ACHARYA NAGARJUNA UNIVERSITY

NAGARJUNA NAGAR, GUNTUR – 522 510

ANDHRAPRADESH, INDIA

Syllabus

for

MECHANICAL ENGINEERING

4-Year B.Tech Degree Course

(Semester System)

w.e.f.: 2020-2021

ACHARYA NAGARJUNA UNIVERSITY
B.TECH. MECHANICAL ENGINEERING
(w.e.f. academic year 2020-2021) R-20

I/IV B.TECH -SEMESTER I

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		
				L	T	P	Internal	External	Credits
1	ME 111	Mathematics - I	BS	3	1	0	30	70	3
2	ME 112	Engineering Chemistry	PC	3	1	0	30	70	3
3	ME 113	Basic Electrical Engineering	PC	3	1	0	30	70	3
4	ME 114	Engineering Graphics	PC	3	1	0	30	70	3
5	ME 115	Computer Programming With C	PC	3	1	0	30	70	3
6	ME 116	Mechanical Work Shop	PC	0	0	3	30	70	1.5
7	ME 151	Engineering Chemistry Lab	PC	0	0	3	30	70	1.5
8	ME 152	Computer Programming Using C Lab	PC	0	0	3	30	70	1.5
Total Credits									19.5

I/IV B.TECH -SEMESTER II

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		
				L	T	P	Internal	External	Credits
1	ME 121	Mathematics - II	BS	3	1	0	30	70	3
2	ME 122	Engineering Physics	PC	3	1	0	30	70	3
3	ME 123	Professional Communication Skills	PC	3	0	0	30	70	3
4	ME 124	Python Programming	PC	3	1	0	30	70	3
5	ME 125	Engineering Mechanics	PC	3	1	0	30	70	3
6	ME 126	Environmental Science (Mandetary)	MC	3	0	0	30	70	0
7	ME 161	Engineering Physics Lab	PC	0	0	3	30	70	1.5
8	ME 162	Communication Skills Lab	PC	0	0	3	30	70	1.5
9	ME 163	Python Programming Lab	PC	0	0	3	30	70	1.5
Total Credits									19.5

II/IV B.Tech. -SEMESTER I

S.No.	Code	Subject Name	Category	Scheme of Instruction Hours in a Week L	T	P	Scheme of Examination Marks Internal	External	Credits
1	ME 211	Engineering Mathematics-III(Probability and Statistics)	BS	3	1	0	30	70	3
2	ME 212	Strength of Materials-I	PC	3	1	0	30	70	3
3	ME 213	Material Science and Metallurgy	PC	3	1	0	30	70	3
4	ME 214	Basic Thermodynamics	PC	3	1	0	30	70	3
5	ME 215	Manufacturing Process	PC	3	1	0	30	70	3
6	ME216	Constitution of India	MC	3	0	0	30	70	0
6	ME 251	Machine Drawing Lab	PC	0	0	3	30	70	1.5
7	ME 252	Manufacturing Process Lab	PC	0	0	3	30	70	1.5
8	ME 253	Strength of Materials Lab	PC	0	0	3	30	70	1.5
9	ME254	CATIA-2D Drafting	Skill Course	0	0	3	30	70	2
		Total Credits							21.5

II/IV B.Tech. -SEMESTER II

S.No.	Code	Subject Name	Category	Scheme of Instruction Hours in a Week L	T	P	Scheme of Examination Marks Internal	External	Credits
1	ME 221	Strength Of Materials-II	PC	3	1	0	30	70	3
2	ME 222	Kinematics of Machines	PC	3	1	0	30	70	3
3	ME 223	Fluid Mechanics & Hydraulic Machines	ESC	3	1	0	30	70	3
4	ME 224	Applied Thermodynamics	PC	3	1	0	30	70	3
5	ME 225	Professional Ethics And Human Values	BSC	3	0	0	30	70	3
7	ME 261	Fluid Mechanics & Hydraulic Machines Lab	ESC	0	0	3	30	70	1.5
8	ME 262	Modeling Lab	PC	0	0	3	30	70	1.5
9	ME 263	Advanced English Communication Skills Lab	PC	0	0	3	30	70	1.5
10	ME 264	Matlab for Mechanical Engineering	Skill Course	0	0	3	30	70	2
		Total Credits							21.5`

