MECHANICAL ENGINEERING

I SEMESTER :

COURSE CODE	THEORY/LAB	L	T	P	C
ABM1101	Mathematics-1	4	1	0	4
ABP1101	Physics	4	1	0	4
ABE1101	Environmental Studies	4	0	0	4
AME1101	Basic Workshop Technology	4	1	0	4
ACT1102	Computer Programming through C	4	1	0	4
AME1102	*Engineering Drawing*	0	0	3	2
ACT1103	*Computer Programming Lab*	0	0	3	2
AMT1101	*Engineering Workshop*	0	0	3	2
	Total	**20**	**4**	**9**	**26**

II SEMESTER :

COURSE CODE	THEORY/LAB	L	T	P	C
AHE1101	English	4	0	0	4
ABM1102	Mathematics-II	4	1	0	4
AME1103	Engineering Mechanics	4	1	0	4
ABC1101	Chemistry	4	1	0	4
AEE1136	Basic Electrical Engineering	4	1	0	4
ABP1102	*Physics and Chemistry Lab*	0	0	3	2
AHE1102	*English Language lab*	0	0	3	2
AME1104	*Advanced Engineering Drawing*	0	0	3	2
	Total	**20**	**4**	**9**	**26**

III SEMESTER :

COURSE CODE	THEORY/LAB	L	T	P	C
ABM1105	Probability & Statistics	4	0	0	4
AME1105	Thermodynamics	4	1	0	4
AME1106	Mechanics of Solids	4	1	0	4
AME1107	Material Science & Metallurgy	4	0	0	4
AEC1145	Basic Electronics	4	0	0	4
AME1108	Fluid Mechanics	4	0	0	4
AME1109	*MOS & Metallurgy Lab*	0	0	3	2
AME1110	*Electrical & Electronics Lab*	0	0	3	2
	Total	**24**	**2**	**6**	**28**

IV SEMESTER :

COURSE CODE	THEORY/LAB	L	T	P	C
AME1111	Machine Drawing	2	0	3	4
ABM1108	Numerical Methods	4	1	0	4
AME1112	Hydraulic Machinery & Systems	4	0	0	4
AME1113	Production Technology	4	0	0	4
AME1114	Kinematics of Machines	4	1	0	4
AME1115	Thermal Engineering-1	4	0	0	4
AME1116	*Production Technology Lab*	0	0	3	2
AME1117	*FM & HMS Lab*	0	0	3	2
	Total	**22**	**2**	**9**	**28**

V SEMESTER :

COURSE CODE	THEORY/LAB	L	T	P	C
AHM1101	Managerial Economics and Financial Analysis	4	0	0	4
AME1118	Dynamics of Machinery	4	0	0	4
AME1119	Design of Machine Members-I	4	1	0	4
AME1120	Thermal Engineering-II	4	1	0	4
AME1121	Machine Tools	4	0	0	4
AME1122	Metrology	4	0	0	4
AME1123	Thermal Engineering Lab	0	0	3	2
AME1124	Machine Tools & Metrology Lab	0	0	3	2
	Total	**24**	**2**	**6**	**28**

VI SEMESTER :

COURSE CODE	THEORY/LAB	L	T	P	C
AHM1103	Industrial Management	4	0	0	4
ABM1110	Operations Research	4	0	0	4
AME1125	Design of Machine Members-II	4	1	0	4
AME1126	Heat Transfer	4	1	0	4
AME1127	Instrumentation & Control Systems	4	0	0	4
AME1128	Production Planning & Control	4	0	0	4
AHE1103	Advanced Communication Skills Lab	0	0	3	2
AME1129	Heat Transfer Lab	0	0	3	2
	Total	**24**	**2**	**6**	**28**

VII SEMESTER :

COURSE CODE	THEORY/LAB	L	T	P	C
AME1130	CAD/CAM	4	0	0	4
AME1131	Robotics	4	1	0	4
AME1132	Finite Element Method	4	0	0	4
AME1133	Mechatronics	4	1	0	4
	Elective-I	4	0	0	4
AME1134	Design Optimization				
AME1135	Non-Conventional Sources of Energy				
AME1136	Rapid Prototyping				
AIT1114	Data Structures for Engineering Applications	4	1	0	4
	Elective-II	4	0	0	4
AME1137	Mechanics of Composites				
AME1138	Power Plant Engineering				
AME1139	Project Management				
AME1149	Introduction to Aircraft Systems	4	0	0	4
AME1140	Mechatronics Lab& Instrumentation Lab	0	0	3	2
AME1141	CAD/CAM Lab	0	0	3	2
AME11MP	Industry Oriented Mini-Project	-	-	-	2
	Total	**24**	**2**	**6**	**30**

VIII SEMESTER :

COURSE CODE	THEORY/LAB	L	T	P	C
AME1142	Advanced Machining Process	4	0	0	4
	Elective-III	4	0	0	4
AME1143	Material Handling Equipment				
AME1144	Automobile Engineering				
AME1148	Value Engineering				
AME1150	Fluid Power Systems				
	Elective-IV	4	0	0	4
AME1145	Automation in Manufacturing				
AME1146	Computational Fluid Dynamics				
AME1147	Advanced Mechanics of Solids				
AME1151	Introduction to Aircraft Structures				
AME11SM	Seminar	0	0	3	2
AME11CV	Comprehensive Viva	-	-	-	4
AME11PW	Project work	0	0	9	12
	Total	**12**	**0**	**12**	**30**

SYLLABI FOR I SEMESTER

MATHEMATICS – I

(Common to all Branches)

Course Code : ABM1101

L	T	P	C
4	1	0	4

AIM :

To impart the necessary fundamental principles that are essential to study the core courses of Engineering.

OBJECTIVE :

To motivate and inculcate the logical thinking and methodical approach to solve mathematical problems

UNIT - I

Sequences – Series – Convergence and divergence – Comparison test – Ratio test –Integral test –Alternating series, Leibniz's test
(9.1 to 9.9, 9.12).

Rolle 's theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem –Taylor's theorem and Maclaurin's series (all theorems without proof)
(4.3, 4.4).

UNIT - II

Differential equations of first order (linear, Bernoulli), Linear differential equations with constant coefficients, Method of Variation of parameters .
(11.9, 11.10, 13.1, 13.3-13.8(i), 13.9)

UNIT - III

Applications of Linear differential equations: orthogonal trajectories, Newton's law of cooling, Simple harmonic motion, Oscillatory electrical circuits (LC and LCR circuits).
(12.3, 12.6, 14.2, 14.5)

UNIT - IV

Laplace transform of elementary functions, properties, Transforms of derivatives and integrals – Unit step function – second shifting theorem,

Periodic function.
(21.1-21.5, 21.7-21.11)

UNIT - V

Inverse transform –- Inverse transform of Derivatives and Integrals - Convolution theorem – Application of Laplace transforms to ordinary differential equations, Unit step function, Unit impulse function.
(21.12-21.15, 21.17, 21.18)

UNIT - VI

Partial differentiation: Total derivative, change of variables, Jacobians, Taylor's theorem for functions of two variables, maxima and minima of functions of two variables.
(5.5 – 5.9, 5.11)

UNIT - VII

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear first order (standard type) equations.
(17.1 to 17.3, 17.5, 17.6)

UNIT - VIII

Method of separation of variables – Classification of second order linear Partial Differential Equations, solutions of one dimensional heat equation, wave equation and two-dimensional Laplace's equation under initial and boundary conditions.
(18.1 to 18.7)

TEXT BOOK :

Dr.B.S.Grewal "Higher Engineering Mathematics", 40th Edition, Khanna Publishers

REFERENCES :

1. Kreyszig E, "Advanced Engineering Mathematics", 8th Ed. John Wiley, Singapore (2001)
2. Greenberg M D, "Advanced Engineering Mathematics", 2nd Ed, Pearson Education, Singapore, Indian Print (2003).

PHYSICS

Course Code : ABP1101

L	T	P	C
4	1	0	4

AIM :

To give prerequisites in understanding the advanced Physics leading to applications in engineering field.

OBJECTIVE :

To impart the students the concept and principles in Engineering to enable them to comprehend and take up the experimental work independently.

UNIT - I

VIBRATIONS & ACOUSTICS OF BUILDINGS :

i) Overview of vibrations with emphasis on damped and forced oscillations- resonance, coupled oscillators - two coupled pendulums and normal mode solutions.

(Engineering Physics - Gaur & Gupta Chap - 33, and Unified Physics, Vol-1, S L Gupta & Sanjeev Gupta, Chap-11 (coupled oscillators)

ii) Reverberation and Reverberation time – Sabine's formula for reverberation time – measurement of absorption coefficient of material- Basic requirements of acoustically good hall -Factors affecting the architectural acoustics and their remedies.

(Engineering Physics - Gaur & Gupta Chap - 14)

UNIT – II

PHYSICAL OPTICS :

Interference: Superposition of waves, Young's double slit experiment, Interference in thin films by reflection, Newton's rings experiment with necessary theory.

Diffraction: Fresnel and Fraunhoffer diffraction, Diffraction at single slit and diffraction grating, determination of wavelengths of various spectral lines, resolving power of grating.

Polarization: Types of Polarizations, Brewster's law, Double refraction, Nicol Prism, Polaroid's.

(Engineering Physics - Gaur & Gupta Chap - 26, 27, 28 & 29)

UNIT – III

CRYSTAL PHYSICS & SUPERCONDUCTIVITY :

i) Crystal Physics : Space lattice, basis and crystal structure, Unit cell, primitive cell, Seven crystal systems, Bravais lattices- SC, BCC, FCC crystal structures- crystal planes and Directions- Miller indices, Derivation of inter planar spacing.

(Applied Physics for Engineers - P K Palanisamy Chap - 2)

ii) Superconductivity: superconducting phenomenon, Meissner effect, Type I & Type II Super conductors, BCS theory, DC and AC Josephson effects, SQUIDS, High Temperature Super conductors- Applications.

(Applied Physics for Engineers - P K Palanisamy Chap - 9)

UNIT – IV

QUANTUM MECHANICS :

Dual nature of matter, DeBroglie wave length, Time independent Schrödinger wave equation, Physical significance of wave function, particle in a potential well, rigid and non rigid walls, Tunneling effect

(Applied Physics for Engineers - P K Palanisamy Chap - 3)

UNIT – V

FREE ELECTRON THEORY :

Introduction, Quantum free electron theory, Fermi-Dirac distribution and its dependence on temperature, Fermi energy, Electron scattering and resistance, motion of an electron in periodic potential, Kronig-Penney model (qualitative treatment), effective mass; classification of solids.

(Applied Physics for Engineers - P K Palanisamy Chap - 4 & 5)

UNIT – VI

DIELECTRICS :

Basic definitions, relation between **P,D** and **E** vectors, Polarization mechanisms, expression for electronic polarizability, Internal fields in solids, Claussius-Mosotti equation, frequency and temperature dependence of

electronic polarization, Dielectric strength, Dielectric loss, Loss tangent and Dielectric breakdown, Applications.

(Applied Physics for Engineers - P K Palanisamy Chap - 6)

UNIT – VII

LASERS AND FIBER OPTICS :

i) Introduction, Characteristics of lasers, Induced absorption, spontaneous and stimulated emission of radiation, Population Inversion, Einstein's coefficients, Low and high power Lasers, Ruby laser, He-Ne laser, CO_2 and semiconductor laser, Applications of lasers.

(Applied Physics for Engineers - P K Palanisamy Chap - 10)

ii) Basic principle of propagation of light in optical fibers, Numerical aperture, acceptance angle, Derivation of Numerical aperture, Classification of optical fibers on the basis of refractive index profile, Fiber optic communication system, Applications.

(Applied Physics for Engineers - P K Palanisamy Chap - 2)

UNIT – VIII

FUNCTIONAL MATERIALS :

i) Bio materials, SMART materials, metallic glasses, metal matrix composites, Electrets – piezo and ferro electric matrerials.

(Engineering Physics by V Rajendran, Chap - 21, 24, 25, materials Science - M Armugam - Metal Matrix composites and Electrets, SMART Materials chap -11)

ii) Nanophase materials: Introduction to nano materials, types of nano materials, Fabrication Techniques: ball milling, nano lithography, CVD, carbon nano tubes (CNT's), Applications.

(Engineering Physics M R Sirnivasn, Chap - 15)

TEXT BOOKS :

1. R.K. Gaur and S.L.Gupta, "Engineering Physics", 8th Edition, Dhanpaat Rai, 2003.
2. P.K. Palanisamy, "Applied Physics", 2nd Edition, Scitech Publishers, 2010.

3. M.R. Srinivasan, "Engineering Physics", 1st Edition, New Age Publishers, 2009.
4. V. Rajendran, "Engineering Physics", TMH, 2009.

REFERENCES :

1. C.Kittel, "Introduction to Solid State Physics", 7th Edition, John Wiley, 2007.
2. M Ross, Lowrence, Shepard, J Wulff "Structure and properties of Materials", (Volume-4, Electronic properties), Wiley East Publishers, 2004.
3. Avadhanulu & Kshirasagar, "Engineering Physics", 9th Edition, S. Chand Publishers, 2008.
4. S.O. Pillai, "Solid State Physics", New Age Publishers, 2004.
5. Sulabh. K. Kulkarni, "Nano Technology - Principles and Practices", 2006.
6. V.Raghavan, "Material Science", 5th Edition, PHI, 2007.
7. R.L.Singhal, "Solid State Physics", 6th Edition, Kedarnadh, Ramnadh Publishers, 2003.
8. A. Beiser., "Perspectives in Modern Physics", 5th Edition, McGraw Hill Publishers, 2006.
9. A.J. Dekker, "Electrical Engineering materials", 1st Edition, Mac Millan, 2007.
10. M. Armugam, "Material Science",3rd Edition, Anuradha Publishers, 2009.
11. S.L. Gupta, & Sanjeev Gupta, "Unified Physics", Vol - 1, 16th Edition, Jaiprakash Nath & Co., 2007.

ENVIRONMENTAL STUDIES

Course Code : ABE1101

L	T	P	C
4	0	0	4

AIM :

To create awareness on environmental hazards.

OBJECTIVE :

The student shall acquire knowledge regarding utilization of natural resources, and the imbalance in ecosystems, environmental pollution caused by various practices and safe guards to be taken.

UNIT - I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES : Definition, Scope and Importance – Need for Public Awareness.

UNIT - II

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems -Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - III

ECOSYSTEMS : Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems
(ponds, streams, lakes, rivers, oceans, estuaries)

UNIT - IV

BIODIVERSITY AND ITS CONSERVATION : Introduction - Definition: genetic, species and ecosystem diversity.- Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social,ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a megadiversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, manwildlife conflicts. - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Exsitu conservation of biodiversity.

UNIT - V

ENVIRONMENTAL POLLUTION : Definition, Cause, effects and control measures of :

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT : Causes, effects and control measures of urban and industrial wastes. – Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

UNIT - VI

SOCIAL ISSUES AND THE ENVIRONMENT : From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies - Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. -Wasteland reclamation. -Consumerism and waste products. –Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution)

Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT - VII

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.

UNIT - VIII

FIELD WORK : Visit to a local area to document environmental assets River /forest grassland/hill/mountain -Visit to a local polluted site-Urban/ Rural/industrial/ Agricultural Study of common plants, insects, birds. - Study of simple ecosystems-pond, river, hill slopes, etc.

TEXT BOOKS :

1 Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", University Press, Reprint 2005.

2 R. Rajagopalan, "Environmental Studies", Oxford University Press, 2nd Edn. 2011..

REFERENCE :

1. M. Anji Reddy, B "Textbook of Environmental Sciences and Technology"

BASIC WORKSHOP TECHNOLOGY

Course Code : AME1101

L	T	P	C
4	1	0	4

AIM & OBJECTIVES :

1. To make the student gain fundamental knowledge of basic workshop processes
2. The course has focused on making the student understand the physics of various workshop processes
3. To introduce the concept of workshop job estimates.

UNIT - I

Introduction: Introduction to Basic Manufacturing processes: wood and wood working - foundry practice- sheet metal working - smithy and forging - soldering, brazing and welding - bench work and fitting - machining.

UNIT - II

Wood and wood working: Structure of wood, Grain in wood, seasoning of wood, classification of wood. Carpentry tools - marking and measuring tools, cuttings tools, planes, boring tools, striking tools, and holding tools. Carpentry processes, Marking, Sawing, Planning, Chiseling, Boring, Grooving. Carpentry joints. Wood working Machines.

UNIT - III

Foundry: Introduction - Pattern: materials, types, pattern making tools. Core prints, core boxes, Foundry: moulding tools and equipments, moulding sands, sand additives. Properties of moulding sand. Risers & gates - functions. Preparation sand moulds. Outline of sand casting.

UNIT - IV

Sheet metal working: Introduction - Metals used in sheet metal work. sheet metal hand tools - sheet metal operations - sheet metal joints Hems and seams, sheet metal allowance - sheet metal working machines.

UNIT - V

Smithy and forging: Introduction to black-smithy - operations - types of forging - hand tools and appliances - smith forging operations - examples. forging processes - types - grain flow effects of forging - forged parts Vs. cast parts, defects in forging, advantages and limitation.

UNIT - VI

Soldering, brazing and Welding: Introduction to metal joining process - soldering, brazing and welding - types of welding, Arc welding - Gas welding - welded joints and edge prepations weld defects.

UNIT - VII

Bench work and fitting: Introduction - Vices, Hammers, Chisels, files, Hacksaw marking tools and accessories, drilling operations, taping.

UNIT - VIII

Machining : Introduction - removal of material on lathe -parts of lathe - operations on lathe.

TEXT BOOKS :

1. S.K.Hajra Choudary and A.K. Hajra Choudary "Elements of Workshop Technology, Vol.1 & Vol.2: Manufacturing Processes", Media Promoters and Publishers Pvt. Ltd. 13th Edn. 2007

REFERENCES :

1. B.S. Raghu vanshi "Workshop Technology", Dhanpat Rai & Sons, 13th Edn. 2011.
2. W A J Chapman, "Workshop Technology Vol.-I", 5th Edn. Butterworth-Heinmann, 1972

COMPUTER PROGRAMMING THROUGH C

Course Code : ACT1102

L	T	P	C
4	1	0	4

AIM :

To give the basic idea about programming.

OBJECTIVE :

To make the students capable of programming in high level computer languages as well as applications.

UNIT - I

Algorithm, Flow chart, Program development steps, Basic structures of C Language, C tokens, Data types and sizes, Declaration of variables, Assigning values, Arithmetic, Relational and Logical operators, Increment and decrement operators, Conditional operator, Bitwise operators, Type conversions, Expressions, evaluation, Input output statements, blocks.

UNIT - II

If and switch statements, while, do while and for statements. C programs covering all the above aspects.

UNIT - III

One dimensional and two dimensional arrays, Initialization, String variables declaration, reading, writing, basics of functions, parameter passing, String handling functions.

UNIT - IV

User defined functions, recursive functions, variables and storage classes, scope rules, block structure, header files, C preprocessor, Example C Programs.

UNIT - V

Pointers and arrays: Pointers and addresses, Pointers and arrays, Pointers and function arguments, address arithmetic, character pointers and functions

UNIT - VI

Pointers to pointers, multi-dimensional arrays, initialization of pointer arrays, command line arguments, pointers to functions, function pointers.

UNIT - VII

Structure definition, initializing, assigning values, passing of structures as arguments, arrays of structures, pointers to structures, self reference to structures, unions, type-defs, bit fields, C program examples.

UNIT - VIII

Console and file-I/O: Standard I/O, Formatted I/O, Opening and closing of files, I/O operations on files, command line arguments.

TEXT BOOKS :

1. Herbert Schild, "Complete Reference Using C", 4th Edition, Tata McGraw Hill, 2009.
2. Yashawanth Kanethkar, "Let us C", 9th Edition, BPB Publishers, 2009.

REFERENCES :

1. B.A.Fouruzan and R.F.Gilberg, "Computer Science, A structured Programming Approach using C", 3rd Edition, Thomson Publishers, 2008.
2. B.W.Kerninghan and Dennis M. Ritche, "C Programming Language", 2nd Edition, Pearson Education, 2009.
3. Stephen G.Kochan, "Programming in C" 3rd Edition, Pearson Education, 2005.
4. N. B. Venkateswarlu, E. V. Prasad, "C & Data structures", 1st Edition, S. Chand Publications, 2002.

ENGINEERING DRAWING

Course Code : AME1102

L	T	P	C
0	0	3	2

AIM & OBJECTIVES :

1. To make the student familiar to the drawing practices and convention
2. To familiarize the student about various engineering curves used in industry
3. To enable the student draft simple engineering components.

LIST OF EXERCISES

1 Introduction to Engineering drawing & basics of Geometrical construction

2 Construction of parabola, ellipse, hyperbola

3 Construction of Involutes and Cycloidal curves

4 Projections of points and lines inclined to one plane

5 Projections of lines inclined to both the planes

6 Projections of planes in simple positions, planes inclined to one plane

7 Projections of planes inclined to both the planes

8 Demonstration & Practice: Computer aided drafting of lines, planes and dimensioning

9 Projections of solids in simple positions

10 Projections of solids inclined to both the planes

11 Isometric projections

12 Demonstration & Practice: Computer aided drafting of solids and dimensioning.

TEXT BOOKS :

1. N.D. Bhatt, V.M. Panchal, "Engineering Drawing", Charotar Publication House, 49th Edition, 2008.

2. R.B. Choudary "Engineering graphics with Auto CAD", Anuradha Publishes

3. Trymbaka Murthy, "Computer Aided Engineering Drawing", I.K. International, 3rd Edn. I.K. International, 2007

COMPUTER PROGRAMMING LAB

Course Code : ACT1103

L	T	P	C
0	0	3	2

AIM :

To give basic knowledge with practical orientation of programming language.

OBJECTIVE :

To train the students to write programmes in C language for different applications.

LIST OF PROGRAMMES :

1. To write C programs for the following
   a) Sum of individual digits of a positive integer.
   b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1.Subsequent terms are found by adding the preceding two terms in the sequence. Write a c program to generate to generate the first n terms of the Fibonacci sequence.

2
   a) To write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user
   b) To write a C program to calculate the following sum:
   Sum=$1+x^2/2!+x^4/4!$ ———————— upto given 'n' terms.
   c) To write a c program to find the roots of a quadratic equation.

3. To write C programs that uses both recursive and non-recursive functions
   i) To find the factorial of a given number.
   ii) To find the GCD(greatest common divisor) of two given integers.
   iii) To solve Towers of Hanoi problem.

4. The total distance traveled by vehicle in 't' seconds is given by distance=ut+1/2at^2 where 'u' and 'a' are the initial velocity (m/sec) and acceleration (m/sec^2). Write a C program to find the distance traveled at regular intervals of time given values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.
5. Using switch-case statement, write a C program that takes two operands and one operator from the user, performs the operation and then prints the answer. (consider operators +, -, *, and %).
6. Write a C program to find the largest and smallest number in a list of integers.
7. Write a C program that uses functions to perform the following
   a. Addition of Two Matrices
   b. Multiplication of Two Matrices
8. Write a C program that uses functions to perform the following operations
   a. To insert a sub-string in to given main string from a given position
   b. To delete n characters from a given position in given string.
9. Write a C program to determine if the given string is a palindrome or not.
10.
    a) Write a C program that displays the position or index in the string S where the string T begins, or -1 if S does not contain T.
    b) Write a C program to count the lines, words and characters in a given text.
11. To write a C program
    a) to generate Pascal's triangle
    b) to construct a pyramid of numbers

12. To write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression $1+x+x^2+x^3+\ldots x^n$
For example : if n is 3 and x is 5, then the program computes 1+5+25+125. print x,n, the sum.

    Perform error checking. For example the formula does not make sense for negative

    Exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the nest pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too..

13. To write a C program
    a) to find the 2's compliments of a binary number.
    b) to convert a Roman numeral to its decimal equivalent

14. To write a C program that uses functions to perform the following operations
    a. Reading a complex number
    b. Writing a complex number
    c. Addition of 2 complex numbers
    d. Multiplication of 2 complex numbers
    (Note: represent complex number using a structure)

15. To write a C program
    a) to copy the contents from one file to another.
    b) to reverse the first n characters in a file.

    (Note: the file name and n are specified on the command line)

    c) to fine the no. of characters, no. of words, no. of lines in a given file.

