other factors.

10 Hours

Unit II

Acceleration and Vibration Measuring Instruments

Use of photo cell in displacement measurement, measuring displacement and velocity using solar cell. Elementary accelerometers and vibrometers - the seismic instrument as accelerometer, piezoelectric crystal – calibration of accelerometers. Including and recording instrument

10 Hours

Unit III

Temperature Measurement

Approximate range and accuracy of various temperature measuring elements, glass thermometers, platinum resistance thermometers, thermistors, thermocouples, total radiation pyrometers, temperature measuring problems in flowing fluid

10 Hours

Unit IV

Pressure Measurement

Manometers, elastic transducers, elastic diaphragm transducers, pressure cells, bulk modules pressure gauge, Mcleod gauge, thermal conductivity gauges, calibration of pressure gauge using dead weight tester, dynamic characteristics of pressure measuring system. Flow measurement: Venturi orifice and nozzle meters, Pitot tube, turbine type meter, hot wire anemometer, magnetic flow meters. Level measurement: float level meters and electrical conductivity method. Viscosity measurement and telemetry.

10 Hours

Unit V

Control Systems

Open – loop and closed – loop controls, elements of closed loop control system, practical examples, introduction to sampled data, digital control and multivariable control system, mathematical models for mechanical and electrical systems, transfer function, block diagram representation, signal flow graphs, control system components. Automatic speed control of drives - process control, closed loop control system – pneumatic two step controller, control of chain grate boilers, feed water control – machine tool control, hydraulic operation, automatic positioning, profile generation by co – ordinate setting and copying – inductosyn measuring system – electro optical displacement measuring system.

10 Hours

Total: 50 Hours

Textbooks:

1. Beckwith, T.G. and Buck,N.L., Mechanical Measurements Addition Wesley Publishing Company Limited, 1995

2. Ernest O.Doebelin , Measurement Systems Application And Design, Mc-Graw Hill Publishing Company,1990.

References:

1. Jain, R.K ., Mechanical and Industrial Measurements, Khanna Publishers, Delhi,1984
2. Rangan, Mani and Sharma, Instrumentation , Tata McGraw Hill Publications, New Delhi,1985.
3. Nagrath,I.J. and Gopal , M., Control Systems Engineering ,Wiley Eastern Limited,1995.

07M505 DESIGN OF MACHINE ELEMENTS

3 1 0 4

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

Unit 1

Steady Stresses and Variable Stresses in Machine Members

Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – Design of curved beams – crane hook and 'C' frame - Factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations. **10 Hours**

Unit II

Design of Shafts and Couplings

Design of solid and hollow shafts based on strength, rigidity and critical speed – Design of keys and key ways - Design of rigid and flexible couplings – Introduction to gear and shock absorbing couplings – design of knuckle joints **10 Hours**

Unit III

Design of Fasteners and Welded Joints

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

10 Hours

Unit IV

Design of Springs and Levers

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

10 Hours

Unit V

Design of Bearings and Flywheels

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

10 Hours

Total: 50 Hours

Textbooks:

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

References:

1. Norton R.L, "Design of Machinery", Tata McGraw-Hill Book Co, 2004.Orthwein W, "Machine Component Design", Jaico Publishing Co, 2003.
2. Ugural A.C, "Mechanical Design – An Integral Approach", McGraw-Hill Book Co2004.
3. Spotts M.F., Shoup T.E "Design and Machine Elements" Pearson Education, 2004.

07M506 HEAT AND MASS TRANSFER

3 1 0 4

Unit I

Conduction

Fourier law of conduction in simple and composite geometrics, types of boundary and initial conditions, contact resistance, conduction with heat generation, extended surface heat transfer, transient and periodic heat conduction, application of numerical methods. **10 Hours**

Unit II

Radiation

Basic laws of radiation - radiation in ideal and real surfaces - view factor algebra - radiation shields - electrical analog using radiosity and irradiation - gaseous emission and absorption.

10 Hours

Unit III

Convection Heat Transfer

Dimensional analysis - boundary layer concept - basic governing equations - laminar and turbulent external and internal flows - forced and free convections - integral methods - semi – empirical correlations - flow over bank of tubes.

10 Hours

Unit IV

Phase Change Heat Transfer and Heat Exchangers

Modes of boiling - Nusselt theory of condensation - correlations in boiling and condensation - types of heat exchangers - methods of analysis - fouling factor and simple design problems.

10 Hours

Unit V

Mass Transfer

Diffusion Mass Transfer

Introduction – Concentrations, Velocities and fluxes – Fick's Law of Diffusion – The Diffusion Coefficient – Species Conservation Equation – Initial and Boundary Conditions – Steady-State Molecular Diffusion – Mass Transfer with Chemical Reactions – Transient Diffusion.

Convective Mass Transfer

Introduction – The Convective Mass Transfer Coefficient – The Concentration Boundary Layer – Governing Equations – Momentum, Heat and Mass Transfer Analogies – Turbulence Effects on Mass Transfer – Convective Mass Transfer Correlations – The Evaporation of Water into Air.

10 Hours

Total: 50 Hours

Textbooks:

1. "Heat Transfer", J.P. Holman, McGraw Hill, 8th S.L. edition.
2. R.C.Sachdeva, "Fundamentals of Engineering Heat and Mass Transfer", New Age International Publishers, New Delhi,1995.

Databook:

" HMT Data book", CP Kothandaraman, New Age International Publisher, New Delhi.

References:

1. Frank P. Incropera and David P.DeWitt, "Fundamentals of Heat and Mass Transfer", John Wiley and sons, 1998.
2. A.Bejan, "Heat Transfer", John Wiley and Sons, 1995.
3. M.N. Ozisik, "Heat Transfer", Mc Graw Hill Book Co., 1994.
4. C.P. Kothandaraman, "Fundamental of Heat and Mass Transfer", New age International Publishers, New Delhi, 1998.

07G005 ENGINEERING ECONOMICS
(Common to all branches)

3 0 0 3

Unit I

Introduction

Economic Activities – Nature of economics – Significance of economics – Managerial economics and other disciplines – Micro economics and macro economics – Normative and positive economics, objectives of the firm– Methods of managerial economics.

10 Hours

Unit II

Demand Utility Analysis and Forecasting

Concept of demand – Types of demand factors determining demand – Law of demand – Elasticity of demand – Point elasticity and arc elasticity – Demand forecasting – Fore casting Methods.

10 Hours

Unit III

Production and Cost Analysis

Production function – Least cost combination of inputs – Returns to scale and factor productivities – Statistical Production – Laws of production – Concept and nature of cost – Accounting costs and economic costs – Determination of cost – Cost output relation and cost curves.

10 Hours

Unit IV

Pricing

Determinants of price – Objective of Pricing – Market conduct, performance and structure – Types of Competition – Pricing under different market structure price discrimination – Pricing methods in practice.

10 Hours

Unit V

Financial Accounting System

Significance of accounting – Branches of accounting terminology – Double entry book keeping Journals and ledgers – Mechanics of accounting – Trial balance, balance sheet – Project and loss account – Financial ratio analysis – Fund flow analysis – Cash flow analysis – Capital Budgeting and its limitations.

10 Hours

Total: 50 Hours

Textbooks:

1. Ramachandra Aryasri A and Ramana Murthy V V, "Engineering Economics and Financial Accounting", Tata McGraw Hill Publishing Company Limited , New Delhi, 2006.
2. Kesavan R, Elanchezhian C and Sunder Selwyn T, Engineering Economics and Financial Accounting" Laxmi Publication (P) Ltd , New Delhi, 2005.

References:

1. Mote V L Samuel Paul and Gupta G S, "Managerial Economics – Concepts and Cases" Tata McGraw Hill Publishing Company Limited , New Delhi, 1981.
2. Maheswari S N, "Financial and Management Accounting", Sultan Chand & Sons New Delhi, 1999.

07M508 INSTRUMENTATION AND DYNAMICS LABORATORY

0 0 3 2

List of Experiments

1. Governors - Determination of sensitivity, effort, etc. for Watt, Porter and Proell Governors
2. Cam - Study of jump phenomenon and drawing profile of the cam.
3. Motorized Gyroscope-Verification of laws -Determination of gyroscopic couple.
4. Whirling of shaft-Determination of critical speed of shaft with concentrated loads.
5. Balancing of reciprocating masses.
6. Balancing of rotating masses.
7. Determination of moment of inertia by oscillation method for connecting rod and Flywheel.

8. Vibrating system - spring mass system-Determination of damping co-efficient of Single degree of freedom system.
9. Determination of transmissibility ratio - vibrating table.
10. Determination of torsional frequencies for compound pendulum and flywheel system with lumped Moment of inertia.
12. Epicyclic gear train model differential & worm wheel reducers.
13. Determination of moment of inertia by Flywheel and axle system
14. Determination of moment of inertia by bifilar suspension system
15. Digital vibration indicator (Forced vibration)
16. Displacement Measurement
17. Torque measurement using torque indicator
18. Load measurement using load cell
19. Study of sound measurement **Total: 45Hours**

List of equipment

1. Cam analyzer.
2. Motorized gyroscope.
3. Governor apparatus - Watt, Porter and Proell governors.
4. Whirling of shaft apparatus.
5. Dynamic balancing machine.
6. Vibrating table
7. Displacement indicator
8. Load cell
9. Torque indicator
10. Temperature measuring oven
11. Sound level meter
12. Flywheel and axle system
13. Bifilar suspension system
14. Digital vibration indicator
15. Vibrating table.
16. Balancing of rotating masses
17. Speed measurement stroboscope

07M509 MACHINE DRAWING AND CAD LABORATORY

0 0 3 2

1. Drawing Standards

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

6 Hours

2. Introduction to Drafting Software

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

6 Hours

3. Preparation of 2-D Drawings

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

9 Hours

4. Assembly Drawing (Preparation of assembled view)

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

24 Hours

Total: 45Hours

References:

1. BHATT.N.D. and PANCHAL.V.M., "Machine Drawing", Charotar Publishing House, 388001, 38th Edition, 2003.
2. P.S.G. Design Data Book
3. Ellen Finkelstein, "AutoCAD 2004 Bible", Wiley Publishing Inc, 2003.
4. Sham Tikoo, " AutoCAD 2002 with Applications", Tata McGraw-Hill Publishing Company, NewDelhi, 2002.
5. "CollabCAD Software", National Informatics Centre (CAD Group), Govt. of India, A-Block, C.G.O. Complex, Lodhi Road, New Delhi 110003, 2003" www.collabcad.com

Web sites:

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

List Of Equipment and Software Required

(for a batch of 30 students)

1. Computer System - 30

VGA Color Monitor
Pentium IV Processor
20 GB HDD
256 MB RAM

2. Laser Printer - 01

3. Plotter (A2 size) - 01

Software

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

07M510 THERMAL ENGINEERING LABORATORY- II

0 0 3 2

List of Experiments

1. Thermal Conductivity of lagged pipe
2. Thermal Conductivity of Metal Rod
3. Heat transfer by natural convection
4. Heat transfer by forced convection
5. Heat exchanger test-parallel and counter flow
6. Emissivity measurement
7. Stefan – Boltzman constant
8. Refrigeration test
9. Air conditioning test
10. Reciprocating compressor testing

List of Equipments

1. Lagged pipe apparatus with asbestos insulation 1 No.
2. Thermal conductivity apparatus – Aluminum rod with water flowing facility and electrical loading -1 No.
3. Natural convections apparatus – Having metallic cylinder with thermo couple connection with electrical loading facility -1 No.
4. Forced convection apparatus – Having blower with electrical loading - 1 No.
5. Heat exchangers test apparatus – parallel and counter flow – Having blower to pass air as tube side fluid with electrical loading facility - 1 No.
6. Emissivity measurement test apparatus – Having set up with black and grey body, thermocouple connection with electrical loading facility - 1 No.
7. Stefan- Boltzman constant apparatus – With electrical facility - 1 No.
8. Refrigeration test kit – With electrical loading facility -1 No.