III/IV B.Tech. -SEMESTER I

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		Credits
	Code	Subject Name		Hours in a Week			Marks		
				L	T	P	Internal	External	
1	ME 311	Design of Machine Elements	PC	3	1	0	30	70	3
2	ME 312	Dynamics of Machines	PC	3	1	0	30	70	3
3	ME 313	Metal cutting & Machine Tools	PC	3	1	0	30	70	3
4	ME 314	Job Oriented Elective-I	OE/JOE	3	1	0	30	70	3
5	ME 315	Professional Elective-I	PE	3	1	0	30	70	3
6	ME 351	Machine Shop Practice Laboratory	PC	0	0	3	30	70	1.5
7	ME 352	Fuels & I.C Engines Laboratory	PC	0	0	3	30	70	1.5
9	ME353	Soft Skills Lab	Skill Course	0	0	3	30	70	2
10	ME354	Summer Internship 2 Months after second year (to be evaluated during V semester)	MC	0	0	3	100	0	1.5
Total Credits									21.5

Job Oriented Elective-I

- **A.** I.C Engines & Gas Turbines
- B. Elements of Aerospace Engineering
- C. Computional Fluid Dynamics

Professional Elective-I

- **A.** Operations Research
- B. Process Planning and Cost Estimation
- C. Total Quality Management

III/IV B.Tech. -SEMESTER II

S.No.	Code	Subject Name	Category	L	T	P	Internal	External	Credits
		Course Details	Category	Scheme of Instruction			Scheme of Examination		
				Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	ME 321	Design of Transmission Elements	PC	3	1	0	30	70	3
2	ME 322	Heat Transfer	PC	3	1	0	30	70	3
3	ME 323	Advanced Manufacturing Engineering	PC	3	1	0	30	70	3
4	ME 324	Job Oriented Elective-II	OE/JOE	3	1	0	30	70	3
5	ME 325	Professional Elective-II	PE	3	1	0	30	70	3
6	ME 326	Design thinking for innovation	MC	3	0	0	30	70	0
7	ME 361	Computer Applications in Mechanical Engineering Laboratory	PC	0	0	3	30	70	1.5
8	ME 362	Design & Metrology Lab	PC	0	0	3	30	70	1.5
9	ME 363	Heat Transfer Laboratory	PC	0	0	3	30	70	1.5
10	ME364	Delmia & Simulia Lab	Skill Course	0	0	3	30	70	2
Total Credits									21.5

Job Oriented Elective-II

  A. Industrial Engineering & Management.
  B. Production Planning and Control
  C. Product Lifecycle Management

Professional Elective-II

  A. Mechanical Measurements & Metrology
  B. Composite Materials
  C. Farm Machinery and Equipment

IV/IV B.Tech. -SEMESTER I

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	ME 411	Advanced Machine Design	PC	3	1	0	30	70	3
2	ME 412	Automation & Computer Aided Manufacturing	PC	3	1	0	30	70	3
3	ME 413	Finite Element Methods	PC	3	1	0	30	70	3
4	ME 414	Program Elective-III	PE	3	1	0	30	70	3
5	ME 415	MOOCS	OE/JOE	3	1	0	0	100	3
6	ME 416	Energy Recourses & Utilization	BS	3	0	0	30	70	3
7	ME 451	Computer Aided Manufacturing Lab	Skill Oriented Course	0	0	3	30	70	2
8	ME 452	Industrial/ Research Internship (2 Months)	MC	0	0	3	100	0	3
Total Credits									23

PROGRAM ELECTIVE COURSE-III

  A. Refrigeration & Air conditioning
  B. Automobile Engineering
  C. Computer Graphics

OPEN ELECTIVE (OE)/ Job Oriented Elective-III

  A. Operations Research
  B. Robotics
  C. Fluid Power & Control systems.

IV/IV B.Tech. -SEMESTER II

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	ME 461	Project Work	Project	0	0	6	50	100	8
2	ME 462	Seminar	Seminar	0	0	0	50	0	2
3	ME463	MOOCs	Moocs	0	0	3	100	0	2
Total Credits									12

MATHEMATICS-I
(Calculus & Algebra)
(Common to all branches of Engineering)

L	T	P	C
3	1	0	3

Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Unit II: Mean Value Theorems

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

Unit III: Multivariable calculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit IV: Double Integrals

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves.

Unit V: Special Functions

Beta and Gamma functions and their properties, relation between beta and gamma functions.

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

References:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

ENGINEERING CHEMISTRY

(ME, CE)

L	T	P	C
3	1	0	3

UNIT-I: WATER TECHNOLOGY

Various impurities of Water, WHO guidelines, Hardness unit sand determination by EDTA method, water treatment for drinking purpose-sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Water treatment for industrial purpose: Boiler troubles, scales, sludges, caustic embrittlement, boiler Corrosion, priming and foaming- causes and prevention, Internal conditioning -Phosphate, Calgon and Carbonate treatment, External conditioning-Lime Soda process (simple problems), softening by ion-Exchange process, Desalination of Brackish water by Electro dialysis and Reverse osmosis.