16. To implement the algorithms for the below given iterative methods using C to find one root of the equation f(x)=x sinx + cosx=0

    a) Bisection b) False Position c) Newton-Raphson
    d) Successive approximation

17. To write C programs to implement the Lagrange interpolation
18. To implement the Newton- Gregory forward interpolation using C language.
19. To implement in C the linear regression algorithm.
20. To implement in C the polynomial regression algorithm.

TEXT BOOKS :

1. P. Dey & M. Ghosh, "Programming in C", Oxford Univ. Press
2. E. Balaguruswamy, "C and Data Structures", TMH publications
3. P. Padmanabham, "C Programming and Data Structures", 3rd Edition, BS publications.
4. M.K. Jain, S.R.K. Iyengar & R.K. Jain, "Numerical Methods for Scientific and Engineering Computation", New Age International Publishers.
5. Aitkinson & Han, "Elementary Numerical Analysis", Wiely India, 3rd Edition 2006.

ENGINEERING WORKSHOP

Course Code : AMT1101

L	T	P	C
0	0	3	2

AIM :

To provide hands on experience on basic Engineering and IT related skills.

OBJECTIVES :

* To train the student in the basics of computer components, maintenance, software(s) installation and office tools.
* To demonstrate and train the students in basic professional trades.

COMPULSORY EXERCISES :

- Identification of the peripherals of a computer, components in a CPU and its functions - Block diagram of the CPU along with the configuration of each peripheral. Disassembly and assembly of a personal computer.
- Installation of MS windows on the personal computer.
- One lamp controlled by a one-way switch and (b) Two-way switching for stair-case lamp

ANY NINE EXERCISES FROM THE FOLLOWING :

- **Carpentry**: Making a Cross-half lap joint using wooden pieces
- **Carpentry**: Making a Mortise and Tenon joint using wooden pieces
- **Fitting**: Preparation of a V-fit between mild steel flat pieces
- **Fitting**: Preparation of a Square-fit between mild steel flat pieces
- **Foundry**: Preparation of a sand mould using a single piece pattern
- **Foundry**: Preparation of a sand mould using a split piece pattern

- **Tin-Smithy**: Preparation of a sheet metal pipe-joint using tin-smithy tools
- **Tin-Smithy**: Preparation of a sheet metal funnel using tin-smithy tools
- **Welding**: Making a Lap joint through arc welding
- **Lathe Machine**: Demonstration of turning related activities on Lathe machine
- **Black smithy**: Demonstration of Black smithy trade
- **Plumbing**: Demonstration of Plumbing trade
- **Installation of Linux** on the computer wherein the windows was installed. The system should be configured as dual boot with both windows and Linux.
- **Hardware Troubleshooting :** Identification of the problem of a PC which does not boot (due to improper assembly or defective peripherals) and fixing it to get the computer back to working condition.
- **Software Troubleshooting :** Identification of the problem of a malfunctioning CPU (due to some system software problems) and fixing it to get the computer back to working condition.
- **Connectivity Boot Camp : C**onnectivity to the Local Area Network and accessibility to the Internet. TCP / IP setting.
- **Web Browsers, Surfing the Web : C**ustomization the web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
- **Using LaTeX and / word : C**reation of project certificate. Exposure to features like:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and / Word.
- **Creating project abstract :** Features to be covered are: Formatting Styles, Inserting table, Bullets and Numbering,

Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

- **Creating a Newsletter** : Features to be covered are : Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs
- **Creating a Feedback form** - Features to be covered are: Forms, Text Fields, Inserting objects, Mail Merge in Word.
- **Excel Orientation : Introduction of** Excel as a Spreadsheet tool, Using Excel –Accessing, overview of toolbars, saving excel files, Using help and resources
- **Creating a Scheduler -** Features to be covered are: Gridlines, Format Cells, Summation, auto fill, Formatting Text
- **Calculating GPA** - Features to be covered:- Cell Referencing, Formulae in excel – average, standard deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP
- **Performance Analysis** - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting
- **Power point presentation**
- Exposure to basic power point utilities and tools (PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Power point, Hyperlinks, inserting Images, Clip Art, Audio, Video, Objects, Tables, Charts) .to create basic power point presentation.

SYLLABI FOR II SEMESTER

ENGLISH

Course Code : AHE1101

L	T	P	C
4	0	0	4

Reading and Writing skills

OBJECTIVES :

The primary objective of the course is to help students of engineering to achieve a sound foundation in communicational skills, basic grammar and vocabulary. It also enables them to become successful communicators in academic, professional and social areas of life.

The course aims to enable the students to use English effectively for the purpose of

- Understanding class room lectures in different subjects
- Reading technical and general materials
- Effective written communication in professional contexts

OUTCOMES :

- The learners develop adequate skills in skimming, scanning, intensive and extensive reading
- The learners also develop enough vocabulary to be clearly expressive in any group - Professional or Managerial or Social
- The learners can correspond and communicate in descriptive, analytical modes with ease.

COURSE WORK :

To achieve the above objectives, instruction will be imparted through relevant ESP materials, articles from newspapers, technical journals, magazines, industry materials etc. in classes and laboratory. Students will be given individual and holistic practice in LSRW skills.

Contents :

Reading :

- Reading with a purpose; Reading for understanding; skimming, scanning etc;
- Reading and interpreting charts and diagrams
- Vocabulary, synonyms, antonyms, prefixes, suffixes, confusables, one-word substitutes etc.

Writing :

- common errors, articles, prepositions, tenses, concord, phrasal verbs, modals, conditionals etc. (Remedial Grammar)
- Practice of writing- definition, description
- Paragraph writing with coherence, cohesiveness and clarity
- Essay, report and précis writing

Reference skills **:** Use of dictionary, thesaurus, library and internet materials.

UNIT - I

1. Around the House *(Language in Use)*
2. Education on Education *(English for Engineers)*

UNIT - II

1. On Holiday *(Language in Use)*
2. Vocabulary- synonyms, antonyms, prefixes, suffixes, confusables, one-word substitutes etc.

UNIT - III

1. Imagining *(Language in Use)*
2. Tenses & Concord, Articles & Prepositions

UNIT - IV

1. New Information Technology and Poverty Eradication (English for Engineers)
2. The media (Language in Use)

UNIT - V

1. What we must Learn from the West *(English for Engineers)*
2. Paragraph writing, Note-making and Minute writing

UNIT - VI

1. Essay writing
2. Value added Life *(English for Engineers)*

UNIT - VII

1. Breaking the Law *(Language in Use)*
2. Key item *(English for Engineers)*

UNIT - VIII

1. Letter and Précis writing
2. Dialogue writing

TEXT BOOKS :

1. "Language in Use(Intermediate)", Cambridge University Press India Pvt. Ltd.- Reprint-2008.
2. "English for Engineers", Regional Institute of English, Bangalore, Foundation Books Pvt. Ltd, 2006.

REFERENCES :

1. Eric H. Glendinning & Beverly Holmstorm,"Study reading- A course in reading skills for academic purposes"-CUP , 2004.
2. Liz Hamp Lyons, Ben Heasley, "Study writing", CUP, 2004.
3. Norman Lewis, "Word Power Made Easy", Lotus Press, 2006.
4. Michael Swan, "Practical English Usage", Oxford University Press, 3rd Edition, 2005.
5. Murphy "Murphy's English Grammar", CUP, 3rd Edition, 2004.

SUGGESTED READING : Stories of humour, adventure, mystery and autobiographies of eminent scientists.

MATHEMATICS – II

(Common to all Branches)

Course Code : ABM1102

L	T	P	C
4	1	0	4

AIM :

To impart the necessary fundamental principles that are essential to study the core courses of Engineering

OBJECTIVE :

To motivate and inculcate the logical thinking and methodical approach to solve mathematical problems

UNIT - I

Matrices: Rank – Normal form - Echelon form – Consistency – Solution of system of simultaneous linear homogeneous and non-homogeneous equations.(Gauss Jordan)

(2.8, 2.11)

UNIT - II

Eigen values, Eigen vectors – properties – Cayley-Hamilton Theorem (only statement) - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonalisation of matrix. (2.14-2.17)

UNIT - III

Quadratic forms - Linear Transformation - Orthogonal Transformation. Reduction of quadratic form to canonical form, Nature of the quadratic form.

(2.12, 2.18 , 2.19).

UNIT - IV

Double and triple integrals, Change of order, change of variables

(7.1 – 7.3 , 7.5, 7.7).

UNIT - V

Vector Differentiation**:** Differentiation of vectors, Scalar and Vector point functions. Gradient of a scalar field and directional derivatives- Divergence and curl of a Vector field and it's physical interpretation.

(8.1, 8.4 – 8.8)

UNIT - VI

Vector Integration - Line integral – -Circulation-work done - surface and volume integrals Vector integral theorems: Green's theorem- Stoke's and Gauss's Divergence Theorem (Without proof). Verification of Green's - Stoke's and Gauss's Theorems. (8.10 – 8.17)

UNIT - VII

Fourier series: Euler's formulae, Conditions for Fourier expansion, Change of interval, even and odd functions, half range series.

(10.1 – 10.7)

UNIT - VIII

Fourier integral theorem – Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – Finite Fourier transforms.

(22.1 – 22.4)

TEXT BOOK :

1. Dr.B.S.Grewal "Higher Engineering Mathematics", 40th Edition, Khanna Publishers

REFERENCES :

1. Kreyszig E, "Advanced Engineering Mathematics", 8th Ed. John Wiley, Singapore, 2001.
2. Greenberg M D, "Advanced Engineering Mathematics", 2nd Ed, Pearson Education, Singapore, Indian Print, 2003.

ENGINEERING MECHANICS

Course Code : AME1103

L	T	P	C
4	1	0	4

AIM & OBJECTIVES :

1. To develop logical thinking approach to engineering problems.
2. Calculation and estimation of fourses developed in various engineering structures.

UNIT - I

SYSTEMS OF FORCES : Introduction – parallelogram law – Forces and components - Resultant of coplanar concurrent forces - component forces in space - vector notation – moment of force – principle of moments – couples. Resultant of planar force systems and spatial concurrent force system.

UNIT - II

EQUILIBRIUM OF FORCE SYSTEMS : Equilibrium – free body diagrams – Equations of equilibrium – equilibrium of planar systems – graphical methods and analytical methods for equilibrium of planar systems – equilibrium of spatial concurrent force systems.

UNIT - III

FRICTION: Introduction – Theory of friction – Angle of friction – Laws of friction - static friction – Kinetic friction-friction in bodies moving up or down on an inclined plane-screw friction and screw jack.

UNIT - IV

CENTROIDS AND CENTERS OF GRAVITY : Centre of gravity – centroids of area and lines – determination of centroids by integration – centroids of composite figures – theorems of Pappus.

UNIT - V

AREA MOMENT OF INERTIA : Moment of inertia – polar moment of Inertia – Radius of gyration - Transfer theorem for moment of Inertia – Moment of inertia of composite areas – product of inertia – Transfer formula for product of Inertia.

MASS MOMENT OF INERTIA : Moment of inertia of masses – Radius of gyration – Transfer formula for mass moment of inertia – Mass moment of Inertia by Integration.

UNIT - VI

KINEMATICS : Rectilinear motion-curvilinear motion - Rectangular components of curvilinear motion - Normal and Tangential components of acceleration, Radial and transverse components - Kinematics of rigid bodies - angular motion – fixed axis rotation – Definition and analysis of plane motion.

UNIT - VII

KINETICS: Kinetics of rigid bodies – equation of planes motion – fixed axis rotation – rolling bodies (simple examples) - general plane motion (Simple examples).

UNIT - VIII

WORK ENERGY METHODS : Work energy equations for translation – applications to particle motion – connected systems – fixed axis rotation (Simple cases)

TEXT BOOKS :

1. I.B. Prasad, "Applied Mechanics", Khanna Publishers, 19th Edition, 2009.
2. Ferdinand L. Singer, "Engineering Mechanics", Harper Collins Publishers India, 3rd Edition, 2008.

REFERENCES :

1. Irving. H. Shames, "Engineering Mechanics", PHI Publishers, 4th Edition, 2008.
2. Timoshenko & Young , "Engineering Mechanics", MGH Publishers, 4th Edition, 2010.
3. A.K. Tayal, "Engineering Mechanics", Umesh Publishers, 13th Edition, 2008.
4. K.L. Kumar, "Engineering Mechanics", TMH Publishers, 3rd Edition, 2009.

CHEMISTRY

Course Code : ABC1101

L	T	P	C
4	1	0	4

AIM :

The aim of the course is to provide basic chemistry background required for under graduate students of engineering.

OBJECTIVE :

The Objective of the course is to provide an over view of chemical properties of materials which the engineers are likely to use during their professional careers.

UNIT - I

ELECTROMOTIVE FORCE : Electrode potential, Nernest equation, EMF of electro chemical cell, calculation of cell potential, concentration cell, determination of P^H of solution.

BATTERIES - primary cell-Dry or Lachanche cell, alkaline battery; secondary cells (storage batteries or accumulators) – Lead-acid Accumulator, Nickel-cadmium battery.and lithium ion battery.

Fuel cells - hydrogen, oxygen fuel cell, phosphoric acid fuel cell, solid oxide fuel cells.

UNIT - II

CORROSION AND ITS CONTROL : Introduction-Dry or chemical corrosion, Wet or Electrochemical corrosion-Hydrogen evolution type, oxygen absorption type, Galvanic corrosion and concentration cell corrosion, pitting ,waterline, and stress corrosion; passivity; Galvanic series; factors influencing corrosion. Corrosion control-proper designing, cathodic protection, modifying the environment and using inhibitors. Protective coatings- anodic and cathodic coatings; Hot dipping-Galvanizing and Tinning, Metal cladding; Electroplating; Electro less plating; cementation or diffusion coatings.

UNIT - III

CHEMICAL KINETICS : Arrhenius theory-effect of temperature on reaction rates –concept of activated complex; collision theory of reaction rates; Lindeman's theory of unimolecular reactions, steady state approximation; Transition state theory.

UNIT - IV

BONDING IN COORDINATION COMPOUNDS : Valence bond theory- limitations, crystal field theory, ligand field theory- octahedral and tetrahedral complexes. Spectral properties of d^1 ions & magnetic properties of low spin and high spin complexes.Molecular orbital theory as applied to octahedral complexes not involving pi-bonding.

UNIT - V

PRINCIPLES AND MECHANISMS OF ORGANIC REACTIONS : Bond fission – homolysis and heterolysis-examples. Types of reagents-electrophilic and nucleophilic reagents -examples. Concept of aromaticity, Huckel's (4n+2) rule. Introduction to mechanistic aspect of electrophilic aromatic substitution- nitration, sulphonation. Friedel-Crafts alkylation and acylation.

UNIT - VI

POLYMER SCIENCE AND TECHNOLOGY : Nomenclature; Types of polymerization, Mechanism of addition and condensation polymerization, Effect of polymer structure on properties. Plastics- Thermo and thermosetting plastics, constituents of a plastic. Preparation, properties and uses of polythene, PVC, Teflon, nylons-6,6, bakelite and silicones.
RUBBER - Natural rubber-structure-vulcanization, compounding of rubber; synthetic rubbers-Buna-Sand Buna-N.

UNIT - VII

SEMI CONDUCTING MATERIALS : Band theory of solids, Types-Intrinsic, extrinsic,(n-type, p-type,) non-elemental semi conducting materials- stoichiometric semi conducting compounds, defect semiconductors, controlled valency semiconductors. Preparation of semiconductors- Zone refining, Czochralski crystal pulling technique, Doping technique.

UNIT - VIII

CHEMISTRY OF ENGINEERING MATERIALS :

Cement - classification; Portland cement- raw materials, manufacture of Portland cement, chemical constitution of Portland cement, setting and hardening of Portland cement.

REFRACTORIES - Classification and properties of refractories

FUELS - classification; calorific value and its determination using Bomb and Junker's gas calorimeter, theoretical calculation of calorific value-Proximate and ultimate analysis of coal; Refining of petroleum-, catalytic cracking; catalytic reforming, knocking, octane rating, improvement in anti knock characteristics, unleaded petrol; diesel engine fuels, cetane value

LUBRICANTS - Friction- mechanism of lubrication-Fluid film lubrication; thin or boundary lubrication and extreme pressure lubrication, classification-Lubricating oils, greases and solid lubricants.

TEXT BOOKS :

1. A text book of Engineering Chemistry by Jain& Jain, Dhanapat Roy publishing company, 15th Edition, 2006.
2. Engineering chemistry by Shiva Shankar, Tata Mc Graw Hill, 2008.

REFERENCES :

1. Sashi chawala, "Engineering Chemistry", Dhanpath Rai Publications, 3rd Edition, 2010.
2. C. Parameswara Murthy, C.V. Agarwal and Andhra Naidu, "A Text Book of Engineering Chemistry", B.S. Publications, 1st Edition, 2006.
3. J.D.Lee, "Concise inorganic Chemistry", Black well science publications, 5th Edition, 2005.
4. Arun Bahl & B.S.Bahl, "Advanced organic chemistry", S.Chand Publications, 2010.
5. Gurudeep Raj, "Physical chemistry", Goel Publications, 3rd Edition, 2007.
6. S.S. Dara, "Text book of Engineering Chemistry", S. Chand Publications, 11th Edition, 2006.

BASIC ELECTRICAL ENGINEERING

Course Code : AEE1136

L	T	P	C
4	1	0	4

AIM :

The aim of the course is to teach the Basic Fundamentals of Electrical Engineering.

OBJECTIVES :

Basic Electrical Engineering is a basic fundamental course for the disciplines of CSE and IT. Hence it is introduced in I-Year –I Sem so that the students will have to understand the topics related to Electrical Applications in the later studies.

UNIT - I

INTRODUCTION TO ELECTRICAL ENGINEERING : Introduction, SI units, charge & current, voltage, power & energy, circuit elements. Ohm's law, Nodes, Branches & Loops, Kirchoff's laws, series resistors and voltage division, parallel resistors and current division(simple problems).

UNIT - II

DC CIRCUITS : Wye–Delta transformation, source transformation, super position, Thevenin's, Norton's, Maximum power transfer theorems (simple problems).

UNIT - III

MAGNETIC CIRCUITS : Magnetic field due to Electric current, force on current carrying conductor, Electro Magnetic Induction, Direction of Induced EMF's, EMF induced in a coil, comparison of electric, magnetic circuits, self and mutual inductance.

UNIT - IV

AC CIRCUITS : Introduction, Capacitors, series and parallel capacitors, Inductors, series, parallel inductors, sinusoids, Phasors, phasor relationships for circuit elements, impedance, admittance, instantaneous and average power, RMS values, apparent power, power factor, complex power.

UNIT - V

TRANSFORMERS : Working Principle, construction, types, rating, induced EMF, ideal transformer,magnetizing and core loss current, voltage regulation, efficiency (simple problems), Auto transformer (elementary treatment only).

UNIT - VI

DC MACHINES : Constructional features, emf and torque, DC machine excitation, characteristics of DC motors and speed control, losses, efficiency (simple problems), (elementary treatment only).

UNIT - VII

AC MACHINES

SYNCHRONOUS MACHINE : Constructional details, EMF equation, determination of synchronous reactance, voltage regulation (simple problems), Principle of operation of a synchronous motor.

INDUCTION MOTOR : Constructional details, principle of operation, slip, rotor frequency, torque equation (simple problems) (Elementary treatment only).

UNIT - VIII

BASIC INSTRUMENTS : Introduction, classification of Instruments, operating Principles, Basic requirements for measurement, Moving Coil Permanent Magnet (PMMC) instruments, Moving Iron of Ammeters and Voltmeters (elementary treatment only).

TEXT BOOKS :

1. Charles k Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric circuits", McGraw-Hill Companies. (Units 1,2,4)
2. D.P. Kothari & I.J. Nagrath, "Theory and Problems of basic Electrical Engineering" - PHI (Units 3, 5, 6, 7, 8)

REFERENCE :

1. I Mckenzie Smith, Hughes, "Electrical & Electronic Technology", Pearson Education.

PHYSICS AND CHEMISTRY LAB

Course Code : ABP1102

L	T	P	C
0	0	3	2

AIM :

To give prerequisites to understand the advanced Physics & Chemistry leading to applications in engineering field.

OBJECTIVES :

Training the students to understand the principles and concepts helpful in performing experiments in laboratory classes individually. To mould them to solve any technical problem in general.

LIST OF PHYSICS EXPERIMENTS

Any **SIX** of the following experiments are to be performed during the semester

01. Determination of rigidity modulus of the material of a given wire– Torsional pendulum
02. Verification of laws of vibration of stretched string - Sonometer
03. Determination of radius of curvature of a given convex lens - Newton's rings
04. Determination of wavelength of spectral lines of a mercury spectrum - Diffraction grating
05. Study of frequency response of LCR series and parallel resonant circuits
06. Study of variation of magnetic field along a circular current carrying conductor – Stewart & Gee apparatus
07. Determination of Hall coefficient and carrier concentration - Hall effect

08. Study of I-V characteristics of a solar cell
09. Optical Fibers – Determination of numerical aperture and losses in fibers
10. Measurement of dielectric constant of material by Waveguide method

LIST OF CHEMISTRY EXPERIMENTS

Any **SIX** of the following experiments are to be performed during the semester.

1. Preparation of standard potassium dichromate and determination of ferrous iron.
2. Determination of hardness of water by EDTA method.
3. Determination of dissolved oxygen in water.
4. Determination of chlorides in water.
5. Determination of iron-II by potentiometric method.
6. Determination of viscosity of lubricant by viscometer.
7. Determination of flash and fire points of oils.
8. Determination of percentage residue of carbon in oils.
9. Determination of calorific value of solid fuels.
10. Colorometric determination of iron in cement.

REFERENCES :

1. J.Mendham Et.al., "Vogel's text book of Quantitative Chemical Analysis", 6th Edn. Pearson Education.
2. Dr. K. B. Chandrasekhar, "Chemistry practical lab manual".
3. K.Sudha Rani, "Laboratory Manual on Engineering Chemistry"

ENGLISH LANGUAGE LAB

Course Code: AHE1102

L	T	P	C
0	0	3	2

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

OBJECTIVES :

- To make students recognise the sounds of English through Audio-Visual aids and Computer Software.
- To help them overcome their inhibitions and self- consciousness while speaking in English and to build their confidence. *The focus shall be on fluency rather than accuracy.*
- To enable them to speak English correctly with focus on stress and intonation.

SYLLABUS :

The following course content is prescribed for the **English Language Laboratory** sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues / Role Play.
4. Oral Presentations- Prepared and Extempore/Speaking personally
5. 'Just A Minute' Sessions (JAM).
6. Describing things / Narration
7. Information Transfer
8. Debate
9. Telephoning Skills.
10. Giving Directions.

SUGGESTED SOFTWARE :

- Cambridge Advanced Learners' English Dictionary with CD.
- The Rosetta Stone English Library
- Clarity Pronunciation Power
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd with CD.
- Learning to Speak English - 4 CDs
- Microsoft Encarta with CD
- Murphy's English Grammar, Cambridge with CD

REFERENCES :

1. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
2. English Pronouncing Dictionary Daniel Jones Current Edition with CD.
3. Spoken English- R. K. Bansal and J. B. Harrison, Orient Longman 2006.
4. A Practical course in English Pronunciation, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
5. A text book of English Phonetics for Indian Students by T.Balasubramanian (Macmillan), 18th Reprint, 2005.
6. English Skills for Technical Students**,** WBSCTE with British Council, OL

ADVANCED ENGINEERING DRAWING

Course Code : AME1104

L	T	P	C
0	0	3	2

AIM & OBJECTIVES :

1. To make the student aware of the drawing practices and conventions.
2. To familiarize the various engineering curves used in industry.
3. To enable student draft simple engineering components.

LIST OF EXCERCISES

1 Sectional views of Prism, Cylinder, Pyramid, and Cone in simple positions

2 Sectional views of Prism, Cylinder, Pyramid, and Cone inclined to both the planes

3 Development of Surfaces of Prisms, Cylinder

4 Development of Surfaces of Pyramid, Cone

5 Interpenetration of Cylinder & Cylinder, Cylinder & Prism

6 Interpenetration of Cylinder & Cone

7 Conversion of Isometric Views to Orthographic Views (simple cases)

8 Conversion of Isometric Views to Orthographic Views

9 Conversion of Orthographic Views to Isometric Views

10 Perspective View of Points, Lines, Planes, Simple Solids-Vanishing Point Method, Visual ray method

11 Modeling of typical geometrical elements in AutoCAD

12 Modeling of typical geometrical elements in AutoCAD

TEXT BOOKS :

1. Engineering Drawing, N.D. Bhat & V.M. Panchal, Charotar Publishing House, 49th Edition, 2008.
2. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishes.
3. Computer Aided Engineering Drawing- Trymbaka Murthy- I.K. International Publishers, 3rd Edn. 2007.