9. Air conditioning test kit – With electrical loading facility - 1 No.
10. Reciprocating compressor test kit – Two stage compressor with inter cooling - 1 No.

07M601 CNC MACHINES AND ROBOTICS

3 0 0 3

Unit I

Introduction and Structure of CNC Machine Tools

Development of CNC Technology, principles, features, advantages, economic benefits, applications, CNC,DNC concept, classification of CNC Machine, types of control, CNC controllers, characteristics, interpolators.

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

10 Hours

Unit II

Drives and Controls

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

10 Hours

Unit III

CNC Programming and Tooling

Coordinate system, structure of a part program, G & M Codes, Manual part programming for Fanuc, Heidenhain, Sinumeric control system, CAPP, APT part programming using CAD/CAM, Parametric Programming- Examples.

Cutting tool materials, carbide insets classification, qualified, semi qualified and preset tooling, tooling system for Machining centre and Turning centre, work holding devices, maintenance of CNC Machines.

10 Hours

Unit IV

Introduction to Robotics

Introduction to robotics – design of a robot – Robot anatomy – robotics and automation, specification of robots, Classification of robots-Robot drives and power transmissions.

Robot Kinematics – Direct and inverse kinematics – Robot trajectories – Control of robot manipulators – Robot dynamics.

10 Hours

Unit V

Robot Sensors and Vision Systems

Sensors – types –Robotic vision systems, robot cell, design and control layouts.

Robot Programming

Robotics programming and languages, programming commands, arm motion, task point diagram, on-line / off-line programming

Robot Applications and Cell Design

Applications for industrial, business and domestic robots – future of robots.

10 Hours

Total: 50 Hours

Textbooks:

1. HMT, “Mechatronics”, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1998.
2. Steve Krar, Arthur Gill, “CNC Technology and Programming ", McGraw-Hill International Editions, 1990.
3. Mikell P Grover, “Industrial Robots – Technology, Programming and Applications”, McGraw-Hill, NY, USA, 1986.

References:

1. James Madison, “CNC Machining Hand Book ", Industrial Press Inc., 1996.
2. Berry Leathan - Jones, “Introduction to Computer Numerical Control ", Pitman, London, 1987.
3. Hans B.Kief, T.Fredericx Waters, “Computer Numerical Control", MacMillan / McGraw-Hill, 1992.
4. Bernard Hodgers, “CNC Part Programming Work Book ", city and Guids / Macmillan, 1994.
5. David Gribbs, “An Introduction to CNC Machining ", Cassell, 1987.

6. Sadasivan, T.A. and Sarathy, D, "Cutting Tools for Productive Machining ", Widia (India) Ltd., August 1999.
7. Radhakrishnan, P. "Computer Numerical Control Machines ", New Central Book Agency, 1992.
8. Peter Smid, "CNC Programming Hand Book ", Industrial Press Inc., 2000.
Fu K S, Gonzales R L and Lee C S G., "Robotics: Control, Sensing, Vision and Intelligence", McGraw Book company, 1987.
9. Yoran Koren., "Robotics for Engineers", McGraw-Hill, NY, USA, 1980.

Web Reference:

1. http:/liesu5.ieem.ust.hk/dfaculty/ajay/courses/ieem215/lecs/CNC.html
2. http://CNC-router-laser-machine.com/machinery.html

07M602 ELECTRONICS AND MICROPROCESSORS

3 0 0 3

Unit I

INTEL 8086/8088 Architecture

Introduction to 8086/ 8088 - 8086/ 8088 architecture- Instruction Set & Assembler Directives -Assembly Language Programming with 8086/ 8088 - Special Architectural Features & Related Programming.

10 Hours

Unit II

Communication Interfaces

Basic Peripherals & their Interfacing with 8086/ 8088 - Special Purpose Programmable Peripheral Devices & their Interfacing.

10 Hours

Unit III

DMA, Floppy Disk & CRT Controller

DMA Controller 8257 - DMA Transfers & Operations - Programmable DMA Interface 8237 - Floppy Disk Controller 8272 - CRT Controller 8275.

10 Hours

Unit IV

Multiprocessor Systems

Interconnection Topologies - Software Aspects of Multiprocessor Systems - Numeric Processor 8087 - I/ O Processor 8089 - Bus Arbitration & Control - Tightly Coupled & Loosely Coupled Systems- Design of a PC Based Multiprocessor System.

10 Hours

Unit V

Introduction to Microcontrollers

Architecture of 8051- Signal Description of 8051 - Register set of 8051 - Operational Features of 8051 - Memory & I/ O Addressing by 8051 - Interrupts of 8051 - Instruction Set of 8051 - Design of Microcontrollers 8051 based length measurement system.

10 Hours

Total: 50 Hours

Textbook:

Ray A K, K M Bhurchandi, "Advanced Microprocessor & Peripherals", Tata McGraw Hill, 1st Edition, 2000 (CH1, CH2, CH3, CH6, CH7, CH8, CH10)

References:

1. Douglas V Hall, "Microprocessor & Interfacing", Tata McGraw Hill, 2nd Edition, 1999
2. Rafiquzzuman M, "Microprocessor theory & Applications", Prentice Hall of India, 1994
3. Yuchenhiu, Glenn A Gibson, "Microprocessor Systems - 8086/ 8088 Family", Prentice Hall of India, 2nd Edition, 1986

07M603 POWER PLANT ENGINEERING

3 0 0 3

Unit I

Introduction to Power Plants & Boilers

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

10 Hours

Unit II

Steam Power Plant

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

10 Hours

Unit III

Nuclear and Hydel Power Plants

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

10 Hours

Unit IV

Diesel and Gas Turbine Power Plant

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

10 Hours

Unit V

Other Power Plants And Economics of Power Plants

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

10 Hours

Total: 50 Hours

Textbooks:

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

References:

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

07M604 DESIGN OF TRANSMISSION SYSTEMS

3 2 0 4

(Usage of PSG Design Data Book is permitted in the University examination)

Unit I

Design of Transmission Systems for Flexible Elements

Need for power transmission – type and classifications of transmission systems – applications – limitations – Selection of V belts and pulleys – selection of Flat belts and pulleys - Wire ropes and pulleys – Selection of Transmission chains and Sprockets. Design of pulleys and sprockets.

10 Hours

Unit II

Spur Gears and Helical Gears

Gear drives – Theory of gearing – Gear Terminology – contact ratio – interference – gear tooth profile correction – concepts and application. Bending strength – contact strength – Force analysis – Tooth stresses – Dynamic effects. Basics of gear design, gear tooth failure modes – Design of Helical Gears – Equivalent number of teeth – effect of helix angle – Gear materials.

10 Hours

Unit III

Bevel Gears and Worm Gears

Bevel and worm gear drives – types of bevel gears and their applications, nomenclature of straight and spiral, bevel and hypoid gears – calculation of tooth size.Types of worm gears – applications strength and wear rating of worm gears – thermal considerations.

10 Hours

Unit IV

Design of Gear Boxes and cam Design

Gear boxes – applications to spur, helical, bevel and worm gear drives – Standard step ratio – Ray diagram, kinematics layout – Design of single stage, single speed gear boxes – Design of multistage, multi speed gear boxes – applications in machine tools. Cam Design: Types – pressure angle and under cutting base circle determination – relative advantages and disadvantages – applications – design of cam drive for IC engines, machine tools.

10 Hours

Unit V

Design of Bearings and Mechanisms

Bearings – need – types, sliding contact and rolling contact bearings – applications – relative advantages and limitations selection of antifriction bearings – applications to constant and varying loads. Design of hydrodynamic journal bearings – Sommerfeld number – dimensionless parameters – optimum bearings.
Design of Ratchet & pawl mechanism and Geneva mechanism.

10 Hours

Total: 50 Hours

Textbooks:

1. Bhandari, V.B., "Design of Machine Elements", McGraw-Hill Publishing Company Ltd., 1994.
2. Shigley J.E and Mischke C. R., "Mechanical Engineering Design", McGraw-Hill International Editions, 1989.

References:

1. Juvinall R. C, Marshek K.M., "Fundamentals of Machine component Design", John Wiley & Sons Third Edition, 2002, 1989.
2. Prabhu. T.J., "Design of Transmission Elements", Mani Offset, Chennai, 2000,
3. Norton R.L, "Design of Machinery", McGraw-Hill Book co, 2004.
4. Hamrock B.J., Jacobson B., Schmid S.R., "Fundamentals of Machine Elements", McGraw-Hill Book Co., 1999.
5. Kulkarni S G, "Machine Design", McGraw-Hill International Editions, 2003.

Hand book:

Design data book, PSG College of Technology, Coimbatore.

07M605 AUTOMOBILE ENGINEERING

3 0 0 3

Unit - I

Vehicle Structure and Engines

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

10 Hours

Unit - II

Engine Auxiliary Systems

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

10 Hours

Unit - III

Transmission Systems

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

10 Hours

Unit - IV

Steering, Brakes and Suspension

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

10 Hours

Unit - V

Alternative Energy Sources

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

10 Hours

Total: 50 Hours

Textbooks:

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

References:

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

07G006 TOTAL QUALITY MANAGEMENT

Vide Civil Engineering 07G006

07M608 MANUFACTURING TECHNOLOGY LABORATORY - II

0 0 3 2

List of Experiment

1. Milling operations – Polygon cutting and Gear generating
2. Grinding of flat and cylindrical surfaces.
3. Shaping operations – External keyway, Dovetail, and Assembly fit.
4. Measurement of cutting forces in drilling operations using drilling tool dynamometer.
5. Gear cutting using Gear Hobbing Machine.
6. Tool and Cutter grinding machine - Grinding various angles on a single point tool
7. Slotting an internal keyway in a gear blank.
8. Simple operations using Automatic lathe and study of bar feeding mechanism.
9. CNC Turning – Box turning and Step turning.
10. CNC Milling – Profile milling.

List of Equipment

1. Universal Milling machine - 1 No.
2. Surface Grinding machine - 1 No.
3. Cylindrical Grinding machine - 1 No.
4. Shaping machine - 3 Nos.