UNIT-II: POLYMER CHEMISTRY

Introduction to polymers, Functionality of monomers, chain growth and step growth polymerization, Co-polymerization (Stereo specific polymerization) with specific examples and mechanisms of polymer formation.

PLASTICS: Thermoplastics and Thermosetting, preparation, properties and applications of Bakelite, Elastomers, Preparation, properties and applications of BUNA-S and BUNA-N Rubbers.

Conducting Polymers- Introduction, examples, general applications and mechanism of Conduction on Polyacetylene.

Chemistry of Nano materials: Introduction to nano chemistry, preparation of nano materials - carbon nanotubes and fullerenes and their engineering applications.

UNIT-III: ELECTRO CHEMISTRY AND APPLICATIONS

Electrodes-concepts, types of cells, electro chemical series, Nernst equation.

BATTERIES: Primary cell (Dry cell), Secondary cell (Lead-acid), Lithium batteries and their advantages, Fuel cell (H_2-O_2 cell).

Corrosion:

Types of corrosions- chemical corrosion, dry corrosion, electro chemical corrosion and wet corrosion, galvanic series, pitting and differential aeration of corrosion, factors affecting corrosion.

Corrosion control: Cathodic protection, Corrosion Inhibitors, Electro plating (Au) & (Ni).

Learning Outcomes:

UNIT-IV: INSTRUMENTAL METHODS

Electromagnetic spectrum-Absorption of Radiation: Beer-Lambert's law-Principle and applications of Ultra-Violet, Infra-Red and Nuclear Magnetic Resonance Spectroscopy. Principle and applications of Gas Chromatography and HPLC Techniques.

UNIT-V:

(i) Cement and Concrete Chemistry: Introduction to Building Materials, Portland Cement, Constituents, Manufacturing Process, Setting and Hardening Cement.

(ii) Organic reactions and synthesis of a drug molecule: Introduction to reactions involving substitution (SN_1 and SN_2), elimination reactions (E_1 and E_2), Synthesis of commonly used drug molecule – Aspirin and Paracetmol.

Prescribed Text Books

1. Engineering Chemistry, P.C. Jain and M. Jain - DhanapathiRai& Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi
3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. Shashichawla,A text book of engineering chemistry,3[rd]Edition,Dhanpatrai& co new delhi,2007.

5.   Gurudeep raj &chatwalanand , "Instrumental methods of analysis ", 7thedition,CBS publications,1986.

6. Quantitative analysis by day&underwood.

7. A Text book of Instrumental methods by Skoog and West.

8. H.W. Wilard and demerit, "Instrumental methods of analysis ", 7thedition,CBS publications,1986.

9. Text book of Nano Science and Nano technology, B.S. Murthy and P. Shankar, University

Basic Electrical Engineering

(CIVIL, MECH & CSE)

L-T-P-C
3-1-0- 3

UNIT – I: DC & AC Circuits

Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Nodal and loop analysis. Thevenin's and Superposition Theorems

Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits. Series Resonance and band width.

.UNIT-II: Poly phase & Magnetic circuits

Generation of 3-phase voltages - phase sequence - star & delta connections - voltage, current & power in star & delta connected systems - analysis of 3-phase balanced circuits - measurement of 3-phase power by 2 wattmeter method.

Faraday's Laws of Electromagnetic Induction .Dynamically induced EMF –Statically induced EMF – Self Inductance – Mutual Inductance - Coefficient of coupling –Inductances in Series – Inductances in parallel – Dot convention.

UNIT-III: DC Machines

Principle and operation of DC Generator - EMF equation - OCC characteristics of DC generator – Principle and operation of DC Motor – Performance Characteristics of DC Motors - Speed control of DC Motors.

UNIT-IV: AC Machines:

Principle and operation of Single Phase Transformer - EMF equations-losses in transformers, regulation and efficiency. OC and SC test on transformer – auto transformer.

Principle, operation and construction of Three phase Induction Motor –torque equation and torque slip characteristics-power losses and efficiency.

UNIT-V: Semiconductor Devices:

Characteristics of Semiconductor junction Diode, Zener diode, transistor, JFET, UJT, SCR and their applications. Half-wave, Full-wave rectifiers and Bridge rectifier, with (L and LC) and without filters.

Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitterconfiguration, Transistor amplifying action, Common collector configuration, Operating point

Text Books:
1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

References:
1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

ENGINEERING GRAPHICS

(CE/ME)

L	T	P	C
3	1	0	3

UNIT-I

Introduction to Engineering graphics: Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions. Dimensioning principles and conventional representations

a) Conic sections including the rectangular-hhyperbola- general method only,b) Cycloid, epicycloids and   hypocycloid, c) Involutes

UNIT-II

Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

UNIT-III

Projections of solids: Projections of regular solids inclined to one or both planes by rotational.
Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

UNIT-IV

Development of surfaces: Development of surfaces of right regular solids-prism,

cylinder, pyramid, cone and their sectional parts.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric

views: lines, planes, figures, simple and compound solids.

UNIT-V

Orthographic Projections: Systems of Projections, Orthographic Projection (Simple Figures)

UNIT-VI

(DEMONESTRATION ONLY)

Computer Aided Drafting(Using any standard package): Setting up a drawing: starting ,main menu (New, Open, Save, Save As etc.), Opening screen, error correction on screen,units, co-ordinate system, limits, grid, snap, ortho.

Tool bars: Draw tool bar, object snap tool bar, modify tool bar, dimension tool BarPractice of 2D Drawings: Exercises of Orthographic views for simple solids using allcommands in various tool bars.

TEXTBOOKS

1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. BasantAgarwal&C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Computer Programming with C
(Common to all branches)

L-T-P-C
3-1-0-3

Unit – 1: Flowchart design through Raptor

Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers

Example problems(section 2) - Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

Unit 2: C Basics

C-Basics: C-character set, Data types, Constants, Expressions, Structure of C program, Operators and their precedence & associatively, Simple programs in C using all the operators, Type casting ,type coercion.

Unit 3: Control Structures and Functions

Control Structures, Basic input and output statements, Preprocessor directives.

Functions: Concept of a function, passing the parameters, automatic variables, scope and extent of variables, storage classes, recursion, iteration vs recursion, types of recursion, Simple recursive and non recursive programs, Towers of Hanoi problem.

Unit 4: Arrays and Pointers

Arrays: Single and multidimensional Arrays, Character array as a string, string functions, Programs using arrays and string manipulation.

Pointers: Pointers declarations, Pointer expressions, Pointer parameters to functions. Pointers, Pointers and array, Pointer arithmetic.

Unit 5: Structures and Files

Structures: Declaring and using structures, operations on structures, structures and arrays, user defined data types, pointers to structures.Command line arguments.

Files: Introduction, file structure, file handling functions, file types, file error handling, Programs using file functions.

Text Books:
1. https://raptor.martincarlisle.com/
2. Programming with C-Gottfried-Schaums Outline Series-TMH
3. C Programming – AnithaGoel/Ajay Mittal/E.Sreenivasa Reddy-Pearson India
Referrences:
1. Problem Solving with C- Somasekharan-PHI.
2. C Programming- Behrouz A forouzan – CENGAGE Learning
3. Test your c skills-Yaswanthkanithker
4. Let us C- Yaswanthkanithker

Mechanical Engineering Workshop
(CIVIL & MECH)

L	T	P	C
0	0	3	1.5

Foundry Practice: (2 Sessions)
  i. a) Determination of average grain size for sand sample using sieve shaker
     b) Preparation of a green sand mould using single piece pattern
  ii. Preparation of a green sand mould using split piece pattern with core and demonstration
      of casting.

Welding Practice: (2 Sessions)
  i. Lap joint, butt joint and T joint using arc welding.
  ii. a) Lap joint using resistance spot welding
b) Lap and butt joints using gas welding

Assembling/Disassembling Practice: (3 Sessions)
  i. Bicycle
  ii. Clutch and carburetor
  iii. Two wheeler engine

Manufacture of a Plastic Component (2 Sessions)
  i. Use of injection moulding machine
  ii. FRP composite using hand layup method
  iii. Joining of plastic components

Design and manufacture any two domestic utility products with any material (2 Sessions)

Use of Power Tools (2 Sessions)

ENGINEERING CHEMISTRY LABORATORY

ME, CE

L	T	P	C
0	0	3	1.5

Course Objectives:
- Verify the fundamental concepts with experiments

LIST OF EXPERIMENTS:

1. Determination of hardness of water by EDTA method
2. Estimation of Mohr's salt by Permanganometry
3. Estimation of Mohr's salt by Dicrometry
4. Determination of alkalinity of water
5. Percentage of purity of washing soda
6. Determination of available chlorine in bleaching powder
7. Preparation of Urea-formaldehyde resin
8. Determination on strength of NaoH using HClconductometrically
9. Acid-Base titration by P^H meter
10. Acid-Base titration by Potentiometer
11. Determination of viscosity of lubricating oil
12. Determination of Surface tension

COMPUTER PROGRAMMING Using C Lab

Cycle 1:

1. Construct flowcharts to
a. calculate the maximum, minimum and average of N numbers
b. develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
2. Construct flowcharts with separate procedures to
a. calculate simple and compound interest for various parameters specified by the user
b. calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
3. Construct flowcharts with procedures to
a. generate first N numbers in the Fibonacci series
b. generate N Prime numbers
4. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)
5. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
6. Design a flowchart to determine the number of characters and lines in a text file specified by the user

Cycle 2:

1.Exercises on data types and operators?
a) Practice exercises 3.1 to 3.16 and 4.1 to 4.17 and 14.1 to 14.20 Test your C Skills - yaswanthkanitkar text book.
b) Write a program which determines the largest and the smallest number that can be stored in different data types of like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
c) Write a program to find greatest of three numbers using conditional operator?
d) Write a program to swap two numbers with and without temp variable?
e) Practice a program using multiple unary increment and decrement operators in arithmetic expressions?

2. Exercises on control structures?
a) Practice exercise 2.1 to 2.15 Test your C Skills - yaswanthkanitkar text book.
b)Write a program to find greatest of three numbers? Use nested if, if else if and switch statements?
c) Write a program to read marks of a student and print the sum and average?
d) Display the grade based on the sum of marks?
e) write a program to count the digits of a number? Use for loop
f) Write a program to check whether a number is perfect or not? Use do-while
g) Write a program to check whether a number is strong or not? Use while
h) Write a program to check whether a number is amstrong or not? Use for
i) Write a program to check whether a number is palindrome or not? Use for
j) Write a program to find the Fibonacci series upto the given number? Use while
k) Write a program to print the pascals triangle? Used do-while
l) Write a program to print the result of the series $1+x^2/2+x^3/3+\ldots+x^n/n$

3. Exercises on functions?

a) Practice exercise 5.1 to 5.14 Test your C skills -yaswanthkanitkar text book.

b) Write program to swap two variables using functions? Write a program to perform menu driven arithmetic operations using functions?

c) Write a program to find the factorial of a number using recursive and non- recursive functions?

d) Write a program to find the Fibonacci series using recursive functions?

e) Write a program to find the solution for towers of Hanoi using recursive function?

f) Write a program to pass parameters to a functions using call by value and call by reference?

4. Exercises on Arrays?

a) Practice exercise 9.1 to 9.17 Test your C skills - yaswanthkanitkar text book.

b) Write a program to read n numbers and sort them?

c) Write a program to find the minimum and maximum numbers of the array?

d) Write a program to read two matrices and find their sum, difference and product of them?

e)Find the transpose of a matrix?

f) Write a program to print upper and lower triangle of a given matrix?

5. Exercises on strings?

a) Practice exercise 10.1 to 10.15 yaswanthkanitkar text book.

b) Write a program to demonstrate the use of string manipulation functions?

c) Write a program to compare two strings?

d) Write a program to sort the names in Alphabetical order?

6. Exercises on pointers?

a) Practice exercise 7.1 to 8.26 yaswanthkanitkar text book.

b) Write a program to read dynamic array and sort the elements?

c) Write a program to read dynamic array and find the minimum and maximum of the elements?

d) Write a program to perform pointer arithmetic?

 e) Write a program on pointers for strings?

f) Write a program to use array of pointers?

7. Exercises on structures?

a) Practice exercise 11.1 to 11.30 yaswanthkanitkar text book.

b) Write a program to create student structure and read marks of three subjects and find the sum and total of the student?

c) Write a program on arrays of structures for 60 students record using the above student structure?

d) Write a program for complex structure? Perform addition, subtraction and multiplication of two complex numbers?

e) Write a program for addition and multiplication of two polinomials?

8.Write a program on Files?

a) Practice exercise 12.1 to 12.20 yaswanthkanitkar text book.

b)write a program to append content of a file?

c)Write a program to display the content of a file?

d)Write a program to copy content of one file to other file?

e)Write a program to count the no of characters in a file?

f)Write a program to compare the contents of two files?

References:

1. Test your C Skills by – YaswanthKanithkar-BPB Publishers
2. C programming; Test your skills-A.N.Kamthane-Pearson India

	L	T	P	C
Mathematics-II				
(ODE, PDE and Multivariable Calculus)	**3**	**1**	**0**	**3**

(Common to all branches)

UNIT I: Linear Differential Equations of Higher Order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

UNIT II: Equations Reducible to Linear Differential Equations and Applications

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients,

UNIT III: Partial Differential Equations – First order   8 hrs

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Solutions to homogenous and non-homogenous higher order linear partial differential equations.