SYLLABI FOR III SEMESTER

PROBABILITY AND STATISTICS

Course Code: ABM1105

L	T	P	C
4	1	0	4

AIM:

To acquire basic knowledge in concepts of probability and statistics.

OBJECTIVE:

The student shall be able to apply the methods of probability distributions, perform Statistical analysis and draw inference in various engineering problems.

UNIT-I

PROBABILITY: Probability, The axioms of probability, some elementary theorems - Conditional probability – Baye's theorem. (3.3-3.7)

UNIT-II

DISCRETE RANDOM VARIABLES: Random variables , mean and variance, Chebyshev's theorem, Binomial distribution, Poisson distribution (4.1,4.2, 4.4-4.7)

UNIT-III

CONTINUOUS RANDOM VARIABLES: Continuous Random Variable, normal distribution, Normal approximation to Binomial distribution, Uniform distribution (5.1-5.3, 5.5)

UNIT-IV

SAMPLING DISTRIBUTION OF MEANS: Population and sample, Sampling distributions of mean, Point estimation, Interval estimation (6.1-6.3, 7.1, 7.2)

UNIT-V

INFERENCES CONCERNING MEAN: Null hypothesis and tests of hypothesis, Inference concerning one mean and two means (7.3-7.5, 7.8)

UNIT-VI

INFERENCES CONCERNING VARIANCES: Sampling distribution of the variance, the estimation of Variance, Hypothesis concerning one and two variances (6.4, 8.1-8.3)

UNIT-VII

INFERENCES CONCERNING PROPORTIONS: Estimation of Proportions, Hypothesis concerning one proportion, several proportions (9.1-9.3)

UNIT-VIII

CORRELATION REGRESSION: The method of least squares , Curvilinear regression, multiple regression, correlation(excluding causation) (11.1,11.3, 11.4,11.6)

TEXT BOOK:

Miller Freund's" Probability and Statistics for Engineers" Richard A Johnson, CB Gupta, Peason education , Seventh Edition 2005.

REFERENCES :

1. SC Gupta and V.K. Kapoor" Fundamentals of Mathematical Statistics" 9th Revised Edition, Sultan Chand & Sons educational Publishers

2 Dr. B.S. Grewal " Higher Engineering mathematics" 40th Edition, Khanna Publishers.

THERMODYNAMICS

Course Code: AME1105

L	T	P	C
4	1	0	4

AIM AND OBJECTIVE:

To study the basic concepts of thermodynamics and apply it to various applications and to integrate the concepts, laws and methodologies from thermodynamics for the analysis of cyclic processes.

UNIT – I

INTRODUCTION: Thermodynamic system, control volume, surrounding, boundaries, universe, types of systems, macroscopic and microscopic view points, concept of continuum, thermodynamic equilibrium, state, property, process, reversible process, irreversible process, cycle, quasi – static process, energy in state and in transition, energy types, work and heat, point and path function.

UNIT - II

ZEROTH LAW AND FIRST LAW OF THERMODYNAMICS: Concept of equality of temperature, principles of thermometry, reference points, constant volume gas thermometer, scales of temperature, ideal gas temperature scale, Joule's experiments, first law of thermodynamics, first law applied to a process - isochoric, isobaric, isothermal, adiabatic, polytropic , PMM1, first law applied to flow processes – steady flow energy equation.

UNIT – III

SECOND LAW OF THERMODYNAMICS: Limitations of the first law, thermal reservoir, heat engine, refrigerator and heat pump, parameters of performance, second law of thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, reversibility and irreversibility, causes of irreversibility, types of irreversibility, conditions for reversibility, Carnot cycle, Carnot's theorem and its specialties.

UNIT – IV

ENTROPY: Clausius theorem, entropy, inequality of Clausius, entropy change in an irreversible process, principle of entropy, applications of entropy principle, entropy generation in closed and open systems, first and second laws combined, entropy and disorder.

UNIT -V

AVAILABILITY: Available energy, quality of energy, maximum work in reversible process, useful work, dead state, availability, availability in chemical reactions, Maxwell relations, TdS equations, Joule – Kelvin effect, elementary treatment of the third law of thermodynamics.

UNIT -VI

PURE SUBSTANCES: Phase transformations, triple point at critical state properties during change of phase, P-V-T surfaces, T-S and h-s diagram, dryness fraction, Clausius – Clapeyron equation, steam tables, Mollier charts, measurement of steam quality.

UNIT -VII

PERFECT GAS LAWS: Avogadro's law, Equation of state, ideal gas - characteristic and universal gas constants, various non-flow processes, heat and work transfer, changes in internal energy, throttling and free expansion processes, flow processes, deviations from perfect gas model, Van der waal's equation of state, compressibility charts, gas tables.

UNIT – VIII

MIXTURES OF PERFECT GASES: Dalton's law of partial pressures, mole fraction, volume fraction and partial pressure, Amagat's laws of additive volumes – equivalent gas constant, internal energy, enthalpy, specific heats and entropy of mixture of perfect gases

TEXT BOOK:

1. PK Nag, "Engineering Thermodynamics", TMH, 3rd Edn. 2009.
2. Engineering Thermodynamics: A generalized approach, Elsevier

REFERENCES:

1. Yunus Cengel & Boles, "Thermodynamics – An Engineering Approach",TMH, 2011.
2. K. Ramakrishna, "Engineering Thermodynamics", Anuradha Publishers, 1st Edn. 2010.
3. Richard E Sonntag, Borgnakke and Van Wylen, "Fundamentals of Thermodynamics", John Wiley & Sons, 2008.

MECHANICS OF SOLIDS

Course Code: AME1106

L	T	P	C
4	1	0	4

AIM AND OBJECTIVE:

To develop the ability to analyse the state of stress and strain at any point in a member. This is a prerequisite course for design of machine members.

UNIT – I

SIMPLE STRESSES AND STRAINS: Elasticity and plasticity – types of stresses and strains–Hooke's law – stress – strain diagram for mild steel – working stress – factor of safety – lateral strain, Poisson's ratio and volumetric strain – elastic moduli and the relationship between them – bars of varying section – composite bars – temperature stresses, strain energy – resilience – gradual, sudden, impact and shock loadings.

UNIT – II

TORSION

TORSION OF SHAFTS: Assumptions in theory of torsion, torsion equation, polar modulus, torsion of circular solid and hollow shafts, shafts in series and parallel, combined bending and torsion, Application of torsion in helical springs - open and closed.

UNIT – III

SHEAR FORCE AND BENDING MOMENT: Definition of beam – types of beams – concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported, overhanging beams subjected to point loads, U.D.L, uniformly varying loads and combination of these loads – point of contraflexure – relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – IV

FLEXURAL STRESSES: Theory of simple bending – assumptions – derivation of bending equation– determination of bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T sections – design of simple beam sections.

Shear Stresses in Beams: Derivation of formula – shear stress distribution across various beam sections like rectangular, circular, triangular, I, T.

UNIT –V

PRINCIPAL STRESSES: Transformation of plane stress into normal and shear stresses on inclined plane, principal planes, Mohr's circle for plane stress. Maximum shearing stress.

UNIT – VI

DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflection and radius of curvature – differential equation for the elastic line of a beam – double integration and Macaulay's methods – determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load. Mohr's theorems – moment area method – application to simple cases including overhanging beams.

UNIT – VII

THIN AND THICK CYLINDERS: Thin seamless cylindrical shells – derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders, thin spherical shells.

Introduction to thick cylinders – Lame's equation – cylinders subjected to inside and outside pressures.

UNIT – VIII

ANALYSIS OF PIN-JOINTED PLANE TRUSSES: Determination of Forces in members of plane, pin jointed, ideal trusses by (i) method of joints and (ii) method of sections.

TEXT BOOKS:

1. Bansal, "Strength of Materials", Lakshmi Publications, 4th Edition, 2005
2. Beer Johnston and DeWolf, "Mechanics of Materials", TMH, 5th Edn. 2010.

REFERENCES:

1. Bhavikatti, "Strength of Materials", New Age International Publishers, 1st Edn, 2010.
2. Rajput, "Strength of Materials", S. Chand Publishers, 4th Edn. 2008.

MATERIAL SCIENCE AND METALLURGY

Course Code: AME1107

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE :

To acquire fundamental knowledge about metals and materials used in engineering and to create the awareness in efficient problem solving, decision making and development of advanced materials in the functioning of an engineer.

UNIT-I

STRUCTURE OF METALS: Bonds in solids-metallic bond-crystal structure-BCC, FCC, HCP, unit cells, packing factor, crystallization of metals, grains and grain boundaries, effect of grain boundaries on properties of metals, crystal imperfections, determination of grain size.

UNIT-II

MECHANICAL BEHAVIOUR OF MATERIALS: Elastic deformation, plastic deformation- twinning, fracture, fatigue, creep

CONSTITUTION OF ALLOYS: Necessity of alloying, types of solid solutions, Hume Rothery rules, intermediate alloy phases and electron compounds.

UNIT-III

EQUILIBRIUM DIAGRAMS: Phase rule, Experimental method of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys. Lever rule, coring, miscibility gaps, eutectic systems. Congruent melting intermediate phases, peritectic reaction, Transformations in solid state – allotropy, eutectoid, peritectoid reactions, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams: Cu-Ni, Al-Cu, Bi-Cd.

UNIT-IV

METALLURGY OF IRON AND STEEL-I: $Fe-Fe_3C$ equilibrium diagram, micro constituents in steels, classification of steels, structure and properties of plain carbon steels.

Heat treatment of steels- annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface hardening methods, age hardening treatment.

UNIT-V

METALLURGY OF IRON AND STEEL-II: Effect of alloying elements on $Fe-Fe_3C$ system, low alloy steels, stainless steels, Hadfield manganese steels, tool steels and die steels, structure and properties of white cast iron, malleable cast iron, grey cast iron and spheroidal grey cast iron.

UNIT–VI

NON-FERROUS METALS AND ALLOYS: Structure and properties of copper and its alloys, aluminum and its alloys and titanium and its alloys.

UNIT-VII

CERAMIC MATERIALS : Crystalline ceramics, glasses, cermets, abrasive materials, Nano materials-definition, properties and applications of the above.

UNIT–VIII

COMPOSITE MATERIALS: Classification of composites, particle reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal-matrix composite and C-C composites. Introduction to powder metallurgy.

TEXT BOOKS:

1. Sidney H Avner, "Introduction to physical metallurgy", TMH, 2nd Edition, 1997.
2. Kodgire, "Materials Science and Metallurgy", Everest Publishing House, 31st Edition, 2012

REFERENCES:

1. Van Vlack, "Elements of materials science and Engineering", Dorling Kindersley (India) Pvt. Ltd, 6th Edn. 2007.
2. V.Raghavan, "Elements of materials science", Pearson Education, 5th Edn. 2004.

BASIC ELECTRONICS

Course Code: AEC1145

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

To familiariz with the basics of electronics circuits.

UNIT -I

SEMI CONDUCTOR MATERIALS: Classification of materials, energy levels, intrinsic and extrinsic semiconductor, conduction in metals and semiconductors.

UNIT -II

SEMI CONDUCTOR DIODES AND APPLICATIONS: Diode under forward bias condition, diode under reverse bias condition, current-voltage characteristics of PN junction diode, Diode as a switch, , as a rectifier , Half Wave rectifier, Full Wave rectifier, rectifier with Filters.

UNIT -III

BJTs: Bipolar Junction Transistor structure , Principle of operation of npn and pnp transistor, transistor as a switch , transistor as an amplifier, Transistor (BJT) configurations CB, CE, CC, Relation between á, â and ã. Input and output characteristics of BJT.

UNIT -IV

FEEDBACK AMPLIFIERS: Concept of feedback, advantages & disadvantages of negative feedback amplifier, feedback amplifier topologies, effect of negative feedback on R_I, R_0, A_V, A_I of an amplifier.

UNIT -V

OSCILLATORS : Classification of oscillators, Barkhausen's criterion, RC phase shift oscillator, Hartley and Colpitts oscillators.

UNIT -VI

NUMBER SYSTEMS & BOOLEAN ALGEBRA : Philosophy of number systems, complement representation of negative numbers, Binary

arithmetic codes, fundamental postulates of Boolean algebra, Basic Theorems and properties, sum of products, product of sums, realization of logic gates.

UNIT -VII

INTRODUCTION TO COMBINATIONAL CIRCUITS: Design using conventional logic gates, Encoder, Decoder, MUX, De-Mux.

UNIT -VIII

MICROPROCESSORS: Introduction to 8085 microprocessor, Architecture, D/A Converters: Weighted Resistor, R-2R Ladder network, A/D Converters: successive approximation, dual slope.

TEXT BOOKS:

1. J Millman and C.C.Halkias, "Electronics Devices and Circuits", TMH 1998.
2. Ramesh S. Goankar "8085 Microprocessor and Interfacing"
3. Morris Mano, "Digital Design", PHI, 3rd Edition, 2006.
4. B.Visweswara Rao, K.Bhaskara Murthy, K.Raja Rajeswari, P.Chalam Raju Pantulu, "Electronics Devices and Circuits", Pearson Publications, 2nd Editions.
5. Prof.G.S.N.Raju, "Electronics Devices and Circuits", I K International Publishing House Pvt Ltd, 2006.

REFERENCES:

1. Dr.Lal Kishore, "Electronics Devices and Circuits", B.S. Publication.
2. K.Satyaprasad, "Electronics Devices and Circuits".

FLUID MECHANICS

Course Code: AME1108

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

To make the students familiar with the behavior of fluids at rest or in motion. To achieve a sound foundation in basic principles of mechanics of fluids with their applicability in engineering domain. This is a prerequisite course for hydraulic machinery and systems.

UNIT – I

INTRODUCTION& FLUID PROPERTIES: Density, specific weight, specific gravity, viscosity, vapour pressure, compressibility, pressure at a point, Pascal's law, pressure variation with temperature, density and altitude, hydrostatic law, total pressure and center of pressure – horizontal, vertical and inclined plane surfaces, buoyancy and floatation.

UNIT – II

FLUID KINEMATICS: Stream line, path line, streak line, stream tube, classification of flows -steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, one, two and three dimensional flows, continuity equation in three-dimensional flow, stream and velocity potential function.

UNIT – III

FLUID DYNAMICS: Surface and body forces – Euler's and Bernoulli's equation derivation, introduction to Navier- Stokes equation, momentum equation - applications, vortex – free and forced vortex with free surface.

UNIT – IV

BOUNDARY LAYER: Concepts, boundary layer along a thin flat plate, Boundary layer Equations, Von-Karman's momentum integral equation, laminar and turbulent Boundary layers, boundary layer in

transition, separation of boundary layer, control of boundary layer separation.

UNIT – V

DRAG AND LIFT: Types of drag, lift, drag on sphere and flat plate.

LAMINAR FLOW: Relation between shear and pressure gradient, steady laminar flow between parallel flat plates, steady laminar flow in circular pipes and laminar flow through inclined pipes.

UNIT – VI

FLOW THROUGH PIPES: Reynolds experiment –Darcy's equation, Chezy's formula, minor losses, pipes in series, equivalent pipe, pipes in parallel, total energy line and hydraulic gradient line, siphon, power transmission through pipes, flow through nozzle at the end of pipe.

UNIT – VII

FLOW OF COMPRESSIBLE FLUID: Introduction, thermodynamic relations, basic equations of compressible flow, velocity of sound wave in a fluid for isothermal and adiabatic process, Mach number and its applications, Mach angle, propagation of pressure waves and stagnation properties.

UNIT –VIII

SIMILITUDE: Types of similarity- geometric, kinematic and dynamic similarities, dimensionless numbers, similarity laws.

FLOW MEASUREMENT: manometers, simple manometers, differential manometers, venturimeter and orifice meter, pitot tube, flow through notches.

TEXT BOOKS:

1. Modi and Seth, "Fluid Mechanics, Hydraulics & Hydraulic Machines", Standard Publications, New Delhi, 14th Edition, 2002.
2. K.L.Kumar, "Engineering Fluid Mechanics", S.Chand & Co., 6th Edition, 2004.

REFERENCES:

1. Dr. D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", S.K. Kataria and Sons, 2009.
2. John F Douglas, "Fluid Mechanics" Pearson Education Publishers, 5th Edn. 2009.
3. D. Ramadurgaiah, "Fluid Mechanics & Hydraulic Machines", Newage Publishers, 2002.

MECHANICS OF SOLIDS & METALLURGY LAB

Course Code: AME1109

L	T	P	C
0	0	3	2

Any TEN of the following experiments (Five from each Lab) are to be performed during the semester

MECHANICS OF SOLIDS LAB

AIM AND OBJECTIVE :

To demonstrate and provide the hands-on experience in testing for mechanical properties of materials.

LIST OF EXPERIMENTS

1. Direct tension test
2. Bending test on
   a) Simply supported beam b) Cantilever beam
3. Hardness test
   a) Brinells hardness test b) Rockwell hardness test
4. Test on springs
5. Compression test on cube
6. Impact test
   a) Izod Impact Test b) Charpy Impact Test
7. Maxwell's reciprocal theorem-verification

METALLURGY LAB

AIM AND OBJECTIVE :

To provide the hands-on experience in observing the microstructures of different types of specimens.

LIST OF EXPERIMENTS

1. Preparation and study of microstructure of pure metals
   i) Copper ii) Aluminium
2. Preparation and study of microstructure of low carbon steels
3. Preparation and study of microstructure of medium carbon steels
4. Preparation and study of microstructure of cast irons
   i) White ii) Grey iii) Spheroidal Graphite
5. Preparation and study of microstructure of non ferrous alloys á+â brass
6. Simple heat treatment of steels and study of the microstructure of heat treated steels
7. Hardenability by Jominy end quench test

ELECTRICAL AND ELECTRONICS LAB

Course Code: AME1110

L	T	P	C
0	0	3	2

Any TEN of the following experiments (Five from each Lab) are to be performed during the semester

Electrical Lab

AIM :

To introduce the student to the connections of various electrical equipments and their testing.

OBJECTIVE :

At the end of this course the student will be able to i) understand various types of controls and measuring instruments ii) conduct performance tests on electrical machines.

LIST OF EXPERIMENTS:

Note: Five experiments are to be conducted from (Two to Seven) and First experiment is compulsory.

1. Demonstration of the following and their working (compulsory).
   (a) Fuse (b) Rheostat (c) Meters (d) Switches
2. Verification of KCL and KVL.
3. Speed control of D.C. Shunt Motor.
4. OC and SC test on a single phase transformer.
5. Brake test on 3-phase induction motor
6. Regulation of Alternator by synchronous impedance method.
7. Speed control of slip-ring induction motor.

ELECTRONICS LAB

AIM AND OBJECTIVE:

To study the characteristics of electronic devices and circuits.

LIST OF EXPERIMENTS

1. Diode characteristics.
2. Zener Diode Characteristics
3. Half wave and full wave Rectifier.
4. Common emitter characteristics.
5. Common emitter amplifier.
6. RC Phase shift oscillator.

SYLLABI FOR IV SEMESTER

MACHINE DRAWING

Course Code: AME1111

L	T	P	C
2	0	3	4

AIM AND OBJECTIVES:

(A) To learn about basic machine parts, conventions of machine elements.

(B) To enable students to apply the principles of basic engineering drawing in drafting simple machine components.

(C) To gain the knowledge of assembly and details of various machine parts.

Note: First angle projection to be adopted.

MACHINE DRAWING CONVENTIONS:

Need for drawing conventions – introduction to ISI conventions

a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.

b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.

I. Drawing of Machine Elements and Simple Parts

Selection of Views, additional views for the following machine elements and parts with easy drawing proportions.

a. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.

b. Keys, cotter joint and knuckle joint.

c. Riveted joints for plates

d. Shaft coupling, spigot and socket pipe joint.

e. Journal bearing and foot step bearing.

II. Assembly Drawings:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

a) Engine parts – stuffing box, steam engine cross head, Eccentric, Petrol Engine connecting rod, piston assembly.

b) Other machine parts - Screw jack, Machine Vice, Plummer block, Lathe tailstock.

c) Valves- Steam stop valve, spring loaded safety valve and feed check valve.

III. Computer aided drawing of components (Demonstration only)

TEXT BOOKS:

1. K.L.Narayana, P.Kannaiah & K. Venkata Reddy, "Machine Drawing", 3rd Edition, New Age Publishers, 2007.
2. N D Bhatt, "Machine Drawing", 44th Edition, Charotar publishers, 2009.

REFERENCES:

1. Dhawan, "Machine Drawing", S.Chand Publications, 1st Edn. 1996.
2. P.S.Gill, "Machine Drawing", 1st Edn, S.K. Takaria & Sons, 2010.

NUMERICAL METHODS

Course Code: ABM1108

L	T	P	C
4	1	0	4

AIM :

To acquire basic knowledge in concepts of Numerical Methods.

OBJECTIVE:

The student shall be able to apply the methods of Numerical Computation in various engineering problems.

UNIT-I

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS : Introduction to Numerical Methods, Solution of algebraic and transcendental equations-Bisection method, method of false position, Newton's method, Iteration method, Finite differences, Differences of a polynomial, Difference operators . (28.1, 28.2, 29.1, 29.2 & 29.4 of [1])

UNIT-II

INTERPOLATION : Newton's interpolation formulae, Central difference interpolation formulae, Interpolation with unequal intervals – Lagrange's formula, Newton's divided difference formula, Inverse interpolation. (29.5, 29.6, 29.8& 29.9 of [1])

UNIT-III

CURVE FITTING : Curve fitting: Introduction, Graphical method, Laws reducible to the linear law, Principles of least squares, Method of least squares, fitting of other curves, fitting of parabola
(24.1 - 24.6 & 24.8 of [1])

UNIT-IV

NUMERICAL DIFFERENTIATION AND INTEGRATION: Numerical differentiation, Numerical Integration – Newton-cote's formula, Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule, Weddle's rule. (29.10, 29.12 of [1])

UNIT-V

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS-I: Introduction, Picard's method, Taylor's series method, Euler's method, Modified Euler method (31.1 - 31.5 of [1])

UNIT-VI

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS-II: Runge's method, Runge-Kutta method, Predictor-corrector methods: Milne's method, Adams-Bashforth method, Simultaneous first order differential equations (31.6 - 31.9 of [1])

UNIT-VII

ENGINEERING APPLICATIONS OF OPTIMIZATION-I: Introduction to Optimization, Engineering Applications of Optimization, Statement of an Optimization problems, Classification of Optimization problems. (1.1, 1.3 – 1.5 of [2])

UNIT-VIII

ENGINEERING APPLICATIONS OF OPTIMIZATION-II: Single variable optimization, Unimodal function, Exhaustive search, Dichotomous search, Fibonacci method, Golden Section method, Quadratic interpolation method, Newton method.
(2.2, 5.2, 5.4, 5.5, 5.7, 5.8, 5.10, 5.12.1 of [2])

TEXT BOOKS:

[1] Dr.B.S.Grewal "Higher Engineering Mathematics", 40th Edition, Khanna Publishers.

[2] Singiresu S. Rao "Engineering Optimization", Third Edition,New Age International (P) Limited, Publishers

REFERENCE BOOKS:

1. M.K.Jain, S.R.K.Iyengar and R.K.Jain, "Numerical Methods for Scientific and Engineering Computation", New age International Publishers

2. S.S. Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall India Pvt. Ltd.

HYDRAULIC MACHINERY & SYSTEMS

Course Code: AME1112

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

To make the students familiar with hydraulic machinery used in industrial and commercial applications.

UNIT – I

IMPACT OF JETS: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip-velocity triangles at inlet and outlet, expressions for work done and efficiency, angular momentum principle, applications to radial flow turbines, jet propulsion

UNIT – II

HYDRAULIC TURBINES: Classification of water turbines, Pelton wheel, Francis, Kaplan and Propeller turbines – work done and working proportions, draft tubes.

UNIT – III

PERFORMANCE OF TURBINES: Performance under unit head – unit quantities, performance under specific conditions – specific speed, performance characteristic curves, model testing of turbines, cavitation in turbines, governing of turbines.