5. Radial drilling machine - 1 No.
6. Drilling Tool dynamometer - 1 No.
7. Gear Hobbing machine - 1 No.
8. Tool and Cutter grinder - 1 No.
9. Slotting machine - 1 No.
10. Single spindle Automatic lathe - 1No.
11. CNC Turning model - 1 No.
12. CNC Milling model - 1 No.

07M609 ELECTRONICS AND MICROPROCESSORS LABORATORY

0 0 3 2

AIM

This Lab Course will enable the students to implement the small logic at assembly language level.

List of Experiments Study of Peripherals & interfacing

8085 Experiments:

1. 8-bit Addition, Multiplication &Division
2. 16-bit Addition, Multiplication &Division
3. Counters and Time Delay
4. BCD to Hexadecimal & vice-versa
5. Traffic light control
6. Stepper motor control

Constructors & Destructors:

1. Basic arithmetic & Logical operations
2. Sorting & searching algorithms
3. Data transfer instructions
4. RAM size & system date
5. Digital clock
6. Key board & printer status
7. Password checking
8. Serial interface & parallel interface
9. Trouble shooting

07M610 TECHNICAL SEMINAR

0 0 3 2

1. Each student is expected to present a topic of interest in Engineering and Technology field during the Technical Seminar Session. The duration of presentation will be 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar.

2. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Each seminar presentation carries marks that are allotted based on the topic of discussion, presentation techniques, presentation skill and question and answer.

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

(ELECTIVE FOR SEMESTER VIII)

07M023 NON TRADITIONAL MACHINING PROCESSES

3 0 0 3

Introduction

Unconventional Machining Process – Need – Classification – Brief overview of all techniques**.**

10 Hours

Unit III

Mechanical Energy Based Processes

Abrasive Jet Machining – Water Jet Machining – Ultrasonic Machining. (AJM, WJM and USM). Working Principles – equipment used – Process parameters – MRR-Variation in techniques used – Applications.

10 Hours

Unit III

Electrical Energy Based Processes

Electric Discharge Machining (EDM)- working Principles-equipments-Process Parameters-MRR- electrode / Tool – Power Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications.

10 Hours

Unit IV

Chemical and Electro-Chemical Energy Based Processes

Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants-maskant-techniques of applying maskants-Process Parameters – MRR-Applications.Principles of ECM-equipments-MRR-Electrical circuit-Process Parameters-ECG and ECH Applications.

10 Hours

Unit V

Thermal Energy Based Processes

Laser Beam machining (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles-Equipment-Types-Beam control techniques – Applications.

10 Hours

Total: 50 Hours

Textbooks:

1. Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd., New Delhi (2002) ISBN 81-7764-294-4.
2. P.K. Mishra, "Non Conventional Machining", Narosa Publishibng House, New Delhi

References:

1. Benedict. G.F. "Nontraditional Manufacturing Processes" Marcel Dekker Inc., New York (1987).
2. Pandey P.C. and Shan H.S. "Modern Machining Processes" Tata McGraw-Hill, New Delhi (1996).
3. Mc Geough, "Advanced Methods of Machining" Chapman and Hall, London (1998).
4. Paul De Garmo, J.T.Black, and Ronald.A.Kohser, "Material and Processes in Manufacturing" Prentice Hall of India Pvt. Ltd., New Delhi (8th Edition) (2001) ISBN – 81-203-1243-0.

07M702 MECHATRONICS

3 0 0 3

Unit I

Mechatronics, Sensors and Transducers

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

10 Hours

Unit II

Actuation Systems

Pneumatic and Hydraulic Systems – Directional Control Valves – Rotary Actuators. Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and pawl – Belt and Chain Drives – Bearings. Electrical Actuation Systems – Mechanical Switches – Solid State Switches – Solenoids – D.C Motors – A.C Motors – Stepper Motors.

10 Hours

Unit III

System Models and Controllers

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

10 Hours

Unit IV

Programming Logic Controllers

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

10 Hours

Unit V

Design of Mechatronics System

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

10 Hours

Total: 50 Hours

Textbook:

W. Bolton, "Mechatronics", Pearson Education, Second Edition, 1999.

References:

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

07M703 FINITE ELEMENT METHODS

3 1 0 4

Unit I

Introduction-Calculus of Variations

Basic concepts of FEM, FEA applications – stresses and equilibrium – boundary conditions strain Vs displacement relations – Temperature effects – potential energy and equilibrium - general procedure of FEM-solution of equilibrium problems- Gaussian elimination method- Rayleigh Ritz method- Galerkin method.

10 Hours

Unit II

One-Dimensional Problems

Discretisation of domain-element shapes, types, size, location & numbers. Co ordinate and shape function – galerkin approach – element matrices and vectors – Assembly of global equations – Boundary conditions –Higher order elements –shape function – application to axial loading of rods – extension to plane trusses – finite element formulation of stiffness matrix and load vectors –assembly of gloal equation – Boundary conditions- solution and post processing – example problems.

10 Hours

Unit III

Two-Dimensional Problems – Scalar Variable Problems

Finite element modeling – CST-LST elements – element equations, load vectors and boundary conditions – assembly – applications to scalar variable problems such as torsion, heat transfer –examples**.**

10 Hours

Unit IV

Two-Dimensional Problems – Vector Variable Problems

Vector Variable Problems - Elasticity equations – plane stress,plane strain and Axisymmetric problems – Formulation – element matrices – assembly – bounrdy conditions and solutions – examples.

10 Hours

Unit V

Isoparametric Element Formulation

Natural coordinates - Isoparametric elements – elements shape functions – Element equations – Gaussian quadrature – examples. **10 Hours**

Total: 50 Hours

Textbook:

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

References:

1. David V Hutton "Fundamentals of Finite Element Analysis"2005. TATA McGraw-Hill Publishing Company Limited., 2005.
2. Robert D.Cook., David.S, Malkucs Michael E Plesha, "Concepts and Applications of Finite Element Analysis" 4 Ed. Wiley, 2003.
3. Reddy J.N., "An Introduction to Finite Element Method", McGraw-Hill International Student Edition, 1985
4. Zienkiewicz and R.L.Taylor, "The Finite Element Methods, Vol.1", "The basic formulation and linear problems, Vol.1", Butterworth Heineman, 5th Edition, 2000.
5. S.S.Rao, "Finite Element Method in Engineering", Pergamon press.1989
6. C.S.Desai,J.F.abel, "Introduction to Finite Element Method",Affliated East West Press.

07M704 OPERATIONS RESEARCH

3 1 0 4

Unit I

Linear Models

The phases of operations research study- Linear Programming: Formulation - Graphical method - Simplex method – Artificial Variable techniques: Big M Method, two phase method.

10 Hours

Unit II

Transportation and Assignment Model

Transportation Problems: Optimal solution by North West corner method – VAM – Least cost method – MODI method. Assignment Problems: Formulation - Unbalanced Assignment Problem – Hungarian algorithm – Traveling Salesman Problem**.**

10 Hours

Unit III

Network Models

Network models - Shortest route - Minimal spanning tree - Maximum flow models - Project network - CPM and PERT networks - Critical path scheduling.

10 Hours

Unit IV

Queuing Theory

Queuing models - Queuing systems and structures - Notation - parameter - Single Server and multi server models - Poisson input - Exponential service - Constant rate service - Infinite population - Simulation.

10 Hours

Unit V

Sequencing and Replacement Model

Sequencing Problem: Models with n jobs with 2 machines – Models with n jobs with 3 machines. Replacement Models: Replacement of items that deteriorate with time – Value of money changing with time & not changing with time – Optimum replacement policy: Individual & Group replacement.

10 Hours

Total: 50 Hours

Textbook:

Hira and Gupta "Introduction to Operations Research", S.Chand and Co.2002

References:

1. Taha H.A, "Operation Research", Pearson Education sixth edition, 2003
2. Panneerselvam, "Operations Research", Prentice Hall of India, 2003.
3. Dharani Venkatakrishnan S " Operations Research", Kirthi Publishing House (P) Ltd., Coimbatore 1991.
4. Kanti Swarup, Gupta, P.K. and Manmohan, "Operations Research", 3rd Edition S.Chand&Sons, 1996.
5. Wagner, "Operations Research", Prentice Hall of India, 2000.

07G007 CREATIVITY AND INNOVATION
(Common to all branches)

3 0 0 3

Unit I
Creativity
Concept and history of creativity, need for creativity, creative environment, stages of creativity process, creativity and intelligence, creativity in various contexts, economic view of creativity, measuring creativity, fostering creativity, creative problem solving – brain storming and various techniques, lateral thinking.

10 Hours

Unit II
Innovation
Definition, creativity vis-à-vis innovation, conceptualizing innovation, types of innovation, sources of innovation, goals of innovation, process of technological innovation, diffusion of innovation, factors contributing to successful technological innovation, failure of innovations, innovation management, measures of innovation.

10 Hours

Unit III
Project Planning and Evaluation

Definition and purpose of project, collection of ideas, screening ideas, selection criteria for new projects, development of project plan, project evaluation – purpose, kinds of evaluation, stages of evaluation process, techniques of project evaluation, project analysis, benefits and risks of new projects.

10 Hours

Unit IV
Product Development and Evaluation
Research and new product development – process and types of new products, creative design, design of prototype – purpose, process, and types, model preparation, testing and quality evaluation; marketing research – purpose and process, types and methods; introducing new products, cost evaluation.

10 Hours

Unit V
Protection of Innovation
Intellectual property (IP), classes of IP – industrial property and copyrights; Intellectual Property Rights (IPR); Patents, patentability, patent acts, governing laws, history of patent laws and acts, patent administration; patenting process – patent application, patent search, prosecution, publication, examination, opposition, grant, renewal, patent rights; international code for patents, patents vis-à-vis economics.

10 Hours
Total : 50 Hours

Textbooks:

1. Tom Kelly, The Art of Innovation, Doubleday, Random House Inc. USA, 2001.
2. Managing Creativity and Innovation (Harvard Business Essentials), Harvard Business School, 2003.

References:

1. Brain Twiss, "Managing Technological Innovation", Pitman Publishing Ltd., 1992.
2. Harry B. Watton, "New Product Planning", Prentice Hall Inc., 1992.
3. Paul Birch and Brian Clegg, Business Creativity – A Guide for Managers, Kogan Page, London, 1995.
4. Leigh L. Thompson, Hoon-Seok Choi, Creativity and Innovation in Organizational Teams, Lawrence Erlbaum Associates, USA, 2006.
5. Paul E. Plsek, Creativity, Innovations and Quality, Irwin Professional, USA, 1997.
6. Alan G. Robinson, Sam Stern, Corporate Creativity: How Innovation and Improvement Actually Happen, Berrett-Koehler Publishers, USA, 1998.

07M708 COMPUTER AIDED ENGINEERING (CAE) LABORATORY

0 0 3 2

List of Experiments

Part – A

1. **Manual Part Programming (Using G and M Codes) in CNC lathe**
   Machining of small components using CNC LATHE

2. **Manual Part Programming (using G and M codes) in CNC milling**
   Machining of small components using **CNC MILLING MACHINE**

3. **Simulation and NC Code Generation**
   NC code generation using CAM software - Post processing for standard CNC Controls like FANUC, Hiedenhain etc.