UNIT IV: Multivariable Calculus (Vector differentiation)

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V: Multivariable Calculus (Vector integration)

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

References:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011

ENGINEERING PHYSICS

L T P C
3 0 0 3

(ME & CE)

UNIT-I: **(10 hrs)**
Interference: Principle of Superposition-Interference of light-Theory of Interference fringes-Conditions for sustained Interference-Interference in thin films by reflected light-Newton's Rings-Determination of Wavelength.
Diffraction: Fraunhofer Diffraction-Single slit Diffraction -Diffraction Grating – Grating Spectrum -Determination of Wavelength.

UNIT-II **(12 Periods)**
Lasers: Laser characteristics, Spontaneous and Stimulated emissions, Basic requirements of a laser, Population inversion – Solid state laser (Ruby laser), Gas (He-Ne) laser, Semiconductor (GaAs) laser, applications of lasers.
Fiber optics: Introduction to Optical Fibers-Principle of optical fiber-Critical angle, Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile, Modes-Propagation of electromagnetic wave through optical fiber - Fiber optic Communication system-applications of Optical fibers.

Unit– III **(14 hrs)**
Dielectrics: Introduction to Dielectrics--Electric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations-Lorentz (internal) field - Claussius -Mossotti equation.
Magnetics: Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment-Classification of Magnetic materials-Hysteresis-soft and hard magnetic materials- applications of magnetic materials.

Unit – IV: Semiconductors **(12 hrs)**
Origin of energy band formation in solids-Classification of materials into conductors, semi-conductors & insulators – Semiconductors-Intrinsic semiconductors-dependence of Fermi level on carrier concentration and temperature(Qualitative)- Extrinsic semiconductors - P-type & N-type-dependence of Fermi level on carrier concentration and temperature (Qualitative)- Direct and Indirect band gap semiconductors-Hall effect- applications of Semiconductors.

Unit-V **(12 hrs)**
Principles of Quantum Mechanics: Dual nature of light, Matter waves & properties, de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and application (non-existence of electron in nucleus). One dimensional time independent Schrodinger's wave equation, Physical significance of the wave function, Particle in a box (one dimensional).
Superconductivity: First experiment, critical parameters (Tc, Hc, Ic), Meissner effect, BCS Theory (in brief) and Applications of superconductors.

Text books:
1. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017

2. H.K.Malik&A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018
3. Gaur R.K. and Gupta S.L., "Engineering Physics"- DhanpatRai publishers, 2012

Reference Books:
1. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata McGrawHill ,2008
2. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
3. D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015

PROFESSIONAL COMMUNICATION SKILLS
(ME, CE)

L	T	P	C
3	1	0	3

UNIT-I:

1. Reading: Listening Skills – The Boy who broke the Bank (English & Soft Skills)
2. Writing: Paragraph Writing   8 Hrs.
3. Grammar: Common Errors in Nouns- Pronoun Agreement
4. Vocabulary Building: Functional word list -100

UNIT- II: 8 Hrs.
1. Reading: Assertive Skills – The Verger (English & Soft Skills)
2. Writing: Letter Writing (Formal and Informal)
3. Grammar: Correction of Errors in Subject- Verb Agreement
4. Vocabulary Building: Sign Post

UNIT - III: 8 Hrs.
1. Reading: Learning Skills – Three Questions (English & Soft Skills)
2. Writing: Note Making, Note Taking
3. Grammar: Correction of in Tense Usage
4. Vocabulary Building: One Word Substitutes

UNIT - IV: 8 Hrs.
1. Reading: Adaptability Skills – Senor Payroll (English & Soft Skills)
2. Writing: Pictorial Description
3. Grammar: Correction of Errors in Adjectives, Articles, Prepositions
4. Vocabulary Building: Synonyms and Antonyms

UNIT - V: 8 Hrs.
1. Reading: Written Communication Skills - Gateman's Gift (English & Soft Skills)
2. Writing: Information Transfer
3. Grammar: Correction of Errors in Wh- questions, Question Tags
4. Vocabulary Building: Idioms and Phrasal Words (200)

TEXT BOOK:

- Dhanavel S. P. *English and Soft Skills*, Orient Black Swan Pvt. Limited, 2013.
- Barun K Mitra, *Effective Technical Communication*, Oxford University Publication, 2014.

REFERENCE BOOKS:

1. Bailey, Stephen. *Academic writing: A handbook for International Students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
3. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
4. Michael Swan. *Practical English Usage*, OUP. 1995.
5. F.T. Wood. *Remedial English Grammar,* Macmillan.2007
6. Liz Hamp-Lyons and Ben Heasly. *Study Writing,* Cambridge University Press. 2006.
7. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad.
8. Sharon J.Gerson, Steven M.Gerson, *Technical Writing*, New Delhi: Pearson education, 2007.
9. Sanjay Kumar and PushpLata, *Communication Skills*, Noida: Oxford University Press, 2012.
10. Dr. ShaliniVerma, *Word Power Made Handy*, S. Chand & Co Ltd., 2009.