UNIT – IV

RECIPROCATING PUMPS: Main components and working of a reciprocating pump, types of reciprocating pumps, power required to drive the pump, coefficient of discharge and slip indicator diagram, effect of acceleration head in suction and delivery pipes, effect of friction, maximum vacuum pressure, work saved by air vessels, rate of flow into and from air vessels.

UNIT – V

CENTRIFUGAL PUMPS – I : Component parts and working of

centrifugal pump, types of centrifugal pumps, work done by the impeller, manometric head, losses and efficiencies, effect of vane angle on manometric efficiency, effect of finite number of vanes of the impeller on head and efficiency, minimum starting speed, loss of head due to reduced or increased flow, diameters of impeller and pipes.

UNIT – VI

CENTRIFUGICAL PUMPS – II: Specific speed, model testing of pumps, multistage pumps, pumps in parallel, performance of pumps, characteristics curves, NPSH, cavitation, priming devices, pump troubles and remedies.

UNIT – VII

HYDRAULIC DEVICES: Hydraulic accumulator, hydraulic intensifier, hydraulic ram, hydraulic press, hydraulic lift, hydraulic crane, hydraulic couplings and torque converters, air lift pump.

UNIT – VIII

HYDRAULIC SYSTEMS: Gear and vane pumps, hydraulic control valves - direction control valve, pressure control valves, flow control valves, hydraulic control systems –closed loop system, open loop system.

TEXT BOOKS:

1. P.N. Modi and S.M. Seth, "Hydraulics and Hydraulic Machines", 11th Edition, Standard Book House, 2011.
2. Banga and Sharma, "Hydraulic Machines", 6th Edition, Khanna Publishers, 1995.

REFERENCES:

1. Jagdish Lal, "Elements of Hydraulic Machines and Fluidics", Metro Politian Books, 1994.
2. D.S.Kumar, "Fluid mechanics and Fluid Power Engineering", S.K.Kataria and Sons Publications, 2009.
3. Anthony Esposito, "Fluid Power with Applications", PHI, 6th Edn. 2003.

PRODUCTION TECHNOLOGY

Course Code: AME1113

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

To make the students familiar and understand the details of various manufacturing processes.

UNIT-I

CASTING-I: Casting, steps involved in making a casting, advantages and applications of metal casting, patterns, pattern making, pattern materials, types of pattern, pattern allowances, mold materials.

Sand testing procedure - moisture content test, permeability test, strength test, grain fineness test.

Principles of gating system ,functions of gating system ,gating ratio ,design of gating systems, risers , types and functions of risers.

UNIT-II

CASTING-II: Solidification of casting, solidification of pure metal and alloys, short and long freezing range, special casting processes-centrifugal, investment, die casting, continuous casting, Casting defects, methods of melting- types of furnaces, crucible melting and cupola operation.

UNIT-III

JOINING PROCESSES-I: Classification of welding process, advantages and disadvantages of welding, applications of welding, safety recommendations in welding , welded joints ,gas welding , arc welding, MIG and TIG welding, Electro slag welding, plasma arc welding, gas cutting.

UNIT-IV

JOINING PROCESSES-II: Resistance welding , spot welding ,projection welding , ultrasonic welding , friction welding , thermit welding ,electron beam welding, laser beam welding , heat affected zone, welding distortion, welding defects, soldering, brazing, adhesives.

UNIT-V

METAL FORMING-I: Hot working, cold working, strain hardening, recrystallisation, grain growth, grain structure. Rolling- hot and cold rolling, types of rolling mills and products, tube rolling, characteristics of hot rolled and cold rolled components.

UNIT-VI

METAL FORMING-II: Metal forming processes, roll forming, flexible die forming, peen forming, swaging, cold heading, thread rolling, spinning, drawing - rod drawing, wire drawing, tube drawing.

Presses and press tools - types of presses, blanking, piercing, bending, embossing, coining.

UNIT-VII

METAL FORMING –III: Forging - types of forging, smith forging, drop forging, roll forging, forging hammers, advantages and disadvantages of forging, limitations , forging defects and remedies.

Extrusion - methods of extrusion, hot and cold extrusion, forward and backward extrusion, impact extrusion, hydrostatic extrusion, tube extrusion.

UNIT-VIII

PLASTICS: Introduction to polymers, types and properties, applications of plastics, plastics moulding processes- compression moulding, transfer moulding, injection moulding, blow moulding, extrusion moulding

TEXT BOOKS:

1. O.P. Khanna & M. Lal, "Production Technology Vol I", Dhanpat Rai Publications
2. P.N. Rao, "Manufacturing Technology", 3rd Edition, TMH, 2008.

REFERENCES:

1. R.K. Jain, "Production Technology", Khanna Publishers, 17th Edn. 2011.
2. Parmar, "Welding processes and Technology", Khanna Publishers, 2nd Edn. 2003.
3. Rosenthal, "Principles of Metal Casting", McGraw-Hill, 2nd Edn. 1967.

KINEMATICS OF MACHINES

Course Code: AME1114

L	T	P	C
4	1	0	4

AIM & OBJECTIVE:

The objective of this course is to expose the students to various mechanisms and motion transmission elements used in Mechanical Engineering practice and their kinematic analysis. This is a pre requisite course for Dynamics of Machines and design of machine elements.

UNIT – I

SIMPLE MECHANISMS: Link or element – types of links – Rigid, flexible and fluid links – kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs, Types of constrained motion – completely, incompletely and successfully constrained motion – kinematic chain - mechanism – Inversion – Types of kinematic chains – four bar or quadric cycle chain – single slider crank chain – Double slider crank chain and their inversions.

UNIT – II

VELOCITY IN MECHANISMS: Relative velocity method – velocity of point on a link- application of relative velocity method to four bar mechanism and slider crank mechanism – rubbing velocity of a joint – Instantaneous centre method –body centrode and space centrode - velocity of point on a link by Instantaneous centre method, location of Instantaneous centre - three centres in line theorem and application of the method for simple mechanisms.

UNIT – III

ACCELERATION IN MECHANISMS: Acceleration diagrams of a link - acceleration diagrams for a four bar mechanism and slider crank mechanism- Analytical expression for the determination of velocity and acceleration of the piston of a reciprocating engine- kleins construction

to determine the acceleration of piston - coriolis component of acceleration - acceleration diagram for slotted lever quick return mechanism

UNIT - IV

MECHANISM WITH LOWER PAIRS: Pantograph – straight line motion mechanisms – exact straight line motion mechanisms made of turning pairs – Peaucellier mechanism, Hart's Mechanism – exact straight line motion consisting of one sliding pair - Scott Russel's mechanism – Approximate straight line motion mechanisms - Grass hopper – Watt – Tchebicheff - Robert mechanism- steering mechanism - condition for correct steering – Davis steering gear-Ackerman's steering gear, Hooke's joint – ratio of shaft velocities – maximum and minimum speed of driven shaft – condition for equal speeds – Angular acceleration of driven shaft – Double Hooke's joint.

UNIT - V

CAMS: Classification of followers and cams – terms used in radial cams – displacement, velocity and acceleration diagrams when the follower moves with uniform velocity, uniform acceleration and retardation, simple harmonic motion – construction of cam profiles – cams with specified contours – tangent cam with roller follower – circular arc cam with flat faced follower.

UNIT – VI

BELT DRIVES: Types of belt drives, materials used for belts, slip and creep in belt drives, length of belt in open and crossed belt drives, ratio of driving tensions in flat and V belt drives – initial tension, centrifugal tension, maximum tension in belt, condition for transmission of maximum power.

UNIT – VII

TOOTHED GEARING: Classification of toothed wheels – terms used in gears - law of gearing – velocity of sliding of teeth – forms of teeth – cycloidal and involute teeth – standard proportions of gear teeth – length of arc of contact – path of contact – contact ratio- interference in involute teeth - minimum number of teeth to avoid interference. Introduction to helical and spiral gears.

UNIT – VIII

GEAR TRAINS: Simple, compound and reverted gear trains – epicyclic gear train – velocity ratio of epicyclic gear train-sun and planet wheels – torques in epicyclic gear train.

TEXT BOOKS:

1. R.S. Khurmi, J.K. Gupta, S.Chand, "Theory of Machines", 13th Edition, Eurasia Publishing House Pvt. Ltd, 2003.
2. S.S.Rattan, "Theory of Machines and Mechanisms", TMH Publishers, 3rd Edn. 2009.

REFERENCES :

1. Thomas Bevan, "Theory of Machines", CBS Publishers, 3rd Edn. 2004.
2. R.K. Bansal, "Theory of machines", Laxmi Publications, 4th Edn. 2006.

THERMAL ENGINEERING - I

Course Code: AME1115

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

To familiarize students with the thermodynamic cycles and analysis skills associated with the thermodynamic principles applied to thermal energy conversion systems like I.C. Engines and Gas turbines.

UNIT – I

POWER CYCLES : Otto, Diesel, Dual Combustion cycles, Sterling cycle, Atkinson cycle, Ericcson cycle, Lenoir cycle, Brayton cycle – description and representation on P–V and T-S diagram, thermal efficiency, mean effective pressures on air standard basis – comparison of cycles.

UNIT-II

I.C. ENGINES : Classification, working principles, valve and port timing diagrams, air-fuel and actual cycles, engine systems – fuel, carburetor, fuel injection system, ignition, cooling and lubrication.

UNIT – III

COMBUSTION IN S.I. ENGINES : Normal Combustion and abnormal combustion, importance of flame speed and effect of engine variables, type of abnormal combustion, pre-ignition and knocking, fuel requirements and fuel rating, anti knock additives, combustion chamber – requirements, types.

UNIT -IV

COMBUSTION IN C.I. ENGINES: Four stages of combustion, delay period and its importance, effect of engine variables, Diesel knock, need for air movement, suction, compression and combustion induced turbulence, open and divided combustion chambers and nozzles used, fuel requirements and fuel rating.

UNIT –V

TESTING AND PERFORMANCE: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, brake power, determination of frictional losses and

indicated power, performance test, heat balance sheet and chart.

UNIT – VI

COMPRESSORS: Classification – positive displacement and roto dynamic machinery, power producing and power absorbing machines, fan, blower and compressor, positive displacement and dynamic types, reciprocating and rotary types.

RECIPROCATING: Principle of operation, work required, isothermal efficiency volumetric efficiency and effect of clearance, stage compression, under cooling, saving of work, minimum work condition for stage compression.

UNIT -VII

ROTARY (POSITIVE DISPLACEMENT TYPE): Roots blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

AXIAL FLOW COMPRESSORS: Mechanical details and principle of operation, velocity triangles and energy transfer per stage degree of reaction, work done factor, isentropic efficiency, pressure rise calculations, polytropic efficiency.

UNIT -VIII

GAS TURBINES: Classification of gas turbine, open cycle gas turbine – intercooling, reheating and regeneration - effect of variables, closed cycle gas turbine – efficiency, pressure ratio, merits and demerits of open and closed cycles.

TEXT BOOKS:

1. V. Ganesan, "I.C. Engines", 3rd Edition, TMH publications, 2007.
2. R.K. Rajput, "Thermal Engineering", 8th Edition, Lakshmi Publications, 2008.

REFERENCES:

1. Mathur and Sharma, "I.C. Engines", Dhanpath Rai and Sons, 2005.
2. R. Yadav, "Thermodynamics and Heat Engines", Central Book Depot., Allahabad, Vol-II, 3rd Edn, Central Book Depot. 1989.
3. V. Ganesan, "Gas Turbines", TMH Publications, 3rd Edn. 2010.

PRODUCTION TECHNOLOGY LAB

Course Code: AME1116

L	T	P	C
0	0	3	2

AIM AND OBJECTIVE:

To provide hands-on experience on different production processes and to demonstrate and train students in basic production trades.

Any TEN of the following experiments are to be performed during the semester

LIST OF EXPERIMENTS

I. METAL CASTING:

1. Pattern design and making (2 exercises)
2. Sand properties testing (2 exercises)
3. Moulding, melting and casting

II. WELDING:

1. Arc welding for lap joint and butt joint (2 exercises)
2. Spot welding
3. Gas welding
4. TIG welding
5. Gas cutting

III. MECHANICAL WORKING :

1. Pipe bending

IV. PROCESSING OF PLASTICS :

1. Injection moulding
2. Blow moulding

FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Course Code: AME1117

L	T	P	C
0	0	3	2

AIM AND OBJECTIVE :

Students should be able to verify the principles studied in theory by conducting the experiments.

Any TEN of the following experiments are to be performed during the semester

LIST OF EXPERIMENTS

1. Calibration of Venturi meter.
2. Calibration of Orifice meter.
3. Verification of Bernoulli's theorem
4. Determination of friction factor for a given pipe line.
5. Determination of minor losses in a pipeline
6. Calibration of V - Notch
7. Impact of jets on vanes.
8. Performance test on Pelton wheel.
9. Performance test on Francis turbine.
10. Performance test on single stage centrifugal pump.
11. Performance test on multi stage centrifugal pump.
12. Performance test on reciprocating pump.

SYLLABI FOR V SEMESTER

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

CODE: AHM1101

L	T	P	C
4	0	0	4

OBJECTIVE:

To explain the basic principles of managerial economics, accounting practices and financial management techniques for effective business decision making and to promote entrepreneurial abilities among budding engineers.

OUTCOME :

To understand the economic environment and to give an idea on various accounting and financial management techniques for effective utilization of economic resources.

UNIT-I

INTRODUCTION TO MANAGERIAL ECONOMICS : Definition, Nature and Scope of Managerial Economics, Demand Analysis, Demand Determinants, Law of Demand and its exceptions.

UNIT-I

ELASTICITY OF DEMAND AND DEMAND FORECASTING: Definition, Types, Measurement and Significance of Elasticity of Demand

Demand Forecasting, Factors governing demand forecasting, Methods of demand forecasting (Survey method, Statistical method, Expert opinion method, Test marketing, Controlled experiment, Judgmental approach).

UNIT-III

THEORY OF PRODUCTION AND COST ANALYSIS : Production Function – Isoquants and Isocosts, Laws of returns, Internal and External Economies of Scale.

COST ANALYSIS: Types of Costs, Break Even Analysis (BEA) – Determination of Break Even Point (Simple numerical problems) – managerial significance and limitations of BEA.

UNIT-IV

INTRODUCTION TO MARKETS : Market Structures: Types of competition, features of perfect competition, monopoly and monopolistic competition, price output determination in case of perfect competition and monopoly.

UNIT-V

FORMS OF BUSINESS ORGANIZATIONS : Features of Business, Advantages, Limitations of Sole Proprietorship, Partnership and Joint Stock Company, Types of companies – Features of Public and Private limited companies.

UNIT-VI

INTRODUCTION TO FINANCIAL ACCOUNTING : Accounting: Principles, concepts, conventions, double entry book keeping, Journal, Ledger.

Trial Balance, Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments, international financial reporting standards (simple numerical problems).

UNIT-VII

FINANCIAL ANALYSIS THROUGH RATIOS : Introduction, Advantages and limitations, Computation, Analysis and Interpretation of Liquidity ratios, Activity ratios, Solvency ratios and Profitability ratios (simple numerical problems).

UNIT-VIII

BUDGETING AND CAPITAL BUDGETING : Introduction to Budgeting: Production budget, Flexible budget and Cash budget Definition, nature and scope of capital budgeting, features of capital budgeting proposals, methods of capital budgeting: Traditional and discounted methods (simple numerical problems).

TEXT BOOKS:

1. A R Aryasri, "Managerial Economics and Financial Analysis", 3rd Edition, Tata Mc Graw Hill, 2009.
2. Siddiqui & Siddiqui, "Managerial Economics and Financial Analysis", 1, New Age, 2005.

REFERENCES:

1. RL Varshney and KL Maheswari, "Managerial Economics", 19, Sultan Chand & Sons, 2007.
2. D Ragnunath Reddy & M V Narasimha Chary, "Managerial Economics and Financial Analysis", 1, SciTech Publishers, 2008.
3. Dwivedi, "Managerial Economics", 7, Vikas Publishers, 2009.
4. P K Sharma and Shashi K Gupta, "Management Accounting", 1, Kalyani Publishers, 2002.
5. S P Jain and K L Narang, "Financial Accounting", 1, Kalyani Publishers, 2002.
6. S N Maheswari & S K Maheswari, "Financial Accounting", 4, Vikas Publishers, 2006.
7. P L Mehta, "Managerial Economics", 15, Sultan Chand & Son, 2010.

DYNAMICS OF MACHINERY

CODE: AME1118

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

This is a natural sequel to the earlier course titled Kinematics of Machines and this gives the student a foundation into the theory of mechanisms and machines. The student is exposed to the systematic analysis of forces and torques involved in various machine components like governors, brakes, flywheels etc., Important aspects of vibration and balancing are also introduced. Thus the course is an essential prerequisite to machine design.

UNIT-I

GYROSCOPES : Angular Velocity, Angular Acceleration, Gyroscopic couple, gyroscopic effect on aeroplanes, ships. Static and dynamic force analysis of planar mechanisms, Stability of four-wheel and two- wheel automobiles.

UNIT-II

FRICTION and FRICTION CLUTCHES : Basics, Inclined planes, Screw thread forms (Square, V), Screw jack, Rolling friction, Journal friction. Friction axis of a link, four-bar mechanism, film friction.

Pivots and collars, uniform pressure, uniform wear.

Types of clutches – disc, multiplate, cone and centrifugal.

UNIT-III

BRAKES AND DYNAMOMETERS : Types of brakes – Block brake, band brake, disc brake, band and block brake, internal expanding shoe brake, effect of brake.

Types of dynamometer - Prony, rope brake, belt transmission, epicyclic train, Bevis – Gibson torsion dynamometers.

UNIT-IV

FLYWHEELS : Engine force analysis, turning moment of crankshaft, dynamically equivalent system, inertia of connecting rod.

Turning moment diagrams, fluctuation of energy, flywheels, dimensions of flywheel rim, applications.

UNIT-V

BALANCING : Static and dynamic balancing of rotating masses. Force balancing of four-bar linkage. Primary and Secondary balancing of reciprocating engine. balancing, inline engine (2,4,6, cylinders), V-engines, W-engines and radial engines. direct and reverse crank method, balancing machines – static, dynamic. Theory of field balancing.

UNIT-VI

GOVERNORS : Types - Watt, Porter, Proell, Hartung, Wilson-Hartnell, spring-controlled gravity governor, inertia governor.

Sensitiveness, hunting, isochronism, stability, power, effort, controlling force of a governor.

UNIT-VII

MECHANICAL VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS : Definitions, types, basic features, degrees of freedom.

Free longitudinal vibration – equilibrium method, energy method, Rayleigh's method, Displacement, velocity, acceleration, effect of mass of spring, damped vibration, logarithmic decrement. Forced longitudinal vibrations - harmonic excitation, magnification factor, vibration isolation and transmissibility, rotating imbalance, support excitation.

UNIT-VIII

TRANSVERSE AND TORSIONAL VIBRATIONS : Transverse vibrations, single concentrated load, uniformly distributed load, several loads, Dunkerley's method, energy method, whirling of shafts.

Torsional vibrations – single rotor, two-rotor, three-rotor systems, torsionally equivalent shaft, geared system.

TEXT BOOK:

1. S.S Rattan, "Theory of Machines", 3rd Edition , Tata McGraw-Hill, New Delhi, 2000.

REFERENCES:

1. Thomas Bevan, "Theory of Machines" CBS Publishers, New Delhi, 2007.
2. J. Hannah & R.C. Stephens, "Mechanics of Machines" Elementary Theory and examples. 4th Edn (S9), Viva Books Pvt Ltd, New Delhi, 1984.

DESIGN OF MACHINE MEMBERS-I

CODE: AME1119

L	T	P	C
4	1	0	4

AIM AND OBJECTIVES:

This course is a continuation of the earlier course AME1103 Engineering Mechanics, AME1106 Mechanics of Solids, and AME1107 Materials Science and Metallurgy in which fundamentals like stresses, strains, static and varying loads, factor of safety, Hooke's law, and material properties such as tensile strength, shear strength, bearing strength were introduced. In this course the students are taught how to use these engineering principles for the design of simple engineering machine members such as threaded joints, power screws, riveted joints, welded joints, circular shafts, couplings, keys and mechanical springs. Students are taught to design for both strength and rigidity against both static and dynamic loads. This subject forms one of the core subjects in mechanical engineering curriculum.

UNIT-I

MECHANICAL ENGINEER'S DESIGN IN BROAD PERSPECTIVE AND LOAD ANALYSIS : Overview; safety, ecological, societal and overall design considerations; systems of units, methodology, work and energy, power, conservation of power.

Introduction to load analysis, equilibrium equations and free body diagrams, beam loading, force flow concept, critical sections, redundant supports, force flow concept applied to redundant ductile structures.

UNIT-II

MATERIALS : Introduction, static tensile stresses, engineering stress-strain curves, true stress – strain curves, energy – absorbing capacity, hardness tests, hand book data, machinability, materials selection charts.

UNIT-III

STATIC BODY STRESSES : Introduction, axial loading, direct shear loading, torsional loading, pure bending loading in straight beams, pure bending loading in curved beams, transverse shear, combined stresses – Mohr circle, 3-D stresses, stress concentration factory K_t.

UNIT-IV

DEFLECTION AND STABILITY : Introduction, deflection and spring rate, beam deflection, Euler column buckling, effective column lengths for column design equations, secant formula, equivalent column stresses, Finite Element Analysis of plane truss.

UNIT-V

FAILURE THEORIES, SAFETY FACTORS, RELIABILITY : Introduction, types of failure, theories of static failure, maximum normal stress theory, maximum shear theory, maximum distortion energy theory, modified selection and use of failure theories, safety factors, concept, definition, selection, reliability, normal distribution, interference theory of reliability prediction.

UNIT-VI

FATIGUE : Introduction, fatigue strength for rotation, bending, reverse bending and reverse biaxial loading, influence of size and surface on fatigue strength, summary of estimated fatigue strength for completely reversed loads, S-N curves, effect of mean stress on fatigue strength, Goodman and Soderberg principles, effect of stress concentration with completely reversed fatigue loads and with mean and alternating loads.

UNIT-VII

SURFACE DAMAGE : Introduction, types of wear, adhesive, abrasive, fretting, analytical approach to wear, Hertz contact stresses, surface fatigue failure.

UNIT-VIII

WELDED JOINTS : Introduction, types of welded joints, (Static) axial, direct shear, torsional and bending loading, fatigue considerations in welded joints.

TEXT BOOK:

1. R.C. Juvinall & K M Marshek, "Fundamental of Machine Components Design", John Wiley&Sons, 4th Edition, 2000.

REFERENCES:

1. Shigley and Mishke "Design of Machine Elements" McGraw. Hill Publication, 5th Edition, 1983.
2. Hall, Holowenko and Laughlin, "Theory and problems of Machine Design", Schaums Outline series, TMH.

Note: Design Data Book will not be permitted during the examination.

THERMAL ENGINEERING – II

CODE: AME1120

L	T	P	C
4	1	0	4

AIM AND OBJECTIVE:

The objective of this course is to expose the students, principle and working of various components associated with a thermal power plant. Also the students will be exposed to the Refrigeration systems and process associated with air conditioning.

UNIT-I

BASIC CONCEPTS : Rankine cycle – Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of heat addition, Methods to improve cycle performance – Regeneration and Reheating.

COMBUSTION : Fuels and combustion, concepts of heat reaction, adiabatic flame temperature, stoichiometry, and flue gas analysis.

UNIT-II

BOILERS : Classification, Working Principle of L.P and H.P Boilers.

BOILER MOUNTINGS AND ACCESSORIES : Working principles, performance, Equivalent evaporation, Efficiency and heat balance, Boiler Draught – Classification – Height of the chimney for a given draught, discharge, condition for maximum discharge and efficiency of the chimney – Artificial draught – Induced and forced.

UNIT-III

STEAM NOZZLES : Function of Nozzle – Applications and types, Flow through Nozzles, thermodynamic analysis – assumptions – Velocity at the Nozzle exit, actual expansion in the Nozzle, Velocity coefficient, Condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape – Supersaturated flow, its effects, Degree of Super saturation, Degree of under cooling – Wilson line.

UNIT-IV

STEAM TURBINES : Classification – Impulse turbine, Mechanical details, Velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – Condition for Maximum efficiency.

De-Laval turbine – its features, Methods to reduce rotor speed – Velocity compounding, Pressure compounding, Velocity and Pressure variation along the flow – Combined velocity diagram for a velocity compounded impulse turbine.