4. **Practice on Computer Aided Measuring Instruments**
   Computer Aided Measurement using Coordinate Measuring Machine.

Part – B

Analysis (Using any FEA package)

1. Modeling 2 – D & 3- D drawings using ANSYS
2. Object modeling and meshing using 2 D & 3 D elements in ANSYS.
3. Simple stress and strain analysis of structural members.
4. Modal analysis & Harmonic analysis
5. Thermal analysis

List of Equipments (for a batch of 30 students)

I. Hardwares

1.	Computer server	- 1 No.
2.	Computer nodes or systems (Pentium Pro with 512MB Ram) networked to the server	- 30 Nos.
3.	A3 size plotter	- 2 Nos.
4.	Laser Printer	- 2 Nos.
5.	Trainer CNC lathe	- 2 Nos.
6.	Trainer CNC milling	- 2 Nos.
7.	Coordinate Measuring M/C	- 1 No.

II. Softwares

1.	CAM Software (CNC programming and tool path simulation for FANUC, Sinumeric and Heiden controller)	- 34 licenses

Total: 45 Hours

List of Equipments (for a batch of 30 students)

Computer System	**35**
19" VGA Color Monitor	
Pentium IV Processor	
80 GB HDD	
1GB RAM	
Color Desk Jet Printer	**01**
Software	
ANSYS Version 12 or latest	34 licenses

07M709 MECHATRONICS LABORATORY

0 0 3 2

(Common to Mechanical and Production VI Semester)

List of Experiments

1. Design and testing of fluid power circuits to control
2. velocity (ii) direction and (iii) force of single and double acting actuators
3. Design of circuits with logic sequence using Electro pneumatic trainer kits.
4. Simulation of basic Hydraulic, Pneumatic and Electric circuits using software.
5. Circuits with multiple cylinder sequences in Electro pneumatic using PLC.
6. Servo controller interfacing for open loop
7. Servo controller interfacing for closed loop
8. PID controller interfacing
9. Stepper motor interfacing with 8051 Micro controller
   (i) full step resolution
   (ii) (ii) half step resolution
10. Modeling and analysis of basic electrical, hydraulic and pneumatic systems and temperature.

Total: 45 Hours

List of Equipments (for a batch of 30 students)

1. Basic Pneumatic Trainer Kit with manual and electrical controls - 1 each
2. Basic Pneumatic Trainer Kit with PLC control - 1 No.
3. HYDROSIM & PNEUMOSIM Software / Automation studio - 10 - 2 sets

07M710 MINI PROJECT

0 0 6 3

(Common to Mechanical and Production)

The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to practical problems.

- The students in convenient groups of not more than 4 members have to take one small item for design and fabrication. Every project work shall have a guide who is the member of the faculty of the institution.

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

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

07M801 INDUSTRIAL ENGINEERING

3 0 0 3

Unit I

Operations Research

Formulation and solution of prototype models of allocation, production and inventory control, scheduling, queuing, replacement and routing. Linear programming problems: simplex method, duality and sensitivity analysis; solution of transportation and assignment problems, CPM and PERT methods.

10 Hours

Unit II

Analysis and Design of Work

Methods of work analysis, including process analysis, activity charts, person machine charts, operation analysis, micromotion study, fundamental hand motions and film analysis. Principles of motion economy, method study, motion and time study, rating factor, performance factor, allowances and standard data. Pre-determined motion time systems. Work sampling. Wage payment. Motivation and work. Wage incentives. Job enrichment. Software available in the field of analysis and design of work.

10 Hours

Unit III

Facilities Planning

Strategic planning, site selection, product, process, schedule, activity relationship and space requirements, personnel requirements. Developing solutions, including material handling systems and equipment, layout and computer aided layout. Functions, including receiving and shipping, storage and warehousing, production, offices and services. Evaluating solutions, including deterministic and probabilistic models. Selection, implementation, and periodical review of the layout.

10 Hours

Unit IV

Production Management

Production systems, including identification of technical, economic, social, human components and characteristics in the system. Forecasting techniques. Inventories, including role, measuring service level, inventory models and their application in distribution and manufacturing. Aggregate planning of production levels and inventories, including master plan, materials requirements planning (MRP), detailed scheduling and sequencing, assembly line balancing. Information and control systems for production operations. Project planning and control.

10 Hours

Unit V

Quality Planning, Control, and Assurance

Basic concepts: planning, measurement, control, and improvement of quality. Economics of quality. Strategic planning of quality. Total quality management. Quality function organization. Motivation for quality. Statistical tools: tests, regression analysis, design and analysis of planned experiments, Taguchi methods, control charts for variables and attributes, capability analysis, acceptance sampling: single, multiple, sequential, elements of reliability. Quality assurance: ISO/QS 9000, suppliers, audits, quality manual, certification.

10 Hours

Total: 50 Hours

Textbooks:

1. O.P. Khanna, "Industrial Engineering and Management", Dhanpat Rai & Sons, New Delhi (2003).
2. Ravi Shankar, "Industrial Engineering and Management", Golgotia Publications Pvt Ltd, New Delhi (2003).

References:

1. Tompkins .J.A. and J.A. White, "Facilities planning ", John Wiley, 1984.
2. Richard Francis .L. and John .A.White, "Facilities Layout and Location ", an anlytical approach, Prentice Hall Inc., 1984.
3. Benjamin .W. Neibel, Motion and time study, Richard .D .Irwin Inc., Seventh Edition, 1982.
4. Barnes,R.M. Motion and Time study,John Wiley,1980.
5. Stephen Konz.,Work design,Publishing Horizon Inc.,Second Edition,1979.

07G008 ORGANIZATIONAL BEHAVIOUR AND MANAGEMENT
(Common to all branches)

3 0 0 3

Unit I

Management and its Environment

Management – definition – functions, evolution of modern management scientific management movement, development of management thoughts, different schools of management, forms of organization – individual ownership – partnership – joint stock companies – cooperative enterprises – public sector undertakings – corporate frame work – share holders – Board of directors – committees –

chief executive – line and functional managers – constraints – environmental – financial – legal – trade unions – technology.

10 Hours

Unit II

Management of Organisation

Planning – nature and purpose – objectives – strategies – policies and planning premises – decision making, organizing – nature and process – premises departmentalisation – line and staff – decentralization – organizational culture, staffing – selection and training – placement – performance appraisal – career strategy – organizational development, leading – managing human factor – motivation, leadership – communication, controlling – system and process of controlling – controlling techniques , productivity and operations management – preventive control, industrial safety.

10 Hours

Unit III

Individual Behaviour

Organizational behaviour – definition – organization – managerial role and functions – organizational approaches, individual behaviour – causes – environmental effect – behaviour and performance, perception – organizational implications, personality – contributing factors – dimension, motivation – need theories – process theories – job satisfaction, learning and behaviour – learning curves, work design and approaches.

10 Hours

Unit IV

Group Dynamics

Group behaviour – groups contributing factors – group norms, communication – process – barriers to communication – effective communication, Leadership – formal and informal characteristics – managerial grid – leadership styles – group decision making – leadership role in group decision, group conflict – types – causes – conflict resolution – inter group relations and conflict, organization centralization – formal and informal – organizational structures, organizational change and development – change process – resistance to change – O.D.programme – culture and ethics.

10 Hours

Unit V

Modern Management Concepts

Management by objectives (MBO) – principles and steps – advantages and disadvantages, management by exception (MBE), strategic management, planning for future direction – SWOT analysis – evolving development strategies, information technology in management – decision support systems – corporate models – business management games – electronic commerce/business, newer concepts – business process reengineering (BPR) – enterprise resource planning (ERP) – supply chain management (SCM) – activity based management (ABM).

10 Hours

Total: 50 Hours

Textbook:

Herold Koontz and Heinz Weihrich, "Essentials of Management", McGraw Hill, New Delhi, 5th edition, 1990.

References:

1. Ernest Dale, "Management Theory and Practice", McGraw Hill Books, 1973.
2. Richard Pettinger, "Mastering Organizational Behaviour", Macmillan Publishers Ltd., 2002.

07M805 PROJECT WORK

0 0 24 12

Project Guide

Every project work shall have a guide who is the member of the faculty of the institution. The guide can be from local industries also (External guide)

Credits
Project work carries 12 credits and 24 conduct hours for library reading, laboratory work, computer analysis or in addition to field/fabrication work. The students will be accessed continuously by conducting at least three seminars and sufficient review meetings as required (40 Marks). One senior faculty member of the department will be coordinating the work done by various project teams.

Project Team
Any student can take an individual project. However the number students in a team are restricted to four.

Project Report
Each student shall produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion. This final report shall be written in the format prescribed for the purpose

Examination
The project work will be evaluated as follows

- Internal examination: Report (50 Marks)
- External examination: Report & Viva (50 Marks).

Note: Prescribed format for Preparation of Project Report to be referred. (Available in the Department)

LIST OF ELECTIVES
ELECTIVES FOR SEMESTER VI

07M001 INTERNAL COMBUSTION ENGINES

3 0 0 3

Unit I
Spark Ignition Engines
Spark ignition Engine- Mixture Requirements - Feedback Control - Carburettors -Fuel Injection systems - Monopoint and Multipoint injection - Stages of combustion - Normal and Abnormal combustion-Factors affecting knock - Combustion Chambers - Introduction to Thermodynamic analysis of S.I. Engine combustion

10 Hours

Unit II
Compression Ignition Engines
States of combustion in C.I. Engine - Direct and indirect injection systems - Combustion chambers - Fuel spray behaviour - spray structure, spray penetration and evaporation - Air motion - Turbocharging - Introduction to Thermodynamic Analysis of C.I. Engine combustion.

10 Hours

Unit III
Pollutant Formation Control
Pollutant - Sources and types - formation of NOx - Hydro-carbon Emission Mechanism - Carbon Monoxide Formation - Particulate emissions - Methods of controlling Emissions- Catalytic converters and Particulate Traps - Methods of measurements.

10 Hours

Unit IV
Alternative Fuels
Bio-fuels: Alcohal, Hydrogen, Natural Gas and Liquefied Petroleum Gas – Properties – Suitability - Engine Modifications - Merits and Demerits as fuels.

10 Hours

Unit V

Recent Trends

Lean Burn Engines - Stratified Charge Engines – Gasoline: Direct Injection Engine - Homogeneous Charge Compression Ignition - Plasma Ignition - Measurement techniques.

10 Hours

Total: 50 Hours

Textbook:

John B. Heywood, "Internal Combustion Engine Fundamentals ", McGraw Hill, 1988.

References:

1. R.B.Mathur and R.P.Sharmal, "Internal Combustion Engines ".
2. Rowland S.Benson and N.D.Whitehouse, " Internal combustion Engines ", Vol.I and II, Pergamon Press, 1983.
3. Duffy Smith, "Auto fuel Systems ", The Good Heart Willox Company, Inc., 1987.