PYTHON PROGRAMMING

ME 124(R20)

L	T	P	C
3	1	0	3

Unit 1:

Context of software development: Software, Development tools, Learning programming with Python, Writing a python program.

Values and Variables: Variables and assignments, identifier, Control codes within Strings, User Input, The eval function, the print function.

Expressions and Arithmetic: Expressions, Operator precedence and Associativity, Comments, Errors, More arithmetic operators.

Unit 2:

Conditional Execution: Boolean Expressions, Simple if and if else,nested conditionals, multiway decision statements, conditional expressions, errors in conditional statements.

Iteration: While statements, for statement, definite loops and indefinite loops, nested loops, abnormal loop termination, infinite loops, iteration examples: computing square root, drawing a tree, printing prime numbers.

Unit 3:

Functions: Introduction, standard mathematical functions, time functions, Random numbers, main function, parameter passing, Function examples: Better organized prime number, Command Interpreter, Restricted Input, Better Die rolling simulator, Tree-Drawing Function, Floating –Point equality, Custom functions Vs Standard functions.

More on Functions: Global variables, Default Parameters, recursion, Making functions reusable, documenting functions and modules, functions as data.

Unit 4:

Lists: Using Lists, List assignment and equivalence, list bounds, Slicing, Lists and functions, Prime generation with a list
Lists processing: Sorting, flexible sorting, search, list permutations, randomly permuting a list, reversing a list.
Unit 5:
Objects: Using Objects, String Objects, List Objects.
Custom types: geometric points, Methods, Custom type examples, Class inheritance.
Handling Exceptions: Motivation, Exception examples, Using Exceptions, Custom Exceptions.
Text books:
1. LEARNING TO PROGRAM WITH PYTHON Richard L. Halterman
2. Core Python Programming by Dr. R.Nageswara Rao, dreamtech, second edition

ENGINEERING MECHANICS

L	T	P	C
3	1	0	3

Unit I   **12 hours**
 Introduction to Engineering Mechanics: Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.
 Friction: Laws of friction, types of friction, equilibrium of force systems involving frictional forces, wedge friction. Free body diagrams involving frictional forces.
Unit II   **10 hours**
 Analysis of Structures: Introduction to plane trusses, analysis of plane trusses by method of joints and method of sections.
 Properties of Surfaces and Volumes: Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes - cylinder, cone, sphere, theorem of Pappus-guidinus.
Unit III   **10 hours**
 Moment of Inertia: Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes -thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.
Unit IV   **10 hours**
 Kinematics: Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity -projectile motion, use of rectangular coordinates, tangential and normal coordinates.
Unit V   **10 hours**
 Kinetics: Principles of dynamics - Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy.
 Ideal Systems: Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse.

Textbooks:
 1. N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill, 2014.
 2. S Timoshenko, DH Young, JV Rao, SukumarPati, Engineering Mechanics (in SI units), 5/e, McGraw Hill, 20
3. S SBhavikatti, Engineering Mechanics, 4/e, New Age International, 2008.
 Reference Books:
 1. Basudeb Bhattacharya., Engineering Mechanics, 2/e, Oxford University Press (India), 2015.
 2. Irving Shames, G K M Rao, Engineering Mechanics: Statics and Dynam-ics, 4/e, Pearson, 2009.
3. K L Kumar, Veenu Kumar, Engineering Mechanics, 4/e, Tata McGraw Hill, 201

Environmental Science

(Common to ME, CE)

L T P C

3 1 0 3

UNIT – I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and Importance – Need for Public Awareness.

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:

UNIT – II: Ecosystems, Biodiversity, and its Conservation

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:Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans)

BIODIVERSITY AND ITS CONSERVATION : 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 mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III: Environmental Pollution and Solid Waste Management

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :Air Pollution., Water pollution,Soil pollution, Marine pollution, Noise pollution, Thermal pollution, 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 – IV: Social Issues and the Environment

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 – V: Human Population and the Environment

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health

– Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD 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, and birds – river, hill slopes, etc..

TEXT BOOKS :
1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

REFERENCES :
1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies byJ.P.Sharma, Laxmi publications.