UNIT-V

REACTION TURBINE : Mechanical details – Principle of operation, thermodynamic analysis of a stage, degree of reaction – Velocity diagram – Parson's reaction turbine – Condition for maximum efficiency.

UNIT-VI

STEAM CONDENSERS : Components of a steam condensing plant – Classification – Working principle of different types – Vacuum efficiency and Condenser efficiency – Sources of air, Air leakage and its effects, Air pumps - Types – Condenser efficiency - Cooling water requirement.

UNIT-VII

INTRODUCTION TO REFRIGERATION : Necessity and application – Unit of Refrigeration and COP - Ideal cycle – Bell Coleman cycle – Classification of Refrigerants used – Nomenclature – Desirable properties.

VCRS – Working principle and essential components of the plant – Cycle analysis – Parameters affecting performance on VCRS – Numerical problems.

Vapor absorption system (VARS) – Calculation of maximum COP – Description and working of ammonia-water system (Ideal) – Differentiate VCRS and VARS.

UNIT-VIII

INTRODUCTION TO AIR CONDITIONING

Psychometric properties and processes – Concept of ESHF, RSHF,

GSHF and ADP – Problems – Requirements of human comfort and concept of effective temperature.

TEXT BOOKS:

1. R.K. Rajput, "Thermal Engineering", 6th Edition, Lakshmi Publications, 2008.
2. Arora and Domokundwar , "A course in Refrigeration and Air-conditioning", 7th Edition, Dhanpatrai and Co, 2005.

REFERENCES:

1. R. Yadav, "Thermodynamics and Heat Engines-II", 3th Edition, Central Book Depot, 1989.
2. D.S. Kumar, "Thermal Science and Engineering", 4th Edition, S.K. Kataria and Sons, 2010.
3. V.Ganesan, "Gas Turbines", 2th Edition, TMH, 2004.
4. Manohar Prasad, "Refrigeration and Air-conditioning", 2th Edition, New Age International Pub, 2003.

MACHINE TOOLS

CODE: AME1121

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

To make the students familiar with various machining processes used in industry for manufacturing the product. To provide the basic knowledge regarding machine tools and their machining process which they are likely to use during their professional careers.

UNIT-I

ELEMENTARY TREATMENT OF METAL CUTTING THEORY: Element of cutting process – Geometry of single point tool and angles, chip formation and types of chips – built up edge and its effects chip breakers. Mechanics of orthogonal cutting –Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life, coolants, machinability – Tool materials. Kinematic schemes of machine tools – Constructional features of speed gear box and feed gear box.

UNIT-II

ENGINE LATHE : Principle of working, specification of lathe – types of lathe – work holders, tool holders – Box tools, Taper turning, thread turning –Lathe attachments.

Turret and capstan lathes-collet chucks– tool holding devices –tool layout. Principal features of automatic lathes.

Classification – Single spindle and multi-spindle automatic lathes– tool layout.

UNIT-III

SHAPING SLOTTING AND PLANING MACHINES : Principles of working – Principal parts–specification, classification, operations performed, machining time calculation.

UNIT-IV

DRILLING AND BORING MACHINES : Principles of working, specifications, types, operations performed – tool holding devices – twist

drill – Boring machines – Fine boring machines – Jig Boring machine. Deep hole drilling machine.

UNIT-V

MILLING MACHINE : Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – milling operations , geometry of milling cutter – milling cutters – methods of indexing – Accessories to milling machines.

UNIT-VI

GRINDING MACHINE : Fundamentals – Theory of grinding – classification of grinding machine – cylindrical and surface grinding machine – Tool and cutter grinding machine – special types of grinding machines –Different types of abrasives – bonds specification of a grinding wheel and selection of a grinding wheel.

UNIT-VII

LAPPING, HONING AND BROACHING MACHINES : Comparison to grinding – lapping and honing, broaching-types of broaching machines, broaching tools, broaching operations.

UNIT-VIII

PRINCIPLES OF DESIGN OF JIGS AND FIXTURES AND USES: Classification of Jigs & Fixtures – Principles of location and clamping – Types of clamping & work holding devices. Typical examples of jigs and fixtures.

TEXT BOOKS:

1. B.S. Raghuwanshi, " Workshop Technology ", Vol. II, 10th Edition, Dhanpat Rai and Co., 2010.
2. R.K. Jain and S.C. Gupta, " Production Technology ", 16th Edition, Khanna publishers, 2001.

REFERENCES:

1. H.M.T. (Hindustan Machine Tools), " Production Technology", 1st Edition, TMH, 2004.
2. Kalpakjian and S R Schmid, "Manufacturing Engineering and Technology", 5th Edition, Pearson, 2006.

METROLOGY

CODE: AME1122

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

To acquire fundamental knowledge about mechanical measurements and measuring instruments. To understand the basic principles of measuring instruments and the precision measurement techniques.

UNIT-I

SYSTEMS OF LIMITS AND FITS : Introduction, nominal size, tolerance limits, deviations, allowance, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly. Indian standard Institution system – British standard system, International Standard system for plain and screwed work.

UNIT-II

LINEAR MEASUREMENT: Length standard, line and end standards slip gauges – calibration of the slip gauges, Dial indicator, micrometers.

MEASUREMENT OF ANGLES AND TAPERS: Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – Sine plate, rollers and spheres used to determine the tapers.

LIMIT GAUGES : Taylor's principle – Design of GO and NO GO gauges, plug, ring, snap, gap, taper, profile and position gauges.

UNIT-III

OPTICAL MEASURING INSTRUMENTS : Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses,interferometer.

FLAT SURFACE MEASUREMENT : Measurement of flat surfaces – instruments used – straight edges– surface plates – optical flat and auto collimator.

UNIT-IV

SURFACE ROUGHNESS MEASUREMENT : Differences between

surface roughness and surface waviness-Numerical assessment of surface finish – CLA, R.M.S Values – Rz values, Methods of measurement of surface finish-Tomlinson' s surface meter, profilograph. Talysurf, ISI symbols for indication of surface finish.

UNIT-V

MEASUREMENT THROUGH COMPARATORS : Comparators – Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.

UNIT-VI

SCREW THREAD MEASUREMENT : Elements of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

UNIT-VII

GEAR MEASUREMENT : Gear measuring instruments, Gear tooth profile measurement, Measurement of diameter, pitch, pressure angle and tooth thickness.

UNIT-VIII

MACHINE TOOL ALIGNMENT TESTS : Alignment tests on lathe, milling, drilling machine tools, preparation of acceptance charts.

COORDINATE MEASURING MACHINES.

Types of CMM, Role of CMM, and Applications of CMM.

TEXT BOOKS:

1. I C Gupta, "Engineering Metrology", 5e, Danpath Rai & Co, 2008.
2. R. K. Jain, Engineering Metrology, 20e, Khanna Publishers, 2007.

REFERENCES:

1. Connie Dotson L, "Fundamentals of Dimensional Metrology", 5th Edn. Thomson learning, 2007.
2. BIS standards on Limits & Fits (IS 919), Surface Finish (IS 2073), Machine Tool Alignment, 1993.

THERMAL ENGINEERING LAB

CODE: AME1123

L	T	P	C
0	0	3	2

AIM & OBJECTIVE:

To provide hands on experience in performing different analysis on I.C.Engines, Compressors and R&AC Machinery.

Any TEN of the following experiments are to be performed during the semester.

LIST OF EXPERIMENTS

1. I. C. Engines Valve / Port Timing Diagrams.
2. I .C Engines Performance Test on four-stroke Diesel Engines.
3. I.C. Engines Performance Test on two-stroke Petrol Engine.
4. Evaluation of Engine friction by conducting Morse test on 4-S Multi cylinder Petrol Engine retardation and motoring test on 4- S Diesel engine.
5. I.C. Engines Heat Balance.
6. I.C Engines A/F Ratio and Volumetric Efficiency.
7. Performance Test on a Variable Compression Ratio Engines, Economical speed test.
8. Performance Test on Reciprocating Air – Compressor unit
9. COP of a Refrigeration Unit.
10. Study of Boilers.
11. Dis-assembly/Assembly of Engines.
12. Performance of Air-Conditioning system.

MACHINE TOOLS AND METROLOGY LAB

CODE: AME1124

L	T	P	C
0	0	3	2

AIM & OBJECTIVE:

This laboratory course consists of two parts section A and section B two relevant theory courses one being Machine tools and the other, Metrology during the same semester. Section A provides hands on training an all conventional machine tools. Section B exposes the student to the handling of various precision measuring instruments.

Any SIX from the each section of the following experiments are to be performed during the semester

LIST OF EXPERIMENTS

SECTION - A: MACHINE TOOLS

1. Introduction of general purpose machines-Lathe, Drilling machine, machine, Shaper, Planing machine, Slotting machine, Cylindrical Grinder, Surface grinder and tool and cutter grinder.
2. Step turning and taper turing on lathe machine.
3. Thread cutting and Knurling on lathe machine.
4. Drilling and Tapping
5. Shaping and Planing.
6. Slotting.
7. Milling.
8. Cylindrical surface Grinding.
9. Grinding Tool angles.

SECTION - B: METROLOGY

1. Measurement of lengths, diameters by vernier calipers micrometers etc.

2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear tooth vernier calipers checking the chordal addendum and chordal height of spur gear.
4. Machine tool "alignment test on the lathe.
5. Machine tool alignment test on milling machine.
6. Tool makers microscope and its application.
7. Angle and taper measurements by Bevel protractor, Sine bars,etc.
8. Use of spirit level in finding the flatness of surface plate.
9. Thread measurement by Two wire/Three wire method or Tool makers microscope.
10. Surface roughness measurement by Talysurf.

SYLLABI FOR VI SEMESTER

INDUSTRIAL MANAGEMENT

CODE: AHM1103

L	T	P	C
4	0	0	4

OBJECTIVE:

To familiarize with the process of management and to provide the basic insights in effective and efficient running of an industry using its human and non-human resources in order to achieve its set goals and objectives.

OUTCOME:

To understand the management processes and evolve management levels for effective decision making.

UNIT-I

Concepts of Management and Organization – Meaning and Definition – Functions of Management, Evolution of Management Thought, Taylor's Scientific Management Theory, Fayols Principles of Management.

UNIT-II

Basic concepts of Organization - Departmentation and Decentralization, Delegation of authority and responsibility, Types of mechanistic and organic structures of organization (Line organization, Line and staff organization, functional organization) and their merits, demerits and suitability.

UNIT-III

Plant location, definition, factors affecting the plant location, comparison of rural and urban sites-methods for selection of plant- Matrix approach. Plant Layout – definition, objectives, types of production, types of plant layout – various data analyzing forms-travel chart.

UNIT-IV

Introduction to Human Resource Management, Functions of HRM, Manpower Planning, Job evaluation, different types of evaluation methods. Job description, Job analysis, Performance Appraisal, Merit Rating, Job

evaluation, different methods of merit ratings, Recruitment, Training and Skill Management.

UNIT-V

Materials Management-Objectives, Inventory – functions, types, associated costs (Ordering Cost, Carrying cost), Economic Order Quantity, Inventory classification techniques-ABC and VED analysis. Stores Management and Stores Records.

UNIT-VI

Work study - Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts-difference between micromotion and memomotion studies. Work measurement- definition, time study, steps involved-equipment, different methods of performance rating- allowances, standard time calculation.

UNIT-VII

Inspection and quality control, types of inspections - Statistical Quality Control-techniques-variables and attributes-assignable and non assignable causes- variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling plan- single sampling and double sampling plans-OC curves. Introduction to TQM.

UNIT-VIII

Project Management (PERT / CPM)

Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, probability of completing the project within given time, project cost analysis, project crashing (simple numerical problems)

TEXT BOOKS:

1. O.P. Khanna, "Industrial Engineering and Management", 2nd Edition, Dhanpat Rai Publications, 2008.
2. Martand Telsang, "Industrial Engineering and Production Management", 2nd Edition, Sultan Chand & Sons, 2008.
3. AR Aryasri," Management Science", 4th Edition, Tata McGraw-Hill,2009.

REFERENCES :

1. M Mahajan, "Industrial Engineering and Production", 2nd Edition Dhanpat Rai Publications, 2006.
2. B S Goel, Production & Operations Management , 22nd Pragati Prakasan, 2010.
3. S D Sharma, "Operations Research", 15nd edition, Kedar Nath Ram Nath Publishers, 2008.
4. Dale H Besterfield,Carol Besterfield, Glen H Besterfield,Mary Besterfield Total Quality Management 3rd Pearson Education 2005.
5. L M Prasad Principles and Practice of Management 7th S Chand & Sons, 2009.

OPERATIONS RESEARCH

CODE: ABM1110

L	T	P	C
4	0	0	4

AIM :

To facilitate the student acquire necessary Operations Research principles to solve Engineering problems.

OBJECTIVE:

The objective of the course is to acquaint the student in modeling, solving and analyzing problems using the concepts of Operations research.

UNIT-I

LINEAR PROGRAMMING PROBLEM : Introduction to OR, Linear Programming, Mathematical Formulation of the problem, Graphical Solution. General LPP, Canonical and standard form of LPP.

Simplex Method: Introduction, Computational Procedure, Use of artificial variables, Degeneracy in LPP

(1.1-1.4, 2.1 – 2.3, 3.1- 3.3, 3.4, 3.5, 4.1, 4.3 – 4.5., Proofs omitted)

UNIT-II

TRANSPORTATION PROBLEM : Introduction, LP formulation of Transportation Problem, The Transportation Table, Solution of Transportation problem, Finding IBFS: North-West Corner rule, Least –cost Method and VAM, Test for Optimality, Degeneracy in Transportation problem, Transportation Algorithm.

(10.1, 10.2, 10.5, 10.8 – 10.10, 10.12, 10.13, Proofs omitted)

UNIT-III

ASSIGNMENT PROBLEM : Introduction, Mathematical Formulation of the Problem, Hungarian Assignment Method only, Special Cases in Assignment Problems, formulation of the Traveling Salesman Problem.

(11.1, 11.2, 11.3 (4), 11.4, 11.7, Proofs omitted)

UNIT-IV

GAME THEORY : Introduction, Two Person Zero sum games, Maximin - Minimax principle, Games without saddle points- mixed strategies, Graphical solution of 2Xn, mX2 games, and Dominance property.

(17.1 – 17.7, Proofs omitted)

UNIT-V

SEQUENCING PROBLEM : Introduction, Problem of Sequencing, Processing n jobs through two machines. Processing n jobs through k-machines, Processing 2 jobs through two machines, maintenance crew scheduling (12.1-12.7, Proofs omitted)

UNIT-VI

INVENTORY CONTROL : Introduction, Types of Inventories, Costs associated with inventories, the concept of EOQ, Deterministic inventory problems with no shortages, with shortages.

(19.1-19.11,Proofs omitted)

UNIT-VII

REPLACEMENT PROBLEM : Introduction, Replacement of items that deteriorate gradually, Replacement of items that fails suddenly.

QUEUING THEORY : Introduction, Queuing system, elements of Queuing system Operating characteristics of a Queuing system, Classification of queuing models: Model-I (M/M/1:(∞/ FIFO)) , Model-III (M/M/1:(N/FIFO))

(18.1- 18.3, 21.1-21.4, 21.7-21.9, Proofs omitted)

UNIT-VIII

DYNAMIC PROGRAMMING : Introduction, The recursive equation approach, Dynamic programming algorithm, Solution of Discrete DPP (13.1 - 13.5, Proofs omitted)

TEXT BOOK:

1. Kanthi Swarup, P.K.Gupta and Man Mohan, " Operations Research" , Sultan Chand & Sons New Delhi, 14th Edition - 2008.

REFERENCES:

1. Hamdy. A. Taha, "Operations Research, An Introduction", Pearson Education, Seventh Edition, 2002.
2. SD Sharma, "Operation Research" Kedar Nath and Ram Nath - Meerut, 2008.

DESIGN OF MACHINE MEMBERS -II

CODE: AME1125

L	T	P	C
4	1	0	4

AIM AND OBJECTIVE:

This course is a continuation of the earlier course (Design of Machine Members-I) in which fundamentals like factor of safety, theories of failure, design for fatigue etc,. were introduced. The philosophy and methodology of designing machine elements like bearings, belt drives, power screws, gears, engine parts etc., is taught to the student. An additional skill gained is referring to a design data handbook. Thus this subject forms one of the core subjects in a mechanical engineers curriculum.

UNIT-I

THREADED FASTENERS: Introduction, thread forms, terminology, standards, threaded fastener types, materials, bolt tightening, initial tension, thread locking, bolt design for static loads, axial and eccentric and fatigue loads.

UNIT-II

POWER SCREWS : Introduction, comparison of types of power screw threads, differential and compound power screws, derivations for torque for lifting, lowering, self locking conditions , efficiency, effect of collar friction, design of power screws, applications, screw jack, C- clamp.

UNIT-III

SPRINGS : Introduction, types and terminology, Design of helical springs –static and fluctuating loads, shear stress, deflection, spring rate, initial compression, types of ends, buckling, surging, helical torsion springs, spiral torsion springs, leaf springs – bending stress, deflection.

UNIT-IV

BEARINGS : Introduction, sliding bearings, basic concepts of hydrostatic and hydrodynamic lubrication, Petroff, Steinbeck, Mc Kee's equations,

bearing design, design charts, heat dissipation and equilibrium oil film temperature, rolling contact bearings – Introduction, types, comparison with sliding element bearings, design and selection of rolling bearings – static loads dynamic load, life, reliability, influence of axial load, variable loads.

UNIT-V

SPUR AND HELICAL GEARS : Spur Gears, gear tooth strength, basic analysis of gear tooth bending stress (Lewis equation), velocity factor, service factor, overload correction factor, Buckingham equation for incremental dynamic load, gear tooth surface durability and fatigue analysis, helical gears – geometry, force analysis, tooth bending, surface fatigue strength.

UNIT-VI

SHAFT, KEYS AND COUPLINGS : Introduction, terminology, overall shaft design, axial bending and torsional loading design for torsional rigidity, keys, pins and splines, types of couplings, concept of shaft alignment.

UNIT-VII

IC ENGINE COMPONENTS : Introduction, piston, piston pin, connecting rod, big end bearings and crankshaft bearings.

UNIT-VIII

CHAIN DRIVES, WIRE ROPES : Introduction to chain drives, roller chains, inverted – tooth chains, geometric relationships, polygon effect, power rating, design of chain drives.

Wire rope types – construction, breaking strength, selection of wire ropes

TEXT BOOKS:

1. RC Juvinall & K M Marshek, "Fundamental of Machine Components Design", John Wiley&Sons, 4th Edition, 2000.
2. Design Data Hand Book, PSG College of Technology, Coimbatore, 1992.

REFERENCE:

1. V. B. Bhandari, "Design of Machine Elements", Third Edition, Tata McGraw-Hill, 1990.

Note: *Design Data Book to be permitted during the examination*

HEAT TRANSFER

CODE: AME1126

L	T	P	C
4	1	0	4

AIM AND OBJECTIVE:

To make the students understand the principles of heat transfer and its wide applications and with design of heat exchange equipment.

UNIT-I

INTRODUCTION : Modes and Mechanisms of heat transfer – Basic laws of heat transfer – Applications of heat transfer.Conduction Heat Transfer: Fourier heat conduction equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.

UNIT-II

SIMPLIFICATION AND FORMS OF FIELD EQUATION ; Steady, unsteady and periodic heat transfer - Initial and boundary conditions.

ONE DIMENSIONAL STEADY STATE HEAT CONDUCTION

Homogeneous slab, hollow cylinders and spheres - Overall heat transfer coefficient - electrical analogy - Critical radius of insulation. Variable thermal conductivity – systems with Heat Generation. Extended surfaces - Introduction and classification, long fin, fin with insulated tip and short fin, Application to error measurement of temperature.

UNIT-III

ONE DIMENSIONAL TRANSIENT HEAT CONDUCTION : Introduction, lumped heat capacity analysis, Significance of Biot and Fourier numbers - Chart solutions of transient conduction systems.

UNIT-IV

CONVECTIVE HEAT TRANSFER-INTRODUCTION,

APPLICATIONS : Concepts of continuity, momentum and energy equations - Classification of convective systems based on causation flow, medium, configuration and condition of flow Forced convection.

DIMENSIONAL ANALYSIS : Introduction, applications to heat transfer, Buckingham ð Theorem and method, applications for developing semi-empirical non-dimensional correlation fro convection heat transfer - Significance of Non Dimensional numbers in heat transfer.

UNIT-V

EXTERNAL FLOWS : Concepts of Hydrodynamic and thermal Boundary layer - Classification of internal flows based on hydrodynamic and thermal entry lengths and use of empirical correlations for convective heat transfer – Flat plates and Cylinders.

Internal Flows: Concepts of Hydrodynamic and thermal Entry lengths and use of empirical correlations for horizontal and annulus flow.

Free convection: Hydrodynamic and thermal boundary layer along vertical plate - Empirical correlations for Vertical plates and Pipes.

UNIT-VI

HEAT TRANSFER WITH PHASE CHANGE : Introduction, boiling heat transfer phenomena - Pool boiling - Regimes of pool boiling, correlations for pool boiling, critical heat flux and film boiling.

CONDENSATION : Film and drop wise condensation – Nusselt theory of film condensation on a vertical plate - Film Condensation on a vertical plate and horizontal cylinder using empirical correlations.

UNIT-VII

HEAT EXCHANGERS : Introduction - Classification of Heat Exchangers - Concept of overall and fouling resistances - Concept of LMTD and NTU methods – NTU method for heat exchanger design – Problems using LMTD and NTU methods.

UNIT-VIII

RADIATION HEAT TRANSFER : Introduction - Emission characteristics and Laws of black body radiation – Irradiation - total and

monochromatic quantities - Plancks law and Weins law, Laws of Kirchoff, Lambert, Stefan Boltzmann - Heat exchange betweent two balck bodies - Concept of shape factor – Emissivity – Heat Exchange between two grey bodies - Radiation shields - Electrical analogy for radiation networks.

TEXT BOOKS:

1. D.S.Kumar, "Heat and Mass Transfer", 7th Edition, S.K.Kataria & Sons, 2008.
2. R C Sachdeva, "Fundamentals of Engg. Heat and Mass Transfer", 3rd Edition, New Age International, 2008.

REFERENCES:

1. J.P.Holman, "Heat Transfer", 9th Edition, Tata McGraw Hill, 2008.
2. Incropera and Dewitt, "Fundamentals of Heat Transfer and Mass Transfer", 5th Edition John Wiley Pub, 2007.
3. P.K.Nag, "Heat Transfer", 2th Edition, Tata McGraw Hill, 2007.

INSTRUMENTATION AND CONTROL SYSTEMS

CODE: AME1127

L	T	P	C
4	0	0	4

AIMS AND OBJECTIVE:

To impart the knowledge of basic engineering measurement systems. To introduce students to electronic control systems associated with automatically controlling the measuring parameters.

To enable students to practically apply the principles of measurement to engineering applications/ projects.

UNIT-I

Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics –sources of error, Classification and elimination of error.

UNIT-II

MEASUREMENT OF DISPLACEMENT: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

MEASUREMENT OF TEMPERATURE : Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance – Thermistor – Thermocouple – Pyrometers – Temperature Indicators.

UNIT-III

MEASUREMENT OF PRESSURE : Units – classification – different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity

gauges – ionization pressure gauges, Mcleod pressure gauge, Knudsen gauge. Calibration of pressure gauges.

UNIT-IV

MEASUREMENT OF LEVEL : Direct method – Indirect methods – capacitative, ultrasonic, magnetic, cryogenic fuel level indicators – Bubler level indicators.

FLOW MEASUREMENT : Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

UNIT-V

MEASUREMENT OF SPEED : Mechanical Tachometers – Electrical tachometers – Stroboscope, Noncontact type of tachometer

MEASUREMENT OF ACCELERATION AND VIBRATION : Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle.

UNIT-VI

STRESS STRAIN MEASUREMENTS: Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, Strain gauge Rosettes. Strain gauge calibration.

UNIT-VII

MEASUREMENT OF HUMIDITY – Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

MEASUREMENT OF FORCE,TORQUE AND POWER- Elastic force meters, load cells, Torsion meters, Dynamometers.

UNIT-VIII

ELEMENTS OF CONTROL SYSTEMS: Introduction, Importance – Classification – Open and closed systems Servomechanisms–Examples with block diagrams–Temperature, speed & position control systems.