07M002 COMBUSTION ENGINEERING

3 0 0 3

Unit I

Fuels

Types and characteristics of fuels- Determination of properties of fuels- Fuel analysis- Proximate and ultimate analysis- Moisture determination- Calorific value- Gross and net calorific values- Calorimetry- Dulong's formula for CV estimation- Flue gas analysis- Orsat apparatus- Fuel and ash storage and handling- Spontaneous ignition temperatures

10 Hours

Unit II

Solid Fuels

Wood and wood charcoal- Origin of coal-Composition of coal- Analysis and properties of different grades of coal-Preparation and storage of coal- Coal washing- Briqueting Liquid Fuels: Origin of petroleum fuels- Production-Composition-Petroleum refining-various grades of petro products-Properties and testing-Alcohol-Shale oil-Gasification of liquid fuels-Synthetic fuels- Storage and handling of liquid fuels.

10 Hours

Unit III

Classification

Composition and properties- Estimation of calorific value- Gas calorimeter- Rich and lean gas-Wobble index-Natural gas-Dry and wet natural gas- Stripped NG-Foul and sweet NG-LPG-LNG-CNG-Methane-Producer Gas-Gasifiers-Water gas-Town gas-Coal gasification-Gasification efficiency- Non-thermal route-Biogas: Digesters, reactions, viability and economics.

10 Hours

Unit IV

Stochiometry

Mass basis and volume basis- Excess air calculation- Fuel and flue gas compositions- Calculations- Rapid methods-Combustion processes- Stationary flame- Surface or flameless combustion- Submerged combustion- Pulsating and slow combustion- Explosive combustion. Mechanism of combustion- Ignition and ignition energy- Spontaneous combustion- Flame propagation- Solid, Liquid and gaseous fuel combustion- Flame temperature- Theoretical, adiabatic and actual- Ignition limits- Limits of inflammability

10 Hours

Unit V

Type of pollution

Combustion generated air pollution- Effects of air pollution- Pollution of fossil fuels nd its control- Pollution from automobiles and its control.

10 Hours

Total: 50 Hours

Textbook:

S.P.Sharma and Chandamohan (1994), "Fuels and Combustion", Tata McGraw-Hill.

Reference:
1. Samir Sarkar (1992), "Fuels and Combustion", Orient Longman.
2. Civil Davies (1970), "Calculation in Furnace Technology", Pergamon Press.
3. Orbert Edward (1986), "I.C. Engines and Air Pollution", Harper and Row Publishers.
4. A.G. Blokh (1988), "Heat Transfer in Steam Boiler Furnace", Hemisphere Publishing Corporation.

07M003 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

3 0 0 3

(Use of approved design data book is permitted)

Unit I

Purpose Types and Functions of Jigs and Fixtures

Tool design objectives - Production devices - Inspection devices - Materials used in Jigs and Fixtures – Types of Jigs - Types of Fixtures-Mechanical actuation-pneumatic and hydraulic actuation-Analysis of clamping force-Tolerance and error analysis**.**

10 Hours

Unit II

Jigs

Drill bushes –different types of jigs-plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs-Automatic drill jigs-Rack and pinion operated - Air operated Jigs components - Design and development of Jigs for given components**.**

10 Hours

Unit III

Fixtures

General principles of boring, lathe, milling and broaching fixtures- Grinding, planning and shaping fixtures, assembly, Inspection and welding fixtures- Modular fixtures. Design and development of fixtures for given component**.**

10 Hours

Unit IV

Press Working Terminologies and Elements of Dies and Strip Lay Out

Press working terminology-Presses and press accessories-Computation of capacities and tonnage requirements - Elements of progressive combination and compound dies: Die block-die shoe - Bolster plate-punch holder-guide pins and bushes – strippers – knockouts-stops –pilots.

10 Hours

Unit V

Design and Development of Dies

Design and development of progressive and compound dies for Blanking and piercing operations. Bending dies – development of bending dies-forming and drawing dies-Development of drawing dies. Design considerations in forging, extrusion, casting and plastic dies

10 Hours

Total: 50 hours

Textbooks:
1. Edward G Hoffman, "Jigs & Fixture Design", Thomson – Delmar Learning, Singapore 2004
2. Donaldson. C, "Tool Design", Tata McGraw-Hill, 1986

References:
1. Kempster, "Jigs & Fixtures Design", The English Language Book Society", 1978
2. Joshi, P.H., "Jigs & Fixtures", Second Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi 2004
3. Hiram E Grant, " Jigs and Fixture" Tata McGraw-Hill, New Delhi, 2003
4. "Fundamentals of Tool Design", CEEE Edition, ASTME, 1983
5. Design Data Handbook PSG College of Technology, Coimbatore

07M004 COMPOSITE MATERIALS AND MECHANICS

3 0 0 3

Unit I

Introduction to Composites

Fundamentals of composites - need for composites – Enhancement of properties – classification of composites – Matrix – Polymer matrix composites (PMC), Metal matrix composites (MMS), Ceramic matrix composites (CMS) – Reinforcement – Particle reinforced composites, Fiber reinforced composites – Applications of various types of composites.

10 Hours

Unit II

Polymer Matrix Composites

Polymer matrix resins – Thermosetting resins, thermoplastic resins – Reinforcement fibers – Roving , Woven fabrics – Non woven random mats – various types of fibers. PMC processes – – Hand lay up processes – Spray up processes – Compression molding – Reinforced reaction injection molding – Resin transfer molding – Pultrusion – Filament winding – Injection molding. Fiber reinforced plastics (FRP), Glass fiber reinforced plastics (GFRP).

10 Hours

Unit III

Metal Matrix Composites

Characteristics of MMC, Various types of Metal matrix composites Alloys – MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles - fibers. – Effect of reinforcement – Volume fraction – Rule of mixtures – Processing of MMC – Powder metallurgy process – diffusion bonding – stir casting – squeeze casting.

10 Hours

Unit IV

Ceramic Matrix Composites

Engineering ceramic materials – properties, advantages – limitations – Monolithic ceramics – Need for CMC – Ceramic matrix – Various types of Ceramic Matrix composites – oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles – fibers - whiskers. Sintering – Hot pressing – Cold isotatic pressing (CIPing) – Hot isotatic pressing (HIPing).

10 Hours

Unit V

Advances in Composites

Carbon /carbon composites – Advantages of carbon matrix – limitations of carbon matrix -carbon fibre – chemical vapour deposition of carbon on carbon fiber preform – Sol gel technique. Composites for aerospace applications.

10 Hours

Total: 50 Hours

Textbook:

Chawla K.K., “Composite materials”, Springer – Verlag, 1998

References:

1. Clyne T.W. and Withers P.J., “Introduction to Metal Matrix Composites”, Cambridge University Press, 1993.
2. Strong A.B., “Fundamentals of Composite Manufacturing”, SME, 1989.
3. Sharma S.C., “Composite materials”, Narosa Publications, 2000.
4. Mathews F.L. and Rawlings R.D., “Composite materials: Engineering and Science”, Chapman and Hall, London, England, 1st edition, 1994.
5. www.netcomposites.com

07M005 VIBRATION AND CONDITION MONITORING

3 0 0 3

Unit I

Introduction

Review of Fundamentals of Single Degree Freedom Systems – Two Degree Freedom Systems, Multi Degree Freedom System, Continuous system, Determination of Natural frequencies and mode shapes, Numerical methods in Vibration Analysis.

10 Hours

Unit II

Vibration Control

Introduction – Reduction of Vibration at the Source - Control of Vibration – by Structural design – Material Selection – Localized additions – Artificial damping – Resilient isolation, Vibration isolation,Vibration absorbers.

10 Hours

Unit III

Active Vibration Control

Introduction – Concepts and applications, Review of smart materials – Types and Characteristics, Review of smart structures – Characteristics Active vibration control in smart structures.

10 Hours

Unit IV

Condition Based Maintenance Principles and Applications

Introduction - Condition Monitoring Methods - The Design of Information system, selecting methods of monitoring, Machine condition monitoring and diagnosis – Vibration severity criteria – Machine maintenance techniques – Machine condition monitoring techniques – Vibration monitoring techniques – Instrumentation systems – Choice of monitoring parameter.

10 Hours

Unit V

Dynamic Balancing and Alignment of Machinery

Introduction, Dynamic Balancing of Rotors, Field Balancing in one Plane, two Planes, and in several Planes, Machinery Alignment, "Rough" Alignment Methods, The Face- Peripheral Dial Indicator Method, Reverse Indicator Method, Shaft-to-coupling spool method.

10 Hours

Total: 50Hours

Textbook:

Singiresu S. Rao, "Mechanical Vibrations", Addison-Wesley Publishing Company, 1995.

References:

1. K.J. Bathe and F.I., Wilson – "Numerical Methods in Finite Element Analysis" – Prentice Hall of India Pvt. Ltd., New Delhi, 1978.
2. J.O. Den Hartog – "Mechanical Vibrations" – McGraw Hill, Newyork, 1985.
3. Rao, J.S." Vibratory Condition Monitoring of Machines ". CRC Press, 2000.
4. Science Elsevier," Hand Book of Condition Monitoring", Elsevier Science, 1996.

ELECTIVE FOR SEMESTER VII

07M006 ADVANCED CASTING PROCESSES

3 0 0 3

Unit I

Introduction

Introduction to sand casting – Types of sands – Conventional mould making – Jolt machine , Squeeze machine, Jolt and Squeeze machine – Pattern and its types – Allowances – Cores and types – Core making – Sand reclamation – Casting defects – Inspection and testing – Need for special casting processes – applications.

10 Hours

Unit II

Shell Molding

Introduction to the process – Machines – Patterns and materials – Hot coating, warm coating, and cold coating processes – Sand, resin and other materials – Process parameters characteristics of shell mould – castings – Defects and their causes in moulds and cores – Hot box and cold box processes – ABC process – Applications.

10 Hours

Unit III

Investment Casting

Process - Pattern and mould materials – Block mould and ceramic shell mould – Advantages and limitations – Mercast and Shaw process – CLA process – Plaster moulding process – Magnetic molding process – Application**.**

10 Hours

Unit IV

Centrifugal and Die-casting

Centrifugal processes – centrifugal, semi – centrifugal, and centrifuged casting processes -– calculation of rotating speed of the mould – Equipment – Application – Dies for permanent mould castings – Pressure die casting – Types of die casting machines Design considerations for die casting methods – Low pressure die casting.

10 Hours

Unit V

Continuous Casting, CO2 Sand Process, and Full Mould Processes

Reciprocating continuous mould process – Direct chill process – Use of steel, aluminum, brass material in continuous casting – CO2 mould / core hardening process – principles Full mould process – applications – Other special process like squeeze casting and electro slag casting processes.

10 Hours

Total: 50 Hours

Textbooks:

1. P.L.Jain, “Principles of Foundry Technology ", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2006.
2. Howard F. Taylor, Meston C. Fleming & John Wulff, "Foundry Engineering", Wiley Eastern Limited, New Delhi, 1993.