ENGINEERING PHYSICS LABORATORY SYLLABUS

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Learning Outcomes:

<u>**List of Physics Experiments**</u>

1. Determination of the radius of curvature of the lens by Newton's ring method.
2. Determination of wavelength by plane diffraction grating method.
3. Dispersive power of a Prism.
4. Resolving power of a grating.
5. Photo cell – I-V Characteristic curves and determination of stopping potential.
6. Magnetic field along the axis of a circular coil carrying current.
7. B-H Curve
8. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.
9. Hall effect.
10. Photo voltaic cell - Determination of fill-factor.
11. To determine the energy gap of a semiconductor.
12. Determination of Acceleration due to gravity by using compound Pendulum.
13. Poisson's ratio of aluminium and rubber.
14. Rigidity modulus of material by wire-dynamic method (torsional pendulum).
15. Determination of a.c. Frequency – Sonometer.
16. Determine the wavelength of Laser source.

References:

1. S. Balasubramanian , M.N. Srinivasan " A Text book of Practical Physics"- S Chand Publishers, 2017
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

	L	T	P	C

COMMUNICATIVE ENGLISH LAB

(ME, CE)

L T P C
0 0 3 1.5

List of Activities

1. Identifying phonic sounds, listening to the sounds, practice and record the sounds from the English learning software

2. Common mispronounced words

3. Listening to the short audios and complete the tasks based on the audios

4. Listening to motivational speeches and answering the questions

5. Comprehending Spoken material in British English & American English

6. Situational Dialogues

7. Role plays

8. Reading comprehension exercises for GRE, TOEFL, GATE etc

9. Reading articles from newspaper

10. Specific reading for enhancing vocabulary

11. Vocabulary building exercises

12. Extempore

13. JAM sessions

14. Small talks

15. Oral presentations

Python Programming Lab
(ME, CE)

1. Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
2. Design a Python script to determine if a given string is a Palindrome using recursion
3. Design a Python script to sort numbers specified in a text file using lists.
4. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
5. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.
6. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)
7. Design a Python Script to find the value of (Sine, Cosine, Log, PI, e) of a given number using infinite series of the function.
8. Design a Python Script to convert a given number to words
9. Design a Python Script to convert a given number to roman number.
10. Design a Python Script to generate the frequency count of words in a text file.
11. Design a Python Script to print a spiral pattern for a 2 dimensional matrix.
12. Design a Python Script to implement Gaussian Elimination method.
13. Design a Python script to generate statistical reports(Minimum, Maximum, Count, Average, Sum etc) on public datasets.

14. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorising them into distinction, first class, second class, third class and failed.

15. Design a Python script to search an element in the given list.

16. Design a Python script on *str* methods and *list* methods.

ME 211 Mathematics-III
(Probability and Statistics)

II Year B.Tech. (Mech) First Semester
Lectures / Tutorials   :   3+1 Periods / week   *Sessional Marks   : 30*
University Exam.   :   3 hrs.   *University Exam. Marks   : 70*

UNIT - I
Basic Probability: Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

UNIT - II
Continuous   and Bivariate Probability Distributions: Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

UNIT - III
Basic Statistics: Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

UNIT - IV
Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas andmore general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

UNIT- V
Small samples: Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Text / References:
1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003.
3. S. Ross, "A First Course in Probability", Pearson Education India, 2002.
4. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968.
5. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.
6. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2000.
7. T. Veerarajan, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2

ME 212 STRENGTH OF MARETIALS-I

II Year B.Tech. (Mech) First Semester

Lectures / Tutorials :	*3+1 Periods / week*	*Sessional Marks*	*: 30*
University Exam. :	*3 hrs.*	*University Exam. Marks*	*: 70*

UNIT I

Tension, Compression and Shear : Introduction, Normal Stress and Strain, Stress- Strain Diagrams, Elasticity and Plasticity, Linear Elasticity and Hooke's Law, Shear Stress and Strain, Allowable Stresses and Loads.(6)

Axially Loaded Members: Introduction, Deflections of Axially loaded Members, Displacement diagrams (6)

UNIT II

Statically Indeterminate Axially Loaded Members: Statically indeterminate structures

(Flexibility method and Stiffness method) (7)
Temperature and Pre-strain effects, Strain energy of axially loaded members subjected to static load, Dynamic loading (5)

UNIT III

Torsion : Introduction, Torsion of Circular Bars, Pure Shear, Relationship between Moduli of Elasticity E and G, Transmission of power by circular shafts, Strain Energy in pure Shear and uniform Torsion for Statically determinate Members.(7)

Springs: Close coiled helical springs, axial load, torque, and leaf springs. (5)

UNIT IV

Shear Force and Bending Moment : Types of Beams, Shear Force and Bending Moment, Relationships between Load, Shear Force and Bending Moment, Shear Force and Bending Moment Diagrams.(12)

UNIT V

Stresses in Beams: Introduction, Normal Strains in Beams, Normal Stresses in Beams Strain Energy, Shear