TEXT BOOKS:

1. D.S Kumar, "Measurement Systems: Applications & Design", 6th Edition, Metropolitan,2002.
2. A.K.Sawhney, "Mechanical Measurement and Instrumentation", 3rd Edition, Dhanpat Rai, 2004.

REFERENCES:

1. Holman, "Experimental Methods for Engineers", 3rd Edition, McGraw-Hills, 2000.
2. B.C.Nakra & K.K.Choudhary, "Instrumentation measurement & analysis", 4th Edition, TMH,1999.

PRODUCTION PLANNING AND CONTROL

CODE: AME1128

L	T	P	C
4	0	0	4

AIM AND OBJECTIVES:

To learn about production organization and various aspects of production preplanning like design, forecasting etc.To gain the knowledge of production planning of materials, machines and manpower. To learn various production control functions like routing, expediting, dispatching etc.

UNIT-I

INTRODUCTION : Definition – Objectives of production Planning and Control – Functions of production planning and control – Elements of production control – Types of production – Organization of production planning and control department – Internal organization of department – Product design factors – Process Planning sheet.

UNIT-II

FORECASTING – Importance of forecasting – Types of forecasting, their uses – General principles of forecasting – Forecasting techniques – qualitative methods and quantitive methods.

UNIT-III

INVENTORY MANAGEMENT : Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P–Systems and Q-Systems.

UNIT-IV

Introduction to MRP & ERP, LOB (Line of Balance), JIT inventory, and Japanese concepts, Introduction to supply chain management.

UNIT-V

ROUTING : Definition – Routing procedure – Route sheets – Bill of material – Factors affecting routing procedure. Scheduling – definition – Difference with loading.

UNIT-VI

SCHEDULING POLICIES : Techniques, Standard scheduling methods.

UNIT-VII

Line Balancing, Aggregate planning, Chase planning, Expediting, controlling aspects.

UNIT-VIII

DISPATCHING : Activities of dispatcher – Dispatching procedure – follow up – definition – Reason for existence of functions – types of follow up, applications of computer in production planning and control.

TEXT BOOKS:

1. Samuel Eilon, "Elements of Production Planning and Control", 1st Edition, Universal Publishing Corp., 1999.
2. Baffa & Rakesh Sarin, "Modern Production / Operations Management", 8th Edition, John Wiley & Sons, 2002.

REFERENCES:

1. P Rama Murthy, "Production and Operations Management" 1st Edition, New Age, 2002.
2. S.N. Chary, "Operations Management" 1st Edition, TMH, 1996.
3. Joseph Monks, "Operations Management Theory and Problems", 3rd Edition, McGraw-Hills, 1987.
4. S L Narasimhan, McLeavey, Billington, "Production Planning and Inventory Control", 2nd Edition, PHI, 2002.
5. John E. Biegel, "Production Control A Quantitative Approach" 1st Edition, 1963.

ADVANCED COMMUNICATION SKILLS LAB

CODE: AHE1103

L	T	P	C
0	0	3	2

INTRODUCTION

The introduction of English Language Lab is considered essential at III/ IV B.Tech year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context. This is an integrated theory and lab course to enable students use 'good' English and perform the following:

- Gathering ideas and information: organizing ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research/technical reports
- Making oral presentations.
- Writing formal letters and essays.
- Transferring information from non-verbal to verbal texts and vice versa.
- Taking part in social and professional communication.

OBJECTIVES:

The Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

- To improve the students' accuracy and fluency in English through a well-developed vocabulary, and enable them listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.

- To enable them communicate their ideas relevantly and coherently in writing.

TEXT BOOK: LANGUAGE IN USE (Upper-Intermediate) ***by Adrian Doff and Christopher Jones, Cambridge University Publications.***

UNIT-I

- Reading and Listening comprehension – reading for facts, guessing meanings from context, scanning, skimming, inference, critical reading
- (Lesson 2: Communicating)

UNIT-II

- Vocabulary building, Creativity & Innovation, Using Advertisements and Music, Case studies
- Decision-Making, Time Management, Positive Thinking
- (Lesson 4: Sports and Games, Lesson 8: In The Market-Place)

UNIT-III

- Cross-Cultural Communication- Problems of Language, Lack of Language equivalency/difficulties in using English.
- Non-Verbal Communication across different Cultures.
- (Lesson 13: Right and Wrong)

UNIT-IV

- Literary reviews- reviewing the choicest genres like science fiction, autobiographies, travelogues, modern poetry etc.

UNIT-V

- Group Discussion – dynamics of group discussion , Lateral thinking, Brainstorming and Negotiation skills

(Lesson 10: Life, the universe and everything & Lesson 16: World Affairs)

UNIT-VI

- Resume writing – structure and presentation, planning, defining the career objective

- Interview Skills – concept and process, pre-interview planning, opening strategies, answering-strategies, interview through tele and video-conferencing

UNIT-VII

- Writing essays for competitive examinations
- Media writing-writing headlines, analyzing newspaper articles
- Analytical writing

UNIT-VIII

- Technical Report writing – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.- Progress and Project Reports.

RECOMMENDED BOOKS:

COMMUNICATIONS SKILLS

1. M. Ashraf Rizvi, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Ltd., 2005.
2. Bhanu Ranjan, "An Approach to Communication Skills", DhanpatRai &Co, 2010.
3. Raymond V. Lesikar, Marie E. Flatley, "Basic Business Communication: Skills for Empowering The Internet Generation", 11th Edition, Tata McGraw-Hill. 2006.
4. Stephen Bailey, "Academic Writing- A Practical guide for students", Routledge Falmer, London & New York, 2004.
5. Dr A. Ramakrishna Rao, Dr G.Natanam & Prof S.A. Sankaranarayanan, "English Language Communication : A Reader cum Lab Manual", Anuradha Publications, Chennai, 2006.
6. Dr. Shalini Verma, "Body Language- Your Success Mantra", S. Chand, 2006.
7. Barron's, "DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice", New Age International (P) Ltd., Publishers, New Delh, Books on TOEFL/GRE/GMAT/CAT, 2011.
8. "IELTS series with CDs", CUP, 2010.

9. Daniel G. Riordan & Steven E. Pauley, "Technical Report Writing Today", Biztantra Publishers, 2005.
10. Andrea J. Rutherford, "Basic Communication Skills for Technology", 2nd Edition, Pearson Education, 2007.
11. Sunita Mishra & C. Muralikrishna, "Communication Skills for Engineers", Pearson Education, 2007.
12. Jolene Gear & Robert Gear, "Cambridge Preparation for the TOEFL" Test, 2010.
13. Meenakshi Raman & Sangeeta Sharma, "Technical Communication", OUP, 2010.
14. Nick Ceremilla & Elizabeth Lee, "Cambridge English for the Media", CUP, 2010

GENERAL READING

1. A Reader's Digest Selection, "Classic Short Stories" (India Today group), 2004.
2. Saros Cowasjee, "More Stories from the Raj and After", HarperCollins Publishers India, 1986.
3. Girish Karnad, "Hayavadana", OUP 1976.
4. A.P.J. Abdul Kalam "Wings of Fire", Universities Press, 1999.
5. Bernard Shaw, "Apple Cart/Arms and the Man", Orient Longman, 2010.
6. Khalil Gibran, "The Prophet" - Rajapal & Sons, 2008.

HEAT TRANSFER LAB

CODE: AME1129

L	T	P	C
0	0	3	2

AIMS AND OBJECTIVES:

To expose the students to different mechanisms of heat transfer experimentally. The student will be able to correlate the experimental results with theory.

Any TEN of the following experiments are to be performed during the semester

LIST OF EXPERIMENTS

1. Thermal Conductivity of a given metal rod.
2. Heat transfer through composite slab
3. Heat transfer through lagged pipe
4. Heat transfer through composite sphere
5. Heat transfer through extended surface – pin fin
6. Transient heat conduction
7. Forced convection heat transfer in tube flow
8. Natural / Free convection heat transfer
9. Parallel and counter flow heat exchanger
10. Emissivity apparatus
11. Stefan-Boltzmann's apparatus
12. Condensation heat transfer
13. Critical heat flux apparatus
14. Study of Heat pipe and Demonstration

SYLLABI FOR VII SEMESTER

CAD/CAM

Course Code: AME1130

L	T	P	C
4	0	0	4

AIM AND OBJECTIVES:

To provide the students basic understanding of modern trends in design and manufacturing using CAD/CAM

UNIT-I

INTRODUCTION TO CAD/CAM : Product cycle, Design process, Application of computers for design, benefits of CAD.

CAD / CAM hardware: Design workstation, graphics terminal, input devices, output devices, CPU, storage devices.

UNIT-II

COMPUTER GRAPHICS: Coordinate systems, database structures for graphic modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT-III

GEOMETRIC MODELING : Requirements, geometric models, geometric construction methods, wire frame model, curve representation methods, surface model, surface representation methods, modeling facilities desired.

UNIT-IV

DRAFTING AND MODELING SYSTEMS : An overview of CAD software, basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling, constraint based modeling.

UNIT-V

NUMERICAL CONTROL : Basic components of NC system, NC procedure, Coordinate systems, NC motion control systems, applications, economics of NC, CNC, DNC, adaptive control, machining centers.

UNIT-VI

CNC PROGRAMMING : Part programming fundamentals, manual part programming, preparatory functions, miscellaneous functions, canned cycles, Computer Aided Part Programming, APT language structure, geometry commands, motion commands, post processor commands.

UNIT-VII

GROUP TECHNOLOGY : Part family, parts classification and coding, machine cells, benefits of group technology, computer aided process planning.

Computer Aided Quality Control: Terminology in quality control, computer in QC, contact inspection methods, noncontact inspection methods, integration of CAQC with CAD/CAM.

UNIT-VIII

FLEXIBLE MANUFACTURING SYSTEMS: FMS equipment, system layouts, FMS control, case study.

CIM: Integration, CIM implementation, Benefits of CIM, lean manufacturing.

TEXT BOOKS:

1. P.N. Rao, CAD / CAM Principles and Applications, TMH, second edition, 2008
2. M.P. Groover and E.W. Zimmers, CAD/CAM , PHI, First edition, 1995

REFERENCES:

1. Ibrahim Zeid, CAD / CAM Theory and Practice,TMH, special Indian edition, 2007
2. T.K. Kundra, P.N. Rao and N.K. Tewari, "Numerical Control and Computer Aided Manufacturing",TMH, 1st Edition, 2002
3. Chris McMahon and Jimmie Browne, "CAD/CAM Principles, Practice and Manufacturing Management", Pearson education, 2nd Edition, 2001.

ROBOTICS

Course Code: AME1131

L	T	P	C
4	1	0	4

AIM AND OBJECTIVES:

1. To study various industrial robots and their applications.
2. To study kinematics and dynamics associated with the robot linkages.

UNIT-I

INTRODUCTION : Automation and Robotics, CAD/CAM and Robotics, An over view of Robotics, present and future applications, classification by coordinate system and control system.

UNIT-II

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom; Requirements and challenges of end effectors, determination of the end effectors.

UNIT- III

MOTION ANALYSIS : Homogeneous transformations as applicable to rotation and translation – problems.

UNIT-IV

MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates, Forward and inverse kinematics – problems.

UNIT-V

Differential transformation and manipulators, Jacobians – problems. Dynamics: Lagrange-Euler and Newton- Euler formations – Problems.

UNIT-VI

Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion, straight line motion; Robot programming, languages and software packages.

UNIT-VII

ROBOT ACTUATORS AND FEED BACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, Servo motors, Stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders; Velocity sensors; Tactile, Proximity and Range sensors.

UNIT-VIII

ROBOT APPLICATIONS IN MANUFACTURING : Material Transfer - Material handling, loading and unloading; Processing - spot and continuous arc welding & spray painting; Assembly and Inspection.

TEXT BOOKS:

1. Groover M P, "Industrial Robotics", Edition, Pearson Edu, 2002.
2. Mittal R K & Nagrath, "Robotics and Control ", 2nd Edition, TMH, 2008.

REFERENCES:

1. Fu K S, "Robotics", Edition, McGraw Hill, 2004.
2. P. Coiffet and M. Chaironze, "An Introduction to Robot Technology", Edition, Kogam Page Ltd., 1983 London.
3. Richard D. Klafter, "Robotic Engineering", Edition, Prentice Hall, 1998.
4. John J Craig, "Introduction to Robotics", Edition, Pearson Edu. 2005.
5. Mark W. Spong and M. Vidyasagar, "Robot Dynamics & Control", John Wiley & Sons (ASIA) Pte Ltd.

FINITE ELEMENT METHOD

Course Code: AME1132

L	T	P	C
4	0	0	4

AIM AND OBJECTIVES:

The present course introduces the final year student to the theory behind the fundamental concepts of FEM like discretization, nodes, degrees of freedom, , global stiffness matrix, Load vector, isoparametric representation etc.

At the end of the course the student will be in a position to use as well as validated if necessary related software with confidence.

UNIT-I

Introduction to Finite Element Method for solving field problems, Stress and Strain, Equilibrium equations, Strain–Displacement relations, Stress–Strain relations.

UNIT-II

ONE-DIMENSIONAL PROBLEMS : Finite element modeling, coordinates and shape functions. Potential Energy approach, Galerkin approach, Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT-III

ANALYSIS OF PLANE TRUSSES : Local and Global Coordinate systems, Transformation matrix, Element stiffness matrix, Stress calculations.

Analysis of Beams**:** Element stiffness matrix for two node, two degrees of freedom per node beam element.

UNIT-IV

Two dimensional problems using constant strain triangles, Isoparametric representation, Problem modeling and boundary conditions.

UNIT-V

Axisymmetric solids subjected to Axisymmetric loading with triangular elements.

UNIT-VI

Two dimensional four noded isoparametric elements and numerical integration.

UNIT-VII

STEADY STATE HEAT TRANSFER ANALYSIS : one dimensional analysis of a fin and two dimensional analysis of thin plate.

UNIT-VIII

DYNAMIC ANALYSIS : Formulation of finite element model, element matrices, evaluation of Eigen values and Eigen vectors for a stepped bar and a beam.

TEXT BOOK:

1. Chandrupatla TR, and Belegundu AD, Introduction to Finite Elements in Engineering, Prentice Hall of India, 3rd Edition, 2009.

REFERENCES:

1. SS Rao, "The Finite Element Methods in Engineering", Pergamon Press, 2nd Edition, 1999.
2. JN Reddy, "An introduction to Finite Element Method", McGraw Hill, 3rd Edition, 2007.
3. Zienkiewicz, "The Finite Element Method in Engineering Science", McGraw Hill, 1971.

MECHATRONICS

Course Code: AME1133

L	T	P	C
4	1	0	4

AIM & OBJECTIVE :

Mechatronics is the new industrial discipline for understanding how complex systems integrate various elements in the mechanical, fluid power, and controls domain, combined with the ability to work in a team environment with people of different areas of expertise. Students will learn the necessary background and technical skills to build simple home made projects using electronic devices integrating with mechanical principles/systems.

UNIT-I

INTRODUCTION TO MECHATRONICS: Elements of Mechatronic system, system, measurement systems, control systems - open loop, closed loop systems, feed back and feed forward control systems, servomechanisms, applications of mechatronic systems; An overview of different sensors and transducers.

UNIT-II

SIGNAL CONDITIONING : Introduction, Analog signal processing; Noise reduction and filtering, Passive and active filters, types of filters; operational amplifiers- circuits for inverting, non inverting, difference amplifiers, integrator, differentiator, comparator and sample and hold applications (no analytical treatment.); ADC; DAC; Data acquisition; Digital signal processing.

UNIT-III

ACTUATION SYSTEMS : Pneumatic and Hydraulic systems, Overview of components of hydraulic system, overview of components of electro-pneumatic systems; Basic hydraulic circuits-single acting cylinder, double acting cylinder, sequencing circuit

Electrical actuating systems : Relays, types of DC motors, AC motors, Stepper motor, servo motor, Induction motor.

UNIT-IV

INTRODUCTION TO DIGITAL LOGIC : Logic gates-AND, OR, NOT, NAND, NOR, XOR, Boolean algebra, simple applications of Logic Gates, sequential logic, Introduction to Flip-Flops, Registers.

UNIT-V

MICROPROCESSORS AND MICROCONTROLLERS OVERVIEW : Structure of microcomputer, block diagram of microprocessor, block diagram of microcontroller, application of microprocessor control: temperature monitoring system, washing machine system.

UNIT-VI

PROGRAMMING LOGIC CONTROLLERS : Basic Structure, Programming, Ladder diagram, Timers, Internal Relays, Counters, Shift Registers, Master and Jump Controls, Data Handling and manipulation.

UNIT-VII

BASIC SYSTEM MODELS : Basic concepts on mechanical, electrical, fluid and thermal systems building blocks; System transfer functions: Laplace transforms and applications to first order functions; Process controllers-P, PI, PID Control modes.

UNIT-VIII

PROGRAMMABLE MOTION CONTROLLERS : Multi axis Interpolation, PTP, Linear, Circular; Core functionalities: Home, Record position, Go to Position; Design of mechatronic system: coin counter, engine management system, antilock brake system, automatic camera.

TEXT BOOKS:

1. K. P. Ramachandran, et al, "Mechatronics-Integrated Mechanical Electronic Systems", 1st Edition, Wiley India pvt, Ltd., 2008.

2. R.K. Rajput, "A text book of Mechatronics", 1st Edition, S. Chand and Company Ltd., 2007

REFERENCES:

1. Bolton W., "Mechatronics, Electronics Control Systems in Mechanical and Electrical Engineering", 3rd Edition, Pearson Education Press, 2005

2. Histand B.H., Alciatore D.G., "Introduction to Mechatronics and Measurement Systems", 3rd Edition, Tata McGraw Hill Publishing Company Ltd, 2007.

DESIGN OPTIMIZATION

(ELECTIVE - I)

Course Code: AME1134

L	T	P	C
4	0	0	4

AIM:

The student will be able to:

- acquire the insights into different optimization methods, technology and terminology
- analyse, formulate and solve optimization problems
- evaluate the optimization results and suggest possible changes in the existing design solution

OBJECTIVES:

- To provide basic knowledge in recent design optimization methods
- To demonstrate the optimal design of typical problems in engineering

UNIT-I

Introduction, General Characteristics of mechanical elements, adequate and optimum design, principles of optimization, formulation of objective function, design vector, design constraints, constraint surface, Classification of optimization problems.

UNIT-II

CLASSICAL OPTIMIZATION TECHNIQUES : Single variable optimization - Multivariable optimization without constraints - Multivariable optimization with equality constraints: direct substitution method and method of Lagrange multipliers.

UNIT-III

UNCONSTRAINED NONLINEAR SINGLE VARIABLE OPTIMIZATION : Unimodal function, Exhaustive search, Interval halving method, Golden Section method, Quadratic search, Newton method.

UNIT-IV

UNCONSTRAINED NONLINEAR MULTIVARIABLE OPTIMIZATION: Univariate search, Steepest descent (Cauchy's) method, Fletcher-Reeves method, Newton's method.

UNIT-V

CONSTRAINED NONLINEAR OPTIMIZATION PROBLEMS: Characteristics - Interior penalty function method and exterior penalty function method

UNIT-VI

GEOMETRIC PROGRAMMING : Introduction - Solution by differential calculus - Solution by arithmetic-geometric inequality - Degree of difficulty - Optimization of zero degree of difficulty problems.

UNIT-VII

Concepts of Multi-objective optimization and Multi-stage optimization.

Introduction to Genetic Algorithms, Simulated Annealing and Neural Networks.

UNIT-VIII

ENGINEERING APPLICATIONS : Optimal design of beams and torsionally loaded shafts- Optimal design of springs.

TEXT BOOKS:

1. Singerusu S. Rao, "Engineering Optimization -Theory and Practice", New Age International, 2006.
2. Kalyanmoy Deb, "Optimization for Engineering Design-Algorithms and Examples", PHI, 1996.

REFERENCES:

1. Ashok D. Belegundu and Tirupathi R. Chandrupatla, "Optimization Concepts and Applications in Engineering", Pearson Education, Asia, 2002.
2. Johnson, Ray C., "Optimum Design of Mechanical Elements", Johnson Wiley & Sons, Ic., NY, 1980.
3. Goldberg D. E., "Genetic Algorithms in Search, Optimization and Machine", Addison-Wesley, NY.

NON CONVENTIONAL SOURCES OF ENERGY

(ELECTIVE –I)

Course Code: AME1135

L	T	P	C
4	0	0	4

AIM:

To introduce and familiarize the student with the various renewable sources of energy.

OBJECTIVE:

Renewable sources of energy is an area of research and development especially for countries like India. So the student should be in a position to take up small scale projects, as entrepreneurs, since the cost of investment is minimal in some of the sources.

UNIT-I

Introduction to various renewable sources of energy.

SOLAR RADIATIONS: Extra terrestrial radiation, Spectral distribution, Solar constant, Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Longitude, Latitude, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Solar altitude angle expression for angle between incident beam and the normal to a plane surface (no derivation), Local apparent time, Apparent motion of sun, Day length, Solar radiation data for India.

UNIT-II

SOLAR ENERGY : Solar thermal power and its conversion, Solar collectors, Flat plate, Performance analysis of flat plate collector, Solar concentrating collectors, Types of concentrating collectors, Cylindrical collectors, Thermal analysis of solar collectors, Tracking CPC and solar swing . Solar thermal energy storage, Different systems, Solar pond. Applications - Water heating, Space heating & cooling, Solar distillation, solar pumping, solar cooking, Greenhouses, Solar power plants.

SOLAR PHOTOVOLTAIC SYSTEM : Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photovoltaic system, Standards of solar photovoltaic system, Applications of PV system, PV hybrid system.

UNIT-III

WIND ENERGY: Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals, Types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, performance characteristics, Betz criteria Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Selection of a wind mill, Wind energy farms, Economic issues, Recent developments.

UNIT-IV

BIO-MASS AND BIO-GAS: Principles of Bio-Conversion, Photosynthesis, Bio gas production, Aerobic and anaerobic bio-conversion process, Raw materials, Properties of bio gas, Producer gas, Transportation of bio gas, bio gas plant technology & status, Community biogas plants, Problems involved in bio gas production, Bio gas applications, Biomass conversion techniques, Biomass gasification, Energy recovery from urban waste, Power generation from liquid waste, Biomass cogeneration, Energy plantation, Fuel properties, Biomass resource development in India.

UNIT-V

OCEAN ENERGY: Principle of ocean thermal energy conversion, Wave energy conversion machines, Power plants based on ocean energy, Problems associated with ocean thermal energy conversion systems, Thermoelectric OTEC, Developments of OTEC.

TIDAL POWER: Tides and waves as sources of energy, Fundamentals of tidal power, Use of tidal energy, Limitations of tidal energy conversion systems.

UNIT-VI

GEOTHERMAL ENERGY: Structure of earth's interior, Geothermal sites, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principle of working, Types of geothermal station with

schematic representation, Site selection for geothermal power plants. Advanced concepts, Problems associated with geothermal conversion.

UNIT-VII

ELECTROCHEMICAL EFFECTS AND FUEL CELLS: Principle of operation of an acidic fuel cell, Reusable cells, Ideal fuel cells, Other types of fuel cells, Comparison between acidic and alkaline hydrogen-oxygen fuel cells, Efficiency and EMF of fuel cells, Operating characteristics of fuel cells, Advantages of fuel cell power plants, Future potential of fuel cells

HYDROGEN ENERGY: Properties of hydrogen in respect of its use as source of renewable energy, Sources of hydrogen, Production of hydrogen, Storage and transportation, Problems with hydrogen as fuel, Development of hydrogen cartridge, Economics of hydrogen fuel and its use.

UNIT-VIII

DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, Principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule-Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects.

TEXT BOOK:

Rai G.D, "Non-Conventional energy Sources", Khanna Publishers, 4th Editon, 2008

REFERENCE:

Kothari D.P., "Renewable Energy resources and Emerging Tech"., Prentice Hall of India Pvt. Ltd, 1st Edition, 1990.

RAPID PROTOTYPING

(ELECTIVE - I)

Course Code: AME 1136

L	T	P	C
4	0	0	4

AIM:

- Generating a good understanding of RP and applications.
- Expose the students to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.

OBJECTIVES :

The student will able to:

- Understand the principles of RP and its applications.
- Acquaint with different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.

UNIT-I

INTRODUCTION: Prototype, Historical Development, Fundamentals of Rapid Prototyping, Advantages of Rapid Prototyping, Applications, Commonly Used Terms, Classification of RP System.