References:

1. Richard W. Heine, Carl R. Loper & Philip C. Rosenthal, "Principles of Metal Casting", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 1997.
2. R. B. Gupta, "Foundry Engineering", India Publications, ND, 1995.
3. N. K. Srinivasan, "Foundry Engineering", Khanna Publishers, New Delhi, 1994.
4. K. P. Sinha & D. B. Goel, "Foundry Technology", Standard Publishers Distributors, Delhi, 1996.
5. P. N. Rao, "Manufacturing Technology - Foundry, Forming and Welding", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2003.
6. P. C. Sharma, "A text book of Production Technology (Manufacturing Processes)", S. Chand & Company Limited, New Delhi, 2003.

07M007 METAL FORMING

3 0 0 3

Unit I

Theory of Metal Forming

Metallurgical aspects of metal forming – slip – twining - mechanics of plastic deformation – effects of temperature – strain rate-microstructure and friction in metal forming – yield criteria and their significance – classification of metal forming processes.

10 Hours

Unit II

Forging and Rolling Processes

Principle-classification – equipment, tooling-processes – parameters and calculation of forces during forging and rolling processes – Ring compression tests – Post forming heat treatment – Defects(cause and remedy) – applications.

10 Hours

Unit III

Extrusion and Drawing Processes

Classification of extrusion processes – tool, equipment and principle of these processes – influences of friction – Extrusion force calculation – Defects and analysis – Rod/wire drawing –tool – equipment and principle of processes defects – Tube drawing and sinking processes – Mannesmann processes of seamless pipe manufacturing.

10 Hours

Unit IV

Sheet Metal forming Processes

Classification – conventional and HERF processes – Presses - types and selection of presses – formability of sheet metals – Principle, process parameters – equipment and application of the following processes – Deep drawing, spinning - stretch forming, plate bending, press brake forming –Explosive forming – electro hydraulic forming – magnetic pulse forming.

10 Hours

Unit V

Recent Advances

Super plastic forming – electro forming – fine blanking – P/M forging – Isothermal forging – high speed – hot forging high velocity extrusion.

10 Hours

Total: 50 Hours

Textbooks:

1. Narayanasamy. R, " Metalworking Technology ", Prentice Hall (1997).
2. Dieter, " Mechanical metallurgy ", Revised Edition 1992.

References:

1. Dieter, "Mechanical metallurgy ", Revised Edition 1992.
2. Nagpal. G.R., " Metal forming processes ", Khanna Publishers, Delhi, 1998.
3. George E. " Dieter-Engineering Design (A mateirals and processing Approach) ", McGraw Hill-Edition II-Univ. of Maryland - 1991.
4. SEROPE KALPAKJIAN, " Manufacturing engineering and Technology ", Edition III - addition - Wesley Publishing Co., 1995.
5. William F. Hosford & Robert M. Caddel, "Metal forming ", (Mechanics & Metallurgy), Prentice Hall Publishing Co., 1990.
6. Sinha and Prasad, "Theory of metal forming and metal cutting ", Dhanpat Rai Pub (p) Ltd. 1999.
7. Rao P.N, "Manufacturing Technology ", TMH Ltd., 1998. (Revised Edition).

07M008 PROCESS PLANNING AND COST ESTIMATION

3 0 0 3

Unit I

Work Study and Ergonomics

Method study – Definition – Objectives-Motion economy – Principles – Tools and Techniques –Applications – Work measurements- purpose – use – procedure – tools and techniques- Standard time –Ergonomics – principles – applications.

10 Hours

Unit II

Process Planning

Definition – Objective – Scope – approaches to process planning – Process planning activities – Finished part requirements - operating sequences- machine selection – material selection parameters – Set of documents for process planning – Developing manufacturing logic and knowledge – production time calculation – selection of cost optimal processes.

10 Hours

Unit III

Introduction to Cost Estimation

Objective of cost estimation – costing – cost accounting – classification of cost – Elements of cost**.**

10 Hours

Unit IV

Cost Estimation

Types of estimates – methods of estimates – data requirements and sources – collection of cost – allowances in estimation**.**

10 Hours

Unit V

Production Cost Estimation

Estimation of material cost, labour cost and over heads – allocation of overheads – Estimation for different types of jobs.

10 Hours

Total: 50 Hours

Textbook:

1. Sinha.B.P., "Mechanical Estimating and Costing", Tata McGraw-Hill, Publishing Co., 1995

References:

1. Phillip.F Ostwalal and Jairo Munez, "Manufacturing Processes and systems", John Wiley, 9th Edition, 1998
2. Russell.R.S and Tailor, B.W, "Operations Management", PHI, 4th Edition, 2003.
3. Chitale.A.V. and Gupta.R.C., "Product Design and Manufacturing", PHI, 2nd Edition,2000.

07M009 HEAT RECOVERY SYSTEM

3 0 0 3

Unit I

Introduction

Introduction - Principles of Thermodynamics - Cycles-Topping -Bottoming – combined cycle - Organic Rankine Cycles – Performance indices of cogeneration systems – waste heat recovery – sources and types – Concept of trigeneration

10 Hours

Unit II

Waste Heat Recovery Systems

Selection criteria for waste heat recovery technologies - Recuperators - Regenerators - economizers - Plate Heat Exchangers - thermic fluid heaters- Waste Heat Boilers- classification, Location, Service Conditions, Design Considerations - fluidized bed heat exchangers - heat pipe exchangers - heat pumps –sorption systems

10 Hours

Unit III

Cogeneration Technologies

Configuration and thermodynamic performance – steam turbine cogeneration systems – gas turbine cogeneration systems –reciprocating IC engines cogeneration systems – combined cycles cogeneration systems – Advanced cogeneration systems: fuel cell, Stirling Engines

10 Hours

Unit IV

Issues and Applications of Cogeneration Technologies

Cogeneration plants electrical interconnection issues – Utility and cogeneration plant interconnection issues – Applications of Cogeneration in utility sector – Industrial sector – building sector – rural sector – Impacts of cogeneration plants – fuel, electricity and environment

10 Hours

Unit V

Economic Analysis

Investment cost – economic concepts – measures of economic performance – procedure for economic analysis – examples – procedure for optimized system selection and design – load curves - sensitivity analysis – regulatory and financial frame work for cogeneration and waste heat recovery systems

10 Hours

Total: 50 Hours

Textbooks:

1. Charles H.Butler, "Cogeneration", McGraw Hill Book Co., 1984.
2. EDUCOGEN – The European Educational tool for cogeneration, Second Edition, 2001

References:

1. Horlock JH, "Cogeneration - Heat and Power, Thermodynamics and Economics", Oxford,1987.
2. Institute of Fuel, London, "Waste Heat Recovery", Chapman & Hall Publishers, London, 1963.
3. Sengupta Subrata, Lee SS EDS, "Waste Heat Utilization and Management", Hemisphere, Washington, 1983.
4. De Nevers, Noel., "Air Polllution Control Engineering", McGrawHill, New York,1995.

07M010 HEAT EXCHANGERS

3 0 0 3

Unit I

Constructional Details and Heat Transfer

Types – Shell and Tube Heat Exchangers – Regenerators and Recuperators – Industrial Applications – Temperature Distribution and its Implications – Analysis of Heat Exchangers – LMTD and Effectiveness method.

10 Hours

Unit II

Flow and Stress Analysis

Effect of Turbulence – Friction Factor – Pressure Loss – Stress in Tubes – Header sheets and Pressure Vessels – Thermal Stresses, Shear Stresses, Types of Failures.

10 Hours

Unit III

Design Aspects

Heat Transfer and Pressure Loss – Flow Configuration – Effect of Baffles – Effect of Deviations from Ideality – Design of Double Pipe, Finned Tube, Shell and Tube Heat Exchangers.

10 Hours

Unit IV

Compact and Plate Heat Exchangers

Types – Merits and Demerits – Design of Compact Heat Exchangers, Plate Heat Exchangers – Performance Influencing Parameters, Limitations.

10 Hours

Unit V

Condensers & Cooling Towers

Design of Surface and Evaporative Condensers – Cooling Tower – Performance Characteristics.

10 Hours

Total: 50 Hours

Textbooks:

1. Ramesh K. Shah, "Fundamentals of Heat Exchanger Design", Wiley 2003
2. Sadik Kakac and Hongton Lu, "Heat Exchangers: Selection, Rating and Thermal Design", Second Edition CRC Press.

References:

1. T. Taborek, G.F.Hewitt and N.Afgan, "Heat Exchangers, Theory and Practice", McGraw-Hill Book Co. 1980.

2. Walker, “Industrial Heat Exchangers” – A Basic Guide, McGraw Hill Book Co. 1980.
3. Nicholas Cheremistoff, “Cooling Towers”, Ann Arbor Science Pub 1981.
4. Arthur. P. Frass, “Heat Exchanger Design”, John Wiley & Sons, 1988.

07M011 INDUSTRIAL ROBOTICS

3 0 0 3

Unit I

Introduction

Introduction to robotics – design of a robot – Robot anatomy – robotics and automation, law of robots, specification of robots, resolution, repeatability and accuracy of manipulator. Classification of robots and justifying the use of robots.

10 Hours

Unit II

Robot Drives and Control and Robot Kinematics

Robot drives, power transmission systems and control, robot drive mechanisms – hydraulic, electrical, pneumatic and mechanical transmissions – Rotary to rotary and rotary to linear conversions – Characteristics of end of arm tooling – Robot Kinematics – Direct and inverse kinematics – Robot trajectories – Control of robot manipulators – Robot dynamics.

10 Hours

Unit III

Robot Sensors and Vision Systems

Sensors – types – tactile sensors, proximity and range sensors, contact and non-contact sensors, velocity sensors, touch and slip sensors, force and torque sensors – Robotic vision systems, imaging components, image representation – picture coding, object recognition and categorization, visual inspection, robot cell, design and control layouts**.**

10 Hours

Unit IV

Robot Programming and Artificial Intelligence and Expert Systems

Robotics programming and languages, programming commands, arm motion, task point diagram, on – line / off-line programming, Economic consideration, robot safety – Robotics and artificial intelligence – basics – Goals of Artificial Intelligence – AI Techniques

10 Hours

Unit V

Robot Applications and Cell Design

Applications for industrial, business and domestic robots – future of robots – Robot work cell design and control – Safety in Robotics – Robot cell layouts – Multiple Robots and machine interference – Robot cycle time analysis

10 Hours

Total: 50 Hours

Textbooks:

1. Mikell P Grover, “Industrial Robots – Technology, Programming and Applications”, McGraw-Hill, NY, USA, 1986.
2. Richard B Klafter., Thomas A Chmielewski and Michael Negin “Roboti Engineering – An Integrated Approach”, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd., 1989.

References:

1. Fu K S, Gonzales R L and Lee C S G., “Robotics: Control, Sensing, Vision and Intelligence”, McGraw Book company, 1987.
2. Yoran Koren., “Robotics for Engineers”, McGraw-Hill, NY, USA, 1980.
3. Antony C, Mc Donald, “Robot Technology”, Englwood Cliffs, NJ, 1986.
4. James A Rehg., “Introduction to Robots”, PHI, 1985.

07M012 DIRECT ENERGY CONVERSION TECHNIQUES

3 0 0 3

Unit I

Introduction

Energy Conversion – Conventional Techniques – Reversible & Irreversible Cycles – Carnot, Stirling & Ericsson – Otto, Diesel, Dual, Lenior, Atkinson, Brayton and Rankine.

10 Hours

Unit II

Direct Conversion of Thermal to Electrical Energy

Thermoelectric Converters – Thermoelectric refrigerator – Thermoelectric Generator – Thermionic Converters – Ferro Electric Converter – Nernst Effect Generator – Thermo Magnetic Converter.

10 Hours

Unit III

Chemical and Electromagnetic Energy to Electrical Energy

Batteries – Types – Working – Performance - Governing Parameters – Hydrogen Energy – Solar Cells.

10 Hours

Unit IV

Energy Storage Systems

Introduction – Storage of Mechanical Energy, Electrical Energy, Chemical Energy, Thermal Energy.

10 Hours

Unit V

Fuel Cells

Basics – Working Advantages & Drawbacks – Types – Comparative Analysis – Thermodynamics & Kinetics of fuel cell process – Performance of fuel cell – Applications.

10 Hours

Total: 50 Hours

Textbooks:

1. B.K. Hogde, "Analysis and Design of Energy Systems", Printice Hall , 1988
2. Begamudre and Rakoshdas, "Energy Conversion Principles".

References:

1. Archie.W.Culp, "Principles of Energy Conversion", McGraw-Hill Inc., (1991), Singapore
2. K.Kordesch, G.Simader, "Fuel Cell and Their Applications", Wiley-Vch, Germany (1996)
3. M.A. Kettari, "Direct Energy Conversion", Addision – Wesley Pub.Co (1997)
4. A.B.Hart and G.J.Womack, "Fuel Cells: Theory and Application", Prentice Hall,
5. Newyork Ltd., London (1989)

07M013 COMPUTATIONAL FLUID DYNAMICS

3 0 0 3

Unit I

Introduction

Impact and applications of CFD in diverse fields - governing equations of fluid dynamics- continuity – momentum and energy - generic integral form for governing equations - Initial and Boundary conditions - Classification of partial differential equations- Hyperbolic, Parabolic, Elliptic and Mixed types - Applications and Relevance.

10 Hours

Unit II

Basic Aspects of Discretization

Discretization techniques- Finite difference, Finite volume and Finite element method- Comparison of discretization by the three methods. Introduction to Finite differences, Difference equations, Uniform and non-uniform grids, numerical errors, Grid independence test and Optimum step size.

10 Hours

Unit III

Grid Generation

Transformation of non-uniform grids to uniform grids, General transformation of the equations - Form of the governing equations suitable for CFD - Compressed grids, Boundary fitted co-ordinate systems- Elliptic grid generation - Adaptive grids - Modern developments in grid generation.

10 Hours

Unit IV

Steady One

dimensional conduction- two and three-dimensional conduction- Steady one-dimensional convection and Diffusion - Transient one-dimensional and two-dimensional conduction- Explicit, Implicit, Crank-Nicolson, ADI scheme- Stability criterion.

10 Hours

Unit V

Representation of the Pressure

Gradient term and continuity equation- Staggered grid- Momentum equations-Pressure and velocity corrections- Pressure Correction equation - Numerical procedure for SIMPLE algorithm - Boundary conditions for the pressure correction method - Stream function- Vorticity method, Discussion of case studies.

10 Hours

Total: 50 Hours

Textbook:

J.D.Anderson, Jr. (1995), "Computational Fluid Dynamics- The Basic with Applications", McGraw-Hill.

References:

1. K.A. Hoffman (1989), "Computational Fluid Dynamics for Engineering", Engineering Education System, Austin, Texas
2. Muralidhar and T.Sundarajan (1995), "Computational Fluid Flow and Heat Transfer", NArosa Publishing House, New Delhi.
3. S.V.Patankar (1994), "Numerical Heat Transfer and Fluid Flow", Hemisphere, New York.
4. T.J. Chung (2003), "Computational Fluid Dynamics", Cambridge University Press.

ELECTIVES FOR SEMESTER VIII

07M014 RAPID PROTOTYPING

3 0 0 3

Unit I

Introduction

Need for time compression in product development, Product development – conceptual design – development – detail design – prototype – tooling.

10 Hours

Unit II

Classification

Classification of RP systems, Stereo lithography systems – Principle – process parameters – process details – machine details, Applications – Direct Metal Laser Sintering (DMLS) system – Principle – process parameters – process details – machine details, Applications.

10 Hours

Unit III

FDM & LOM

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

10 Hours

Unit IV

SGC & 3DP

Solid Ground Curing – Principle – process parameters – process details – machine details, Applications. 3 – Dimensional printers – Principle – process parameters – process details – machine details, Applications, and other concept modelers like thermo jet printers, Sander's model maker, JP system 5, Object Quadra system.

10 Hours

Unit V

LENS & Rapid Tooling

Laser Engineering Net Shaping (LENS), Ballistic Particle Manufacturing (BPM) – Principle – Introduction to rapid tooling – direct and indirect method, software for RP – STL files, Magics, Mimics – Application of Rapid prototyping in Medical field.

10 Hours
Total: 50 Hours

Textbooks:

1. Pham D.T. & Dimov.S.S., "Rapid manufacturing", Springer-Verlag, London, 2001.
2. Amitabha Ghosh, "Rapid Prototyping – A Brief Introduction", Affiliated East –West Press Private Limited, New Delhi, 1997.
3. Donald E. Lacourse, "Handbook of Solid Modeling", McGraw Hill Inc., New York, 1995.
4. Chowiah M.P. (ED), 'Agile Manufacturing', International Conference on agile Manufacturing, Bangalore, Feb. 22-24, 1996, Tata McGraw Hill Pub. Co., Ltd., New Delhi, 1996.
5. Marshall Burns, "Automated Fabrication: Improving Productivity in Manufacturing", PTR Prentice Hall - Englewood Cliffs, New Delhi, 1993.
6. Lamont Wood, "Rapid Automated Prototyping: An Introduction", Industrial Press Inc., New York. Copyright 1993.

Reference:

1. Terry Wohler, "Wohlers Report 2000", Wohlers Associates, USA, 2000
2. Grover, "Automation, Production Systems and Computer Integrated Manufacturing ", Prentice Hall.
3. Kiffe,et al, "Performance Modelling of Automated Manufacturing Systems"
4. Narang V.D.S, "Industrial Automation and Maintanenance"

07M015 RENEWABLE ENERGY SOURCES

3 0 0 3

Unit I

Direct Solar Energy

The sun as a perennial source of energy; flow of energy in the universe and the cycle of matter in the human ecosystem; direct solar energy utilization; solar thermal applications – water heating systems, space heating and cooling of buildings, solar cooking, solar ponds, solar green houses, solar thermal electric systems; solar photovoltaic power generation; solar production of hydrogen.

10 Hours

Unit II

Energy from Oceans

Wave energy generation – potential and kinetic energy from waves; wave energy conversion devices; advantages and disadvantages of wave energy Tidal energy – basic principles; tidal power generation systems; estimation of energy and power; advantages and limitations of tidal power generation Ocean thermal energy conversion (OTEC); methods of ocean thermal electric power generation

10 Hours

Unit III

Other Renewable Forms of Energy

Wind energy – basic principles of wind energy conversion; design of windmills; wind data and energy estimation; site selection considerations. Classification of small hydro power (SHP) stations; description of basic civil works design considerations; turbines and generators for SHP; advantages and limitations. Biomass and bio-fuels; energy plantation; biogas generation; types of biogas plants; applications of biogas; energy from wastes

10 Hours

Unit IV

Geothermal Energy

Origin and nature of geothermal energy; classification of geothermal resources; schematic of geothermal power plants; operational and environmental problems

10 Hours

Unit V

New Energy Sources

Fuel cell; hydrogen energy; alcohol energy; nuclear fusion; cold fusion; power from satellite stations

10 Hours
Total: 50 Hours

Textbooks:

1. John W Twidell and Anthony D Weir, "Renewable energy resources", English Language Book Society (ELBS), 1996

2. Edited by Godfrey Boyle, "Renewable energy – power for sustainable future",Oxford University Press in association with the Open University, 1996
3. S A Abbasi and Naseema Abbasi, "Renewable energy sources and their environmental impact",Prentice-Hall of India, 2001

References:

1. G D Rai, "Non-conventional sources of energy",Khanna Publishers, 2000
2. G D Rai, "Solar energy utilization", Khanna Publishers, 2000

O7M016 CRYOGENIC ENGINEERING

3 0 0 3

Unit I

Fundamentals of Cryogenics

Insight on Cryogenics - Properties of Cryogenic fluids - Material properties at Cryogenic Temperatures - Carnot Liquefaction Cycle - F.O.M. and Yield of Liquefaction Cycle - Inversion Curve – Joule Thomson Effect - Linde Hampson Cycle - Precooled Linde Hampson Cycle - Claudes Cycle Dual Cycle - Helium Refrigerated Hydrogen Liquefaction Systems - Critical Components in Liquefaction Systems.

10 Hours

Unit II

Separation of Cryogenic Gases

Binary Mixtures - T-C and H-C Diagrams - Principle of Rectification - Rectification Column Analysis – McCabe Thiele Method - Adsorption Systems for purification.

10 Hours

Unit III

Cryo-coolers and Cryo-refrigerators

J. T. Cryocoolers - Stirling Cycle Refrigerators -G. M. Cryocoolers - Pulse Tube Refrigerators Regenerators used in Cryogenic Refrigerators - Magnetic Refrigerators

10 Hours

Unit IV

Cryogens Handling

Cryogenic Dewar Constructive and Design, Cryogenic Transfer Lines - Insulations used in Cryogenic Systems - Different Types of Vacuum Pumps - Instrumentation to measure Flow - Level and Temperature.

10 Hours

Unit V

Cryogenics Applications

Applications of Cryogenics in Space Programs – Superconductivity - Cryo Metallurgy - Medical applications.

10 Hours

Total: 50 Hours

Textbook:

Randali F. Barron, "Cryogenic Systems", McGraw-Hill, 1985

References:

1. Klaus D. Timmerhaus and Thomas M. Flynn, "Cryogenic Process Engineering", Plenum Press, New York, 1989.
2. Scott R.B., "Cryogenic Engineering", Van Nostrand and Co., 1962.
3. Herald Weinstock, "Cryogenic Technology", 1969.
4. Robert W. Vance, "Cryogenic Technology", Johnwiley & Sons, Inc., New York, London.

07M017 REFRIGERATION AND AIR CONDITIONING

3 1 0 4

Unit I

Advanced Refrigeration Systems

Multistage and multiple Vapour compression refrigeration systems - cascade system - COP comparison. Advanced Vapor absorption refrigeration system- Single Effect / Double Effect Systems – Types – Analysis – Advanced Cycles .Simulation of Refrigeration Cycles, Flowcharting and programming, Dynamic process simulation,

Optimisation techniques, Principles, Lagrange method, Geometric programming method, Linear programming method, Case studies**.**

10 Hours

Unit II

Refrigeration System Components

Refrigeration Compressors, Different Types, Performance, Capacity Control – Evaporators, Evaporators Circuitry, Applications and Different Types – Condensers, Types, Evaporative Condenser, Optimum Cooling Water Rate and Velocity, Cooling Towers, Range and Approach, Air Washers, Spray Ponds, Natural and Induced Draught System – Expansion Devices.