Rapid Prototyping Process Chain: Process Chain, Data Conversion and Transmission, Checking and Preparing, Building, Post processing.

UNIT-II

LIQUID BASED RAPID PROTOTYPING SYSTEMS : Principle of operation, process details, data preparation, data files, machine details and applications - Stereo lithography Apparatus (SLA), Solid Ground Curing (SGC)

UNIT-III

SOLID BASED RAPID PROTOTYPING SYSTEMS: Principle of operation, process details, data preparation, data files, machine details and applications - Laminated Object Manufacturing (LOM), Fused Deposition Modeling (FDM), Paper Lamination Technology (PLT)

UNIT-IV

POWDER-BASED RAPID PROTOTYPING SYSTEMS : Principle of operation, process details, data preparation, data files, machine details and applications - Selective Laser Sintering (SLS), Three- Dimensional Printing (3DP), Laser Engineered Net Shaping (LENS), Direct Shell Production Casting (DSPC).

UNIT-V

RAPID TOOLING : Indirect Rapid tooling - Silicon rubber tooling - Aluminum filled epoxy tooling Spray metal tooling, Cast kirksite, 3D keltool; Direct Rapid Tooling - AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, ProMetal, Sand casting tooling, Laminate tooling soft Tooling vs. hard tooling.

UNIT-VI

RAPID PROTOTYPING DATA FORMATS AND SOFTWARE: STL Format, STL File Problems, Consequences of Building a Valid and Invalid, Tessellated Model, Overview of Solid view, magics, mimics, magic communicator. Collaboration tools, Rapid Manufacturing Process Optimization: factors influencing accuracy, data preparation errors, Part building errors, Error in finishing, influence of build orientation.

UNIT-VII

REVERSE ENGINEERING : Meaning and uses of RE, Relationship between Reverse Engineering and Rapid Prototyping, Legal Aspects of Reverse Engineering. The generic processes of RE, Phase 1–scanning, Contact Scanners, Noncontact Scanners, Phase 2–Point Processing, Phase 3–Application Geometric Model Development, Reverse Engineering–Hardware and Software.

UNIT -VIII

METHODOLOGIES and Techniques for Reverse Engineering: Computer Vision and Reverse Engineering, Coordinate Measuring Machines, Active Illumination 3-D Stereo, Data Collection, Mesh Reconstruction, Surface Fitting. Integration of reverse engineering and rapid prototyping.

TEXT BOOKS:

1. Chua, C. K., K. F. Leong and C. S. Lim, "Rapid Prototyping: Principles and Applications", World Scientific, River Edge, NJ., 2003.
2. Amitabha Ghosh, "Rapid Prototyping - A Brief Introduction", Affiliated East West Press Pvt. Ltd., 1997.

REFERENCES:

1. Peter D. Hilton, Hilton/Jacobs, Paul F. Jacobs, "Rapid Tooling: Technologies and Industrial Applications", CRC press, 2000.
2. Ali K. Kamrani, Emad Abouel Nasr, "Rapid Prototyping: Theory and Practice", Springer, 2006.
3. Liou W. Liou, Frank W. Liou, "Rapid Prototyping and Engineering applications: A tool box for prototype development", CRC Press, 2007.
4. Ingle Kathryn A., "Reverse Engineering", McGraw Hill Publication Ltd.

DATA STRUCTURES FOR ENGINEERING APPLICATIONS

(ELECTIVE - I)

Course Code: AIT1114

L	T	P	C
4	0	0	4

AIM:

To empower students to build efficient software applications with suitable data structures.

OBJECTIVE:

To introduce various data storage and organization techniques and enable the students to implement them.

UNIT-I

RECURSION AND LINEAR SEARCH : Preliminaries of algorithm, Algorithm analysis and complexity, Recursion: Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion, recursive algorithms for factorial function, GCD computation, Fibonacci sequence, Towers of Hanoi.

Chapters 1, 2 from Text Book 1;Chapters 1, 2 from Text Book 2.

UNIT- II

SEARCHING TECHNIQUES : Introduction, Linear Search, Transpose Sequential, Search, Interpolation Search, Binary Search, Fibonacci Search.

Chapter 15 from Text Book 2.

UNIT-III

SORTING TECHNIQUES : Basic concepts, insertion sort, selection sort, bubble sort, quick sort, merge sort.

Chapter 12 from Text Book 1

UNIT-IV

STACKS : Basic Stack Operations, Representation of a Stack using Arrays, Stack Applications: Reversing list, Factorial Calculation, in-fix-to postfix Transformation, Evaluating Arithmetic Expressions.

Chapter 3 from Text Book 1.

UNIT-V

QUEUES : Basic Queues Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack.

Chapter 4 from Text Book 1.

UNIT-VI

APPLICATIONS OF QUEUES : Applications of Queues- Enqueue, Dequeue, Circular Queues, Priority Queues.

Chapter 4 from Text Book 1.

UNIT-VII

LINKED LISTS : Introduction, single linked list, representation of a linked list in memory, Operations on a single linked list, merging two single linked lists into one list, Reversing a single linked list, Circular linked list, Double linked list.

Chapter 6 from Text Book 2.

UNIT-VIII

TREES : Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays and linked lists, operations on a Binary tree , Binary Tree Traversals (recursive), Creation of binary tree from in-order and pre(post)order traversals.

Chapter 8 from Text Book 2.

TEXT BOOKS:

1. Richard F, Gilberg & Behrouz A. Forouzan : "Data Structures", 2nd Edition, Thomson, 2007.
2. GAV PAI, "Data Structures and Algorithms", 1st Edition, Tata McGraw-Hill, 2010.

REFERENCES:

1. Seymour Lipschutz, "Data Structure with C", 1st Edition, TMH, 2009.
2. Debasis ,Samanta, "Classic Data Structures", 2nd Edition, PHI, 2009
3. Horowitz,Sahni, Anderson, "Fundamentals of Data Structure in C", 2nd Edition, Freed, University Press, 2009.

MECHANICS OF COMPOSITES

(ELECTIVE - II)

Course Code: AME1137

L	T	P	C
4	0	0	4

AIM:

The aim of the course is to teach the mechanics of composites and various manufacturing methods of composites.

OBJECTIVE:

In under graduate student know about mechanics of isentropic materials only. Today most of the industrial applications the conventional materials are replaced with composites. So in postgraduate students has to understand the concepts of mechanics and ma manufacturing methods of composites.

UNIT-I

INTRODUCTION AND BASIC CONCEPTS : Geometric and Physical definitions, types and classification of composites - Fibres, Matrix materials, interfaces, polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon fibre composites, natural and man-made composites, Aerospace and structural applications.

UNIT-II

REINFORCEMENTS: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

UNIT-III

MICROMECHANICS: Prediction of Elastic constant, Halpin-Tsai equations, Transverse stresses. mechanics of load transfer from matrix to fibre. Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations.

UNIT-IV

COORDINATE TRANSFORMATIONS: Hooke's law for different

types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation, Graphic interpretation of stress – strain relations. Off - axis, stiffness modulus, off - axis compliance.

UNIT-V

ELASTIC BEHAVIOR OF UNIDIRECTIONAL COMPOSITES: Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

UNIT-VI

STRENGTH OF UNIDIRECTIONAL LAMINA: Micro mechanics of failure, Failure mechanisms, Strength of an orthotropic lamina, Strength of a lamina under tension and shear, maximum stress and strain criteria, application to design. The failure envelope, first ply failure, free-edge effects. Micro mechanical predictions of elastic constants.

UNIT-VII

ANALYSIS OF LAMINATED COMPOSITE PLATES : Introduction, thin plate theory, specially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory.

UNIT-VIII

MANUFACTURING METHODS: Autoclave, tape production, moulding methods, filament winding, man layup, pultrusion, RTM.

TEXT BOOKS:

1. R. M. Jones, "Mechanics of Composite Materials", Mc Graw Hill Company, New York, 1975.
2. Isaac and M.Daniel, "Engineering Mechanics of Composite Materials", Oxford University Press, 1994.

REFERENCES:

1. B. D. Agarwal and L. J. Broutman, "Analysis and Performance of Fibre Composites", Wiley-Interscience, New York, 1980.
2. L.R. Calcote, "Analysis of Laminated Composite Structures", Van Nostrand Rainfold, New York, 1969.

POWER PLANT ENGINEERING

(ELECTIVE - II)

Course Code: AME1138

L	T	P	C
4	0	0	4

AIM AND OBJECTIVES:

Through this course the student gains knowledge and develops an awareness of the different technologies adopted in the world for the generation of electrical energy or energy conversion from steam, natural water, fossil fuels like gas and Diesel oil and nuclear materials. The course also includes pollution control measures and the economic aspects of power plant operation and a brief introduction to non-conventional energy sources like solar energy, wind energy and so on.

UNIT-I

THERMAL POWER PLANTS-I: Introduction to energy sources, conventional and non-conventional, power development in India

Constituents of a thermal power plant, plant layout and different circuits and schematic diagrams showing material flow, types of coal, ash content, grades of coal, coal handling and choice of equipment, crushing, grinding and pulverizing of coal, coal storage and stockyards, auto-ignition of coal, dust suppression, associated problems

UNIT-II

THERMAL POWER PLANTS-II: Combustion of coal, effects of ash content, different stokers, spreaders, combustion needs and draught system, cyclone furnace details, coal burners, fluidized beds, cooling towers, feed water treatment and corrosion control, dust collection methods like bag filters, cyclones and electronic precipitators

UNIT-III

HYDRO-ELECTRIC POWER PLANTS: Water power, concepts of potential energy and available head, calculation of available power, hydrological cycle, flow measurement, hydrographs, drainage, reservoirs,

dams, spillways, storage and pondage, classification, typical layouts with main and ancillary equipment like draft tubes and surge tanks, suitability of Pelton wheel, impact and reaction turbines, cavitation, pumped storage plants, plant operation

UNIT-IV

DIESEL POWER PLANTS: Range of power generation, comparison with thermal power plants, turbo-charging, advantages and limitations and applications, role as captive power plant, grades of suitable Diesel oils, storage in tanks, transport of fuel to the engine, starting of plant, lubrication and cooling water circuits, total plant layout

UNIT-V

GAS TURBINE POWER PLANTS: Range of power generation, availability and types of fuels, open and closed cycle layouts, combustion chambers and materials of constructions, comparison with other methods of power generation, limitations, plant auxiliaries, combined cycle power plants, advantages and comparison with other types, typical schematic flow diagrams

UNIT-VI

NUCLEAR POWER PLANTS: Principles of nuclear fission, chain reactions, uncontrolled and controlled, radio-active materials, nuclear fuels, breeding and fertile materials, radio-activity, nuclear reactors and classifications, essential components of reactors, PWR, BWR systems, cooling of reactors, shielding, radiation hazards and nuclear waste disposal, introduction to nuclear fusion

UNIT-VII

POWER PLANT ECONOMICS AND IMPACT ON ENVIRONMENT: Factors affecting type of power plant selection, considerations in plant location, demand and connected load, load curves, load duration curves, average load, maximum demand, various factors in operation, load factor, demand factor, utilization factor, diversity factor, their calculation, cost components plant construction and operation, plant life cycle, replacement

Pollutants from power plants, impact on environment, pollution control standards and pollution control methods

UNIT-VIII

NON-CONVENTIONAL ENERGY SOURCES: Introduction, solar energy, wind energy, tidal energy, geo-thermal energy, biomass, conversion, bio-gas plants, fuel cells

TEXT BOOKS:

1. R. K. Rajput, "A text book of Power Plant Engineering", Laxmi Publications, New Delhi.
2. P. K. Nag, "Power Plant Engineering", Tata McGraw-Hill, New Delhi.

REFERENCES:

1. El-Wakil, "Power Station Engineering", Tata McGraw-Hill, New Delhi.
2. Arora and Domkundwar, "A Course in Power Plant Engineering", Tata McGraw-Hill, New Delhi.

PROJECT MANAGEMENT

(ELECTIVE - II)

Course Code: AME1139

L	T	P	C
4	0	0	4

AIM AND OBJECTIVES:

This subject is a specialized area in Management. In the changing scenario every job, big or small, has to be considered as a separate entity or project for better control and timely completion of the total work. This course of project management introduces all aspects of project management like definition and characteristics of a project, project manager's role, project selection, stages in a project, work breakdown structure, planning, procurement, execution, project closure, project finance and other important topics like environment which bear on projects.

UNIT-I

Introduction, characteristics of a project, types of projects, Project Management Body of Knowledge (PMBOK), role of project manager, his qualities, project organization and benefits, idea generation, needs of society, import substitution, project life cycle, project charter, project sponsor.

UNIT-II

Project planning, customer needs, stakeholder concept, Project scope, feasibility study and report, base line plan, SWOT analysis, project organization structure and hierarchy, project teams, formation, attitude and aptitude, work breakdown structure, project selection methods, break even analysis, DCF methods.

UNIT-III

Project implementation, estimation, cost, price, value, scheduling, bar charts, network diagrams, PERT and CPM, schedule crashing, simple introduction to risk management, probability in project management, decision trees.

UNIT-IV

Procurement, vendor selection methods, JIT, supply chains, quality, quality circles, quality control and quality assurance, cause and effect analysis, ISO and concepts of total quality management and six sigma, resource planning and allocation, availability and constraints of resources, resource leveling and crashing.

UNIT-V

Project control, project scope, project change request, control of schedule, resources, cost and quality, project communications, channels, means, meetings, project reports, project audits.

UNIT-VI

Project evaluation, project close-out reports, guidelines, audit reports, maintenance and shutdown projects, plant turn-around and brief introduction to replacement analysis.

UNIT-VII

Engineering projects, contour maps, site maps, plant layout, suitability of project site, preparation of site, selection and leasing of construction equipment.

UNIT-VIII

Special considerations in selection and location of projects, safety, health, human and environmental factors, project finance, international projects, joint ventures, collaborations, impact of culture, implementation, and handing over of projects.

TEXT BOOKS:

1. Kamaraju Ramakrishna, "Essentials of Project Management", PHI Learning, New Delhi.
2. Maylor Harvey, Project Management", Pearson Education, Harlow (UK).

REFERENCES:

1. Prasanna Chandra, "Projects – Planning, Analysis, Selection, Implementation and Review", Tata McGraw-Hill, New Delhi.

2. Chitkara, “Construction Project Management”, Tata McGraw-Hill, New Delhi.
3. Harold Kerzner, “Project Management”, Wiley, New York.

INTRODUCTION TO AIRCRAFT SYSTEMS

(ELECTIVE - II)

Course Code: AME1149

L	T	P	C
4	0	0	4

AIM & OBJECTIVE:

The aim and objective of the present course is to provide the basic knowledge of aircraft systems.

UNIT-I

AIRCRAFT INDUSTRY OVERVIEW : Evolution and History of Flight, Types Of Aerospace Industry, Key Players in Aerospace Industry, Aerospace Industry Trends, Advances in Engineering/CAD/CAM/CAE Tools and Materials technology, Global and Indian Aircraft Scenario.

UNIT-II

INTRODUCTION TO AIRCRAFTS : Basic components of an Aircraft, Structural members, Aircraft Axis System, Aircraft Motions, Control surfaces and High lift Devices.

UNIT-III

TYPES OF AIRCRAFTS - Lighter than Air/Heavier than Air Aircrafts Conventional Design Configurations based on Power Plant Location, Wing vertical location, intake location, Tail Unit Arrangements, Landing Gear Arrangements.

UNIT-IV

BASIC PRINCIPLES OF FLIGHT: Significance of speed of Sound, Air speed and Ground Speed, Properties of Atmosphere, Bernoulli's Equation, Forces on the airplane, Airflow over wing section, Pressure Distribution over a wing section, Generation of Lift.

UNIT-V

DRAG, PITCHING MOMENTS: Types of Drag, Lift curve, Drag Curve, Lift/Drag Ratio Curve, Factors affecting Lift and Drag.

AEROFOIL NOMENCLATURE: Types of Aerofoil, Wing Section-Aerodynamic Center, Aspect Ratio, Effects of lift, Drag, speed, Air density on drag. Mach Waves, Mach Angles.

UNIT-VI

AIRCRAFT PERFORMANCE: Taking-off, Climing,cruise, Landing, Power Curves.

MANOEUVRES: Pull out dives, the load Factor, Loads during a Turn, Correct and Incorrect Angles of Bank, Control and steep Banks, Inverted Maneuvers, Maneuverability"

UNIT-VII

STABILITY AND CONTROL: Meaning of Stabillity and Control, Degree of Stability- Lateral, Longitudinal and Directional Stability, Dihedral and Anhedral Angles, Control of an Aeroplane", Mechanical Systems, Electrical and Electronic Systems.

UNIT-VIII

MECHANICAL SYSTEMS: Environmental control systems (ECS), Pneumatic systems, Hydraulic systems, Fuel systems, Landing gear systems, Engine Control Systems, Air Conditioning Systems, Steering and Brakes Systems.

TEXT BOOKS:

1. A.C Kermode, "Flight without Formulae", Pearson Education, 10th Edition.
2. A.C Kermode, "Mechanics of Flight", Pearson Education, 5th Edition.
3. Shevell, "Fundamentals of Flight", Pearson Education, 2nd Edition
4. Dave Anderson, "Introduction to Flight".
5. Ian moir, Allan Seabridge, "Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration"

WEB RESOURCES:

1. http://www.aero.org/
2. http://www.rl.af.mil/rrs/resources/griffiss_aeroclub/aircraft.html
3. http://en.wikipedia.org/wiki/Tesla_turbine

4. http://ameslib.arc.nasa.gov/randt/1999/aero/aero.html
5. http://www.ctas.arc.nasa.gov/project_description/pas.html
6. http://www.moog.com/noq/_acoverview__c463/
7. http://www.dcmt.cranfield.ac.uk/aeroxtra/e339.htm

MECHATRONICS LAB & INSTRUMENTATION LAB

Course Code: AME1140

L	T	P	C
0	0	3	2

AIMS AND OBJECTIVES:

1. Become familiar with simple mechatronics equipment and principles of circuit design.
2. To enable students to practically apply the principles of measurement to engineering applications.

Note: Any five from Mechatronics Lab and any five from Instrumentation Lab

MECHATRONICS LAB

1. PTP control and linear interpolation of a linear conveyor using PMC.
2. PTP control and circular interpolation of a Rotary table using PMC.
3. Simulation of basic hydraulic circuits for automating systems
4. Simulation of basic pneumatic circuits for automating systems.
5. Simulation of basic electro-hydraulic circuits for automating systems
6. 3-D Robot simulation for operation of Pick-place robot.
7. PLC programming in ladder logic and functional block diagram Software Packages from the following: P-Simulator, H-Simulator, Control-X, Robo-X, PLC Simulator

INSTRUMENTATION LAB

1. Calibration of Pressure Gauges
2. Calibration of thermistor for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.

4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotameter for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and measurement of vibration of stretched string.
12. Study and calibration of Mcleod gauge for low pressure.

REFERENCE :

George, "Metallography Laboratory Practice", KEHL.

CAD/CAM LAB

Course Code: AME1141

L	T	P	C
0	0	3	2

Aim and Objectives:

The lab is composed of three sections. During the lab session, the students will be able:

1. To draw machine components with various manufacturing drawing symbols such as surface roughness, limits & fits, form tolerances.
2. To understand and know how to use the softwares for modeling and analysis.
3. To perform machining operations and generate NC code.

CAD / CAM LAB:

MANUFACTURING DRAWING

Introduction to representation of form tolerances, surface roughness, limits and fits

1. Details of protected flange coupling
2. Details of eccentric

PART MODELING & ASSEMBLY

Introduction to software commands

3. Part modeling & views
4. Assembly of screw jack
5. Assembly and simulation of 2-stroke petrol engine

FINITE ELEMENT ANALYSIS

Introduction to software commands

6. Static analysis of beam
7. Static analysis of plate with hole

SIMULATION OF MANUFACTURING OPERATION & NC CODE GENERATION

Introduction to software commands

8. Generation of NC code for drilling operation
9. Generation of NC code for milling operation
10. Generation of NC code for turning operation

TEXT BOOKS:

1. K.L. Narayana , P. Kannaiah & K. Venkata Reddy, "Production Drawing", 3rd Editiuon, New Age Int. Publisher, 2011.

REFERENCES:

1. P.N. Reddy, J.A.J. Reddy & C.Srinivasa Rao, "Production Drawing Practice", 2nd Edition, Hi-tech Pub, Hyd., 2002.
2. R.K. Jain, "Engineering Metrology", 4th Edition, Khanna Publications, 2000.

SOFTWARE PACKAGES:

AutoCAD, CATIA, MasterCAM, UG-NX, Pro-E, ANSYS etc.

SYLLABI FOR VIII SEMESTER

ADVANCED MACHINING PROCESSES

Course Code: AME1142

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

To create awareness and provide a Comprehensive reference for non-traditional machining processes and their applications.

The Student will be in a position to identify his machining needs for the job/work he takes up and apply the relevant modern/ non-traditional machining processes to produce finished products with a high degree of accuracy and surface quality.

UNIT–I

MATERIAL REMOVAL PROCESSES : Introduction, History of Machining, Traditional Machining processes, Nontraditional Machining processes, Hybrid machining processes. Need for non-traditional machining processes.

UNIT-II

MECHANICAL PROCESSES:ULTRASONIC MACHINING - Introduction, The machining system, Material removal process, Factors affecting material removal rate, Dimensional accuracy and surface quality, Applications.

WATER JET MACHINING - Introduction, The machining system, Process parameters, Applications, Advantages and disadvantages of WJM.

ABRASIVE JET MACHINING - Introduction, Machining system, Material removal rate, Applications, Advantages and limitations of AJM.

UNIT–III

CHEMICAL PROCESSES: CHEMICAL MILLING - Introduction, Tooling for CHM, Process parameters, Material removal rate, Accuracy and surface finish, Advantages, Limitations, Applications

PHOTOCHEMICAL MILLING - Introduction, Process description, Applications, Advantages

Electro polishing - Introduction, Process parameters, Applications, Process limitations.

UNIT-IV

ELECTROCHEMICAL PROCESSES:Electro chemical machining - Introduction, Principles of electrolysis, Theory of ECM, ECM equipment, Basic working principles, Process characteristics, Process control, Applications

Basics of Electrochemical Drilling, Electro-Chemical Deburring, Electro stream drilling

UNIT-V

HYBRID ELECTROCHEMICAL PROCESSES: ELECTRO CHEMICAL GRINDING - Introduction, Material removal rate, Accuracy and surface quality, Applications, Advantages and disadvantages

ELECTROCHEMICAL HONING - Introduction, Process characteristics, Applications

ELECTROCHEMICAL SUPER FINISHING - Introduction, Material removal process, Process accuracy

ELECTROCHEMICAL BUFFING - Introduction, Material removal process

UNIT-VI

THERMAL PROCESSES I: General Principle and applications of Electric Discharge Machining (**EDM**), Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection.

Wire EDM, principle, Process parameters, surface finish and machining accuracy, applications; **Micro EDM**.

UNIT-VII

THERMAL PROCESSES II: LASER BEAM MACHINING - Introduction, Material removal mechanism, Applications, Advantages and limitations

ELECTRON BEAM MACHINING - Introduction, Basic equipment and removal mechanism, Applications, Advantages and disadvantages

PLASMA BEAM MACHINING - Introduction, Machining systems, Material removal rate, Accuracy and surface quality, Applications, Advantages and disadvantages

Ion Beam Machining - Introduction, Material removal rate, Accuracy and surface effects, Applications

UNIT-VIII

MATERIAL ADDITION PROCESSES: Introduction, classification.

LIQUID-BASED TECHNIQUES – Stereo-lithography, Holographic interference solidification, Beam interference solidification, Solid ground curing-Liquid thermal polymerization, Fused deposition modelling, Multi jet modelling, Ballistic particles manufacturing, Shape deposition manufacturing

POWDER-BASED PROCESSES- Selective laser sintering, Laser engineered net shaping, Three-dimensional printing

SOLID-BASED TECHNIQUES -Solid foil polymerization, Laminated object modelling

TEXT BOOK:

El-Hofy, Hassan Abdel-Gawad, "Advanced Machining Processes: Non traditional And Hybrid Machining Processes", McGraw-Hill, 2005

REFERENCES:

1. Pandey P.C. and Shah H.S., "Modern Machining Processes", 1e, TMH, 2010
2. Bhattacharya A, "New Technology, the Institution of Engineers", India 1984.
3. V. K. Jain, "Advanced Machining Processes", 1e, Allied Publishers, 2010.