10 Hours

Unit III

Refrigerants – Refrigeration Controls and Applications

Refrigerants - properties - selection of refrigerants, Alternate Refrigerants, Refrigeration plant controls - testing and charging of refrigeration units. Balancing of system components. Piping System, Valves, Receivers, Oil Trap, Oil Regenerators, Driers and Strainers. Control System of Temperature, Pressure, Oil Flow, Compressor Motor – Protection Devices.

Applications to refrigeration systems - ice plant - food storage plants - milk -chilling plants – refrigerated cargo ships.

10 Hours

Unit IV

Air Conditioning

Climate and its components, Characteristics of Human Metabolic activities with changing climate, the sensation of heat and comfort zone, Design of solar shading devices and Mechanical Ventilation systems Construction Details of Room Air Conditioner – Window Type, Package Type, Split Type Central Units – Air Distribution Devices – Air Circuits – Air Supply System air cleaning and air filters - humidifiers - dehumidifiers - air washers - elementary treatment of duct design - air distribution system. Air Conditioning in Automobiles, Railway Wagons, Marine Vessels, Aircraft and Other Commercial Applications.

10 Hours

Unit V

Cooling load Calculations

Types of loads considered for Air Conditioning - design of space cooling load - heat transmission through building. Solar radiation - infiltration - internal heat sources (sensible and latent) - outside air and fresh air load - estimation of total load - Domestic, commercial and industrial systems - central air conditioning systems. Computerized cooling load calculations – Packages - Simulation of pschrometric processes - Simulation of air flow in AC systems - EER value assessment -Environmental issues in simulation - Computerized exergy calculation

10 Hours

Total: 50 Hours

Textbooks:

1. Arora C.P., "Refrigeration and Air Conditioning", Tata McGraw-Hill New Delhi, 1988.
2. Langley, Billy C., “Refrigeration and Air conditioning” Ed. 3, Engle wood Cliffs (NJ), Prentice Hall, 1986

References:

1. Roy.J Dossat, “Principles of Refrigeration”, Pearson Education 1997.
2. Stoecker N.F and Jones, "Refrigeration and Air Conditioning", TMH, New Delhi, 1981.
3. Manohar Prasad, "Refrigeration and Air Conditioning", Wiley Eastern Ltd., 1983.
4. Hains, J.B. “Automatic Control of Heating & Air conditioning” McGraw-Hill, 1981.
5. Carrier Air conditioning Co., Handbook of Air conditioning systems design, McGraw-Hill,1985

07M018 WELDING TECHNOLOGY

3 0 0 3

Unit I

Basic Joining Processes

Welding – Classification – gas welding – arc welding – shielded metal arc welding, GTAW, GMAW, SAW, ESW-Resistance welding (spot, seam, projection, percussion, flash types) – atomic hydrogen arc welding – thermit welding soldering, brazing and braze welding.

10 Hours

Unit II

Weld Design and Metallurgy

Welding symbols – Positions of welding – joint and groove design – weld stress – calculations design of weld size estimation of weld dilution, heat input, preheat, and post heat temperature –computer applications in weld design. weldability of cast iron, steel, stainless steel, aluminium alloys – effect of gases in welding – fatigue failure in weldments.

10 Hours

Unit III

Special Welding Processes

Electron beam and Laser beam welding – plasma arc welding – stud welding – friction welding – explosive welding – ultrasonic welding – underwater welding – roll bonding-diffusion bonding – cold welding – welding of plastics, dissimilar metals.

10 Hours

Unit IV

Welding Equipment and Automation

Gas welding equipments – welding power sources and characteristics – safety aspects in welding – automation of welding, seam tracking, vision and arc sensing – welding robots.

10 Hours

Unit V

Quality Control in Celding

Defects in welding – causes and remedies – destructive testing methods – NDT of weldments – testing of pipe, plate, boiler, drum, tank- case studies – weld thermal cycle – residual stresses – distortion – relieving of stresses.

10 Hours

Total: 50 Hours

Textbook:

Parmer R.S. " Welding processes & technology ", Khanna Publishers, 1995.

References:

1. Little, " Welding technology ", Tata McGraw Hill, 1992.
2. Lancaster J.F., " Metallurgy of welding ", George Allen and Unwin, 1991.
3. Metals Hand Book, Volume 6, 8th edition, ASM, 1971.
4. AWS welding handbook, Volume 1 to 4 AWS.

07M019 MARKETING MANAGEMENT

3 0 0 3

Unit I

Marketing Process

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

10 Hours

Unit II

Buying Behaviour and Market Segmentation

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

10 Hours

Unit III

Product Pricing and Marketing Research

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

10 Hours

Unit IV

Marketing Planning and Strategy Formulation

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

10 Hours

Unit V

Advertising Sales Promotion and Distribution

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

10 Hours

Total: 50 Hours

Textbooks:

1. Ramasamy and Nama kumari, "Marketing Environment: Planning, implementation and control the Indian context", 1990.
2. Govindarajan. M. "Industrial marketing management", Vikas Publishing Pvt. Ltd, 2003.

References:

1. Philip Kolter, "Marketing Management", Pearson Education 2001.
2. Green Paul.E. and Donald Tull, "Research for marketing decisions", Prentice Hall of India, 1975.
3. Donald S. Tull and Hawkins, "Marketing Research", Prentice Hall of Inida-1997.
4. Philip Kotler and Gary Armstrong "Principles of Marketing" Prentice Hall of India, 2000.
5. Steven J.Skinner, "Marketing", All India Publishers and Distributes Ltd. 1998.

07M020 NANOTECHNOLOGY

3 0 0 3

Unit I

Introduction to Nanomaterials

Amorphous, Crystalline, microcrystalline, quasicrystalline and nanocrystalline materials- historical sevelopment of nano materials-problems in fabrication and characterization of
nano materials.

10 Hours

Unit II

Production of Nanomaterials

Methods of production of nanomaterials, Sol-gel synthesis, Inert gas condensation, Mechanical alloying or high-energy ball milling, Plasma synthesis, and Electrodeposition.

10 Hours

Unit III

Application of Nanomaterials

Applications in Electronics, Chemical, Mechanical engineering industries-Use of nanomaterials in automobiles, aerospace, defence and medical applications – Metallic, polymeric, organic and ceramic nanomaterials.

10 Hours

Unit IV

Nanofabrication and Machining

LIGA, Ion Beam Etching, Molecular Manufacturing Techniques - Nano Machining Techniques, Top/ Bottom up Nano fabrication Techniques, Quantum Materials.

10 Hours

Unit V

Inspection of Nanomaterials

Scanning Probe Microscopy (SPM)- Contact Mode, Tapping Mode, Scanning Tunnelling Mode (STM). Advanced Scanning Probe Microscopy – Electrostatic force Mode (EFM)- Magnetic Force Mode (MFM)- Scanning Thermal Mode (SthM), Piezo Force Mode (PFM). Scanning Capacitance Mode (SCM), Nanoidentation.

10 Hours

Total: 50 Hours

Textbook:

Mark Ratner and Daniel Ratner, "Nano Technology", Pearson Education, New Delhi, 2003.

Reference:

Tlusty J, "Machining Processes and Equipment", 2nd Edn, Prentice Hall, 2000

07M021 VIBRATION ENGINEERING

3 0 0 3

Unit I

Fundamentals of Vibration

Review of Single degree freedom systems – Response to arbitrary periodic Excitations – Duhamel's Integral – Impulse Response function – Virtual work – Lagrange's equation – Single degree freedom forced vibration with elastically coupled viscous dampers – System Identification from frequency response – Transient Vibration – Laplace transformation formulation.

10 Hours

Unit II

Two Degree Freedom System

Free vibration of spring-coupled system – mass coupled system – Vibration of two degree freedom system – Forced vibration – Vibration Absorber – Vibration isolation.

10 Hours

Unit III

Multi-degree freedom system

Normal mode of vibration – Flexibility Matrix and Stiffness matrix – Eigen values and eigen vectors – orthogonal properties – Modal matrix-Modal Analysis – Forced Vibration by matrix inversion – Modal damping in forced vibration – Numerical methods for fundamental frequencies.

10 Hours

Unit IV

Vibration of Continuous Systems

Systems governed by wave equations – Vibration of strings – vibration of rods – Euler Equation for Beams – Effect of Rotary inertia and shear deformation – Vibration of plates.

10 Hours

Unit V

Experimental Methods in Vibration Analysis

Vibration instruments – Vibration exciters Measuring Devices – Analysis – Vibration Tests – Free and Forced Vibration tests. Examples of Vibration tests – Industrial, case studies.

10 Hours

Total: 50 Hours

Textbook:

Rao, J.S., & Gupta, K. – "Ind. Course on Theory and Practice Mechanical Vibration", New Age International (P) Ltd., 1984.

References:

1. Thomson, W.T. – "Theory of Vibration with Applications", CBS Publishers and Distributors, New Delhi, 1990.
2. Den Hartog, J.P, "Mechanical Vibrations," Dover Publications, 1990.
3. Rao, S.S., "Mechanical Vibrations," Addison Wesley Longman, 1995.

07ME022 INDUSTRIAL SAFETY ENGINEERING

3 0 0 3

Unit I

Safety in Process Plants

Hazards analysis - Energy source – Release of hazardous materials – Fires – Types of fires – Fire extinguishers – types and handling. Personal protective equipments – Types – Helmets – Respirator – Air purification – Chemical protective clothing – gloves for heat – electricity and chemical – Eye stakes – Ear marks – Industrial Hygiene – Principles – Health and safety Ergonomics.

10 Hours

Unit II

High Pressure Operations

Pressure vessels – Storage – Handling – Transportation – Storage of liquids and gases under high pressure – Materials of construction – safety precautions. Explosive chemicals – handling and storage – Testing of such chemicals.

10 Hours

Unit III

Hazards in Industries

Engineering control of hazards and accidents due to fire explosion and natural causes in the Industries – Thermal power plant – Atomic power plant – mining industries – Fertilizers – petroleum refinery – Guide lines for setting standards for safe equipments and safe operation in the above industries.

10 Hours

Unit IV

Safety Education

Types of organization – Safety committee – Safety councils – Safety education – First aid – Principles and methods – Training.

10 Hours

Unit V

Industrial Safety Acts

Legal aspects of Industrial safety – Safety measures in factories act – Mines act – pollution control acts for water – air and land – child labour and women employee acts.

10 Hours

Total: 50 Hours

Textbooks:

1. Rolland P. Blake, "Industrial safety" , II Edn.., Prentice Hall Inc . New york, Latest Edition.
2. Willaim Handley Mc, "Industrial Safety Hand book" , II Edn.., – Graw Hill Book Co., U. K. (1977)

References:

1. "Techniques of safety Management" , Dan paterson , II Edn . Mc Graw Hill - Kogakusha , New Delhi (1978)
2. "Occupational Accident Prevention Judson & Brown ", john Wiley , london (1944).
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