MATERIALS HANDLING EQUIPMENT

(ELECTIVE-III)

Course Code: AME1143

L	T	P	C
4	0	0	4

AIM AND OBJECTIVES:

This subject is a highly specialized area in mechanical engineering. In almost all engineering industries, materials handling equipment are required for handling raw materials, semi-finished and finished goods. They are useful for bulk goods, piece goods and for automation. This course introduces the principles of operation of important materials handling equipment like belt, apron, flight, screw and overhead conveyors, cranes and stockyard equipment like, wagon tipplers and stackers and reclaimers, their description. The course includes some basic calculations also. Further studies in the subject will be greatly facilitated after completion of this course.

UNIT- I

Introduction to materials handling, examples of materials equipment

Classification of materials handling equipment, continuous conveying, intermittent conveying, examples, lifting, hoisting, handling of bulk goods and piece goods, cranes and conveyors

Principles of calculation of conveying equipment, cycle time, bulk materials and bulk density, angle of repose

Example of calculation for a belt conveyor and a simple hoist

UNIT-II

Belt conveyors, constructional details, troughing angle, idlers, belt specifications, chutes, skirt boards, ploughs

Belt conveyor layouts, belt trippers, typical examples

UNIT-III

Roller conveyors, overhead conveyors, apron conveyors, component parts and operational details and applications with typical layouts

UNIT-IV

Bucket elevators, screw conveyors, flight conveyors, component parts, operational details and applications with typical layouts

UNIT-V

Hoists, EOT cranes, specifications, component parts, ropes, pulley layouts, hoisting drums, arrangement of drive

Wire rope specifications and selection, simple calculation of bridge girder, types of crane hooks

UNIT-VI

Jib cranes, like wall-mounted and travelling type, stability criteria, wheel loads, wheel trucks and bogeys, number of mechanisms in jib cranes, jib construction

UNIT-VII

Harbour cranes, luffing and level-luffing cranes, shipyard gantry cranes, portal frames and slewing rings and bearings

Typical stability calculations of portal cranes

UNIT-VIII

Special materials handling equipment, wagon tipplers, stackers, reclaimers, their constructional details, typical materials handling layouts and applications

TEXT BOOKS:

1. Rudenko, "Material Handling Equipment", MIR Publishers
2. Spivakowsky, "Conveying Equipment", MIR Publishers

REFERENCES:

1. R.O. Bailey, M.A. Alspaugh, "Bulk material handling by conveyor belt I & II".
2. Fruchtbaum, "Bulk Solids Handling"

AUTOMOBILE ENGINEERING

(ELECTIVE-III)

Course Code: AME1144

L	T	P	C
4	0	0	4

AIM AND OBJECTIVES:

This is a first course in automobile engineering introducing the anatomy and the functioning of all major components of the modern automobile. With an introduction to the engine and its accessories, the course deals in detail with the description of automobile components like clutch, transmission, final drive, axles, wheels, suspension, steering, electrical systems among others. Concepts of modern automobile controls are also included.

UNIT-I

General introduction, types of automobiles, classification of automobiles, chassis and body, frames, frameless construction, sub-frames, defects in frames

Different systems in an automobile, brief introduction to important parts

Automobile engines, different parts and auxiliary systems, engine terminology, four-stroke and two-stroke operation, multi-cylinder engines, engine balance, power overlap

UNIT-II

Engine accessories, engine lubrication, points of lubrication, types of lubrication systems, wet sump and dry sump, lubrication schedule, properties of lubricants, oil pumps, oil filters, crankcase dilution and crankcase ventilation

Fuel induction in SI and CI engines, fuel pumps and air cleaners, problems in carburetors, direct injection of gasoline, MPFI and TBI, advantages and disadvantages, concepts of electronic injection, diesel injection systems, concepts of supercharging and turbo-charging, waste-gating principle

UNIT-III

Principle of ignition, ignition coil, condenser and distributor, ignition systems without storage battery, electronic ignition, ignition timing and ignition advance, spark plugs

Combustion in SI engines and CI engines, swirl and turbulence, types of combustion chambers in automobile engines

Engine cooling, heat balance, effects of improper cooling, air cooling, radiator details and functioning, thermostats, anti-freeze additives, heater core

UNIT-IV

Automobile emissions, their harmful effects, pollution control measures, catalytic converters, exhaust system layout, mufflers, resonators

Engine parameters, brief discussion of testing devices, engine service, engine tuning, engine re-boring, cyaniding, nitriding, de-carbonisation

UNIT-V

Manual transmission and types of gear box, sliding-mesh, constant-mesh and synchromesh gear boxes, types of dog clutches, gear shift mechanism, principles of automatic transmission, fluid coupling, planetary gear system and torque converter, overdrive, basic principle of electronic transmission control

Clutch operation and types, multi-plate and cone clutches, clutch construction and lining

Propeller shafts, universal joints, slip joint, Hotch-Kiss drive and torque tube drive, transaxle and transfer case, radius rods, four wheel drive arrangement

UNIT-VI

Braking systems, layouts for mechanical braking, hydraulic braking, pneumatic braking, master cylinder, wheel cylinder, tandem cylinder, shoe brakes, disc brakes, requirements of brake fluid, power brakes, concept of ABS and traction control, parking brakes

Steering system, principles and need of steering, components parts, steering gear, steering ratio, steering lock, turning radius, centre point steering, wheel geometry, power steering principle and typical schemes,

UNIT-VII

Front axle scheme and end connections, rear axle, functions, types of rear axle, loads on rear axles, axle casing

Suspension system, functions of suspension, component parts, coil springs, leaf springs, air springs, shock absorbers, torsion bars, stabilizer bars, typical combinations of components in suspension systems, MacPherson strut suspension, its merits

UNIT-VIII

Wheel and tyres, wheel assembly and parts, pressed wheels and cast wheels, wheel rim, tyres, aspect ratio, tyres with tubes and tubeless tyres, advantages, construction of a tyre, plies, radial plies, tyre treads and tyre specifications,

Electrical systems, generator circuit and need for cut-out, starting with solenoid and over-running clutch, lighting points in a passenger car, high beam and restricted high beam from head lights, circuits for flashers, horn, wind screen wiper, fuel level indicator, speedometer

Cabin heating and cooling, simple schemes

TEXT BOOKS:

1 Kamaraju Ramakrishna, "Automobile Engineering", PHI Learning, New Delhi.

2 Jain & Asthana, "Automobile Engineering", Tata McGraw-Hill, New Delhi.

REFERENCE BOOKS:

1 Newton, Steeds & Garret, Butterworth & Heinemann, "The Motor Vehicle", Standard Publishers, Delhi.

2 Crouse & Anglin, "Automotive Mechanics", Tata McGraw-Hill, New Delhi.

VALUE ENGINEERING

(ELECTIVE-III)

Course Code: AME1148

L	T	P	C
4	0	0	4

AIM AND OBJECTIVES:

The concept of value engineering has gained importance in the Indian industrial scenario due to the globalization initiative of 1990s and is considered as one of the most effective cost reduction efforts available.

This course introduces the various terms, techniques and processes involved in value engineering so as to familiarize the student with this essential tool. At the end of this course he/she will have acquired improved problem-solving skills and appreciation of the difficulties involved in resolving their complexities.

UNIT-I

INTRODUCTION: Value Engineering concepts, Advantages, Applications, Problem recognition, and role in productivity, criteria for comparison, element of choice.

UNIT-II

ORGANISATION : Level of VE in the organization, Size and skill of VE staff, small plant, VE activity. Unique and quantitative evaluation of ideas.

UNIT-III

VE JOB PLAN : Introduction, orientation, information phase, speculation phase, analysis phase. Selection and Evaluation of VE Projects: Project selection, Methods selection, value standards, application of VE methodology.

UNIT -IV

ANALYSIS FUNCTION : Anatomy of the function, Use esteem and exchange values, Basic vs secondary vs. unnecessary functions. Approach

of function, Evaluation of function, determining function, classifying function, evaluation of costs, evaluation of worth, determining worth, evaluation of value.

UNIT- V

VE TECHNIQUES : Selecting products and operation for VE action, VE programmes, determining and evaluating function(s) assigning rupee equivalents, developing alternate means to required functions, decision making for optimum alternative, Use of decision matrix, Queuing theory and Monte Carlo method make or buy, Measuring profits, Reporting results, Follow up, Use of advanced technique like FAST (Function Analysis System).

UNIT -VI

VERSATILITY OF VE : VE operation in maintenance and repair activities, value engineering in non hardware projects. Initiating a VE Programme Introduction, training plan, career development for VE specialties.

UNIT -VII

FAST DIAGRAMMING : Cost models, life cycle costs

UNIT -VIII

VE LEVEL OF EFFORT : VE team, Co-coordinator, designer, different services, definitions, construction management contracts, value engineering case studies.

TEXT BOOKS:

1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010.
2. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept to Value Engineering Certification", SAGE Publications, 2003

REFERENCES:

1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997.

2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.
3. Del L. Younker, "Value Engineering Analysis and Methodology", Marcel Dekker Inc, New York, 2004
4. Miles, L.D., "Techniques of Value Analysis and Engineering", McGraw Hill second Edition, 1989.
5. Khanna, O.P., "Industrial Engineering and Management", Dhanpat Rai & Sons, 1993.

FLUID POWER SYSTEMS

(ELECTIVE-III)

Course Code: AME1150

L	T	P	C
4	0	0	4

AIM & OBJECTIVE :

To Provide the student with an in – depth background in the field of fluid power. To Provide knowledge related to the operation maintenance and application of fluid power systems.

UNIT-I

INTRODUCTION TO HYDRAULIC SYSTEMS AND ANCILLARY HYDRAULIC SYSTEMS: Introduction to Hydraulic Systems, Construction of Hydraulic Reservoir, Gravity type, Spring-loaded and Gas loaded type Accumulators

UNIT-II

HYDRAULIC PUMPS : Gear pumps, Vane pumps and Piston pumps, Selection of Hydraulic Pumps

UNIT-III

HYDRAULIC CONTROL VALVES : Direction Control Valves, Pressure Control Valves, Flow Control Valves, Servo Valves

UNIT-IV

HYDRAULIC CYLINDERS AND HYDRAULIC MOTORS : Hydraulic cylinder operation and cylinder mountings, Hydraulic cylinder and Cushions, Hydraulic Motors operation- Gear, Vane and Piston motors, Hydraulic Motor performance, Hydrostatic Transmissions

UNIT-V

HYDRAULIC CIRCUITS-I : Introduction, Control of a Single-Acting Hydraulic Cylinder, Control of a Double Acting Hydraulic Cylinder, Regenerative Circuit, Pump-Unloading Circuit, Double-Pump Hydraulic System, Pressure Intensifier Circuit, Counterbalance Valve Application, Hydraulic Cylinder Sequencing Circuits.

UNIT-VI

HYDRAULIC CIRCUITS-II : Cylinder Synchronizing Circuits, Fail Safe Circuits, Speed control of a Hydraulic Cylinder, Speed control of a Hydraulic Motor, Hydraulic Motor Braking System, Hydrostatic Transmission System, Accumulators and Accumulator Circuits, Mechanical-Hydraulic Servo System.

UNIT-VII

PNEUMATIC CIRCUITS AND APPLICATIONS: Introduction to Pneumatics, Basic Pneumatic Circuits and applications.

UNIT-VIII

MAINTENANCE AND TROUBLE SHOOTING OF HYDRAULIC &PNEUMATIC CIRCUITS AND COMPONENTS: Oxidation and Corrosion of Hydraulic Fluids, Maintaining and Deposing of Fluids, Wear of moving parts due to solid particle contamination of the fluid, Problems caused by gases in Hydraulic Fluids, Troubleshooting of Hydraulic System, Common problems in Pneumatic

Systems, Troubleshooting of Pneumatic Systems

TEXT BOOKS:

1. Anthony Esposito, "Fluid Power with Applications", PHI, New Delhi, 1st Edition, 2005.
2. Andrew Parr, "Hydraulics and Pneumatics", Jaico Publishing house, 9th Edition, 2005.

REFERENCES:

1. S.R.Majumdar, "Oil Hydraulic Systems", Tata McGraw Hill, 1st Edition, 2002.
2. S.R.Majumdar, "Pneumatic Systems", Tata McGraw Hill, 1st Edition, 2002.
3. www.pneumatics.com
4. www.fluidpower.com.

AUTOMATION IN MANUFACTURING

(ELECTIVE-IV)

Course Code: AME1145

L	T	P	C
4	0	0	4

AIM:

To introduce and familiarize the student with the various Automated systems that are established and incorporated in various Production Industries.

OBJECTIVE:

The student should be able to identify and correlate the concepts of automation and be in a position to incorporate, modify and adopt the automation concepts when he is placed, after graduation, in an industry to its requirements.

UNIT-I

INTRODUCTION TO AUTOMATION : Production systems. Automation in Production systems. Types of Automation. Reasons for Automation. Automation Principles and Strategies. Basic elements of an automated system. Advanced Automation Functions, Levels of Automation.

UNIT-II

MATERIAL TRANSPORT SYSTEMS : Introduction, types of equipment in Material Handling systems, design considerations in Material Handling systems. Material transport equipment. Analysis of Material Transport Systems. Simple problems.

UNIT-III

MATERIAL STORAGE SYSTEMS : Introduction, types of Material stored in a factory. Conventional Methods of storage methods and equipment. Automated Storage and retrieval systems.

UNIT-IV

AUTOMATED PRODUCTION LINES I : Fundamentals of Automated

Production Lines (automated Flow lines): Line type, Rotary type. Work Part Transfer- continuous transfer, Intermittent Transfer, Asynchronous transfer, walking beam transfer, chain drive conveyor system, Applications of Automated Production Lines.

UNIT-V

AUTOMATED PRODUCTION LINES II : Analysis of Transfer Lines – Starving, Blocking, analysis using upper bound approach, analysis using lower bound approach. Analysis of flow lines with storage simple problems on automated production lines.

UNIT-VI

FUNDAMENTALS OF ASSEMBLY LINES : Assembly workstations, work transport systems line pacing, coping with Product variety.

Line Balancing Problems and Line Balancing Algorithms: Largest candidate Rule, Kilbridge and wester Method, Ranked Positional weights Method. simple problems on line balancing using the mentioned algorithms.

UNIT-VII

AUTOMATED ASSEMBLY SYSTEMS: Fundamentals of Automated Assembly systems: System Configurations, parts delivery at work stations.

QUANTITATIVE ANALYSIS OF ASSEMBLY SYSTEMS : Parts delivery system at workstations, multi-station assembly machines, single station assembly machines, partial automation.

UNIT-VIII

CAD/CAM/CIM : Computer Aided Design, Computer Aided Manufacturing, Computer Integrated Manufacturing. Product Design and CAD, Application of Computers in design. Fundamentals of Computer Aided Process Planning, Concurrent Engineering and Design for Manufacturing.

TEXT BOOKS:

1. M.P. Groover, Automation, "Production Systems and Computer Integrated Manufacturing", Pearson and PHI, 3rd Edition, 2009.
2. M S Ganesh Prasad and B S Raju, "Computer Integrated Manufacturing", Lakshmi Publications (P) Ltd, 1st Edition, 2009.

REFERENCES:

1. Yoram Coreom, "Computer control of Manufacturing Systems", McGraw-Hill Education – Europe, International Ed ition, 1984.
2. P. Radhakrishnan and S. Subramanyam, "CAD/CAM/CIM", New Age International Pvt Ltd, 3rd Edition, 2009.

COMPUTATIONAL FLUID DYNAMICS

(ELECTIVE-IV)

Course Code: AME1146

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

To familiarize students with mathematical modeling of physical problems and teach some numerical solution methods.

UNIT-I

Equations governing fluid flow and heat transfer - Conservation of mass - Momentum and energy balance equations - Definitions of stream function and vorticity. Classification of second order partial differential equations as hyperbolic, parabolic and elliptic equations.

UNIT-II

Applied numerical methods for numerical integration - Trapezoidal and Simpson rules. Roots of a function - bisection method, method of false position, Newton-Raphson scheme.

UNIT-III

Solution of a system of linear algebraic equations: Iterative methods - Jacobi method - Gauss-Siedel method. Direct methods - Gaussian elimination and Gauss-Jordan method. Solution of a tri-diagonal matrix - Thomas algorithm.

UNIT-IV

Numerical solution of ordinary differential equations by fourth-order Runge-Kutta method: Solution of a first order differential equation - Solution of two simultaneous first order differential equations - Solution of a second order differential equation.

UNIT-V

Certain selected finite difference applications in heat conduction: Heat dissipation through a straight fin - Two dimensional heat conduction in

rectangular geometry - One-dimensional transient heat conduction in a rectangular slab.

UNIT-VI

Fundamentals of fluid flow modeling - Conservative property - Transportive property - Second upwind differencing or hybrid scheme.

A selected finite difference application in heat convection: One-dimensional steady state convection-diffusion equation.

UNIT-VII

Solution of Navier-Stokes equations for incompressible flows - Governing continuity and momentum balance equations in conservative form - Concept of staggered grid - SIMPLE formulation for one-dimensional convection-diffusion equation -

UNIT-VIII

Extension to two dimensional equations with pressure gradient - Discussion on various differencing schemes - central difference approximation - upwind scheme - hybrid scheme.

TEXT BOOK:

1. K. Muralidharan and T. Sundararajan, "Computational Fluid Flow and Heat Transfer", Second Edition, Narosa Publishing House, New Delhi, 2003.

REFERENCE BOOKS:

1. Suhas V. Patankar, "Numerical Heat Transfer and Fluid Flow", Taylor & Francis (1980).
2. John D. Anderson, Jr., "Computational Fluid Dynamics - The Basics with Applications," McGraw-Hill (1995).
3. H.K. Versteeg and W. Malalasekera, "An introduction to computational fluid dynamics".
4. "The Finite Volume Method", Pearson Education Limited, England (1995).
5. S.S. Sastry, Numerical Analysis.

ADVANCED MECHANICS OF SOLIDS

(ELECTIVE-IV)

Course Code: AME1147

L	T	P	C
4	0	0	4

AIM AND OBJECTIVE:

This subject describes the concepts of Fixed beams and Continuous beams. It also gives the analysis of the bending of curved bars for different cross-sections like rectangular, circular and trapezoidal sections. It gives the insight to design the mechanical structures in the view point of both strength and deformation including the design by means of numerical simulation.

UNIT-I

THEORY OF ELASTICITY: Basic equations of elasticity, Stress at a point, Nature of Stress at a point, Stress Tensor, Stress Transformation, Principal Stresses and Planes, Strain at a point, Strain tensor analogy between stress and strain tensors, Constructive equations, Generalized Hook's law, Equations of equilibrium ,Strain displacement relations, Compatibility conditions.

UNIT-II

FIXED BEAMS: Fixing moments for a fixed beam of uniform and variable sections, Effect of Sinking support, slope and deflection, Portal frames.

UNIT-III

CONTINUOUS BEAMS : Analysis of Continuous beams, Reaction at the supports, Theorem of Three Moments, Effect of sinking of supports.

UNIT-IV

ENERGY METHODS : Castigliano's Theorems I&II and its Applications.

UNIT-V

STRESSES IN CURVED BARS: Stresses in bars of Circular, rectangular and trapezoidal sections, Introduction to Theory of Plates and Shells.

UNIT-VI

STRESSES DUE TO ROTATION: Wheel rim, disc of uniform thickness and disc of uniform strength.

UNIT-VII

TORSION OF NONCIRCULAR SHAFTS: Torsion of noncircular prismatic bars,Saint Venant's Theory,Solution for simple cases Pradtl membrane analogy,open and closed sections and shear flow. Introduction to Shear Centre.

UNIT-VIII

BEAMS ON ELASTIC FOUNDATION: Differential equation of the elastic line,Concentrated load on an infinite beam, Force and Couple on a beam, principle of superposition and Udl over part of beam.

TEXT BOOKS:

1. Beer, P.F and Johnson, E. R, "Mechanics of Materials", 2nd Edition, Mc Graw Hill Inc,1992.
2. Arthur P.Boresi and Ken P. Chang, "Elasticity in Engineering Mechanics", 2nd Edition, Johnwiley &Sons, Inc., 2000.

REFERENCES:

1. Sadhu Singh, Dr., "Strength of Materials", 7th Edition, 1999, Khanna Publishers, New Delhi.
2. Rajput, R. K, Strength, "Materials", Revised Edition, 2006, S. Chand & Company Ltd, New Delhi.
3. Irving H. Shames and James M.Pitaressi, "Introduction to Solid Mechanics", 3rd Edition, Prentice Hall, 2000, New Delhi.
4. Timoshenko S.P. and Goodier J N", Theory of Elasticity", MC Grawhill, New Delhi, 1970.

INTRODUCTION TO AIRCRAFT STRUCTURES

(ELECTIVE-IV)

Course Code: AME1151

L	T	P	C
4	0	0	4

AIM & OBJECTIVE:

The present course is to provide the basic methodologies to design and analysis of aircraft structures

UNIT-I

AIRCRAFT DESIGN PROCESS : Introduction, Phases of Aircraft Design, Aircraft Conceptual Design Process, Conceptual Stage, Preliminary Design, Detailed Design, Design Methodologies

UNIT-II

INTRODUCTION TO AIRCRAFT STRUCTURES : Types of Structural members of Fuselage and wing section Ribs, Spars, Frames, Stringers, Longeron, Splices, Sectional Properties of structural members and their loads, Types of structural joints, Type of Loads on structural joints

UNIT-III

AIRCRAFT MATERIALS AND MANUFACTURING PROCESSES : Material selection criteria, Aluminum Alloys, Titanium Alloys, Steel Alloys, Magnesium Alloys, copper Alloys, Nimonic Alloys, Non Metallic Materials, Composite Materials,

UNIT-IV

STRUCTURAL ANALYSIS OF AIRCRAFT STRUCTURES: Plate deflection under different end conditions, Strain energy due to bending of circular, rectangular plates,

UNIT-V

PLATE BUCKLING: Compression buckling, shear buckling, Buckling due to in plane bending moments, Rectangular plate buckling, Sample Exercises.

UNIT-VI

THEORY OF BEAMS: Symmetric Beams in Pure Bending, Deflection of beams, Unsymmetrical Beams in Bending, Bending of Open Section Beams, Bending of Closed Section Beams. Sample Exercises.

UNIT-VII

THEORY OF TORSION: Shafts of Non-Circular Sections, Torsion in Closed Section Beams, Torsion in Open Section Beams, Sample Exercises.

UNIT-VIII

AIRWORTHINESS AND AIRCRAFT CERTIFICATION: Definition, Airworthiness Regulations, Regulatory Bodies, Type certification, General Requirements, Requirements Related to Aircraft Design Covers, Performance and Flight Requirements,

TEXT BOOKS

1. Daniel P. Raymer, "Aircraft Design-A Conceptual Approach", AIAA education series, 6e, 2001.
2. Michael Niu, "Airframe Structural Design", Conmilit Press, 2e, 1988.
3. Michael Niu, "Airframe Stress Analysis and Sizing", Conmilit Press, 3e, 1999.
4. Roger D. Schaufele, "The Elements of Aircraft Preliminary Design", Aries Publications, 2000
5. Dale Hurst, "Aircraft Structural Maintenance", Avotek publishers, 2e, 2006.
6. Frank Delp, Michael J. Kroes & William A. Watkins, "Aircraft Maintenance & Repair", Glencoe &McGraw-Hill,6e,1993.
7. Filippo De Florio, Butterworth-Heinemann, "An Introduction to Aircraft Certification; A Guide to Understanding Jaa, Easa and FAA".

WEB RESOURCES

1. http://www.aero.org/
2. http://www.rl.af.mil/rrs/resources/griffiss_aeroclub/aircraft.html
3. http://en.wikipedia.org/wiki/Tesla_turbine
4. http://ameslib.arc.nasa.gov/randt/1999/aero/aero.html
5. http://www.ctas.arc.nasa.gov/project_description/pas.html
6. http://www.moog.com/noq/_acoverview__c463/
7. http://www.dcmt.cranfield.ac.uk/aeroxtra/e339.htm
8. http://www.aeromech.usyd.edu.au/structures/as/acs1-p4.htm
9. http://www.av8n.com/how/htm/xref.html
10. http://www.aviation-history.com/video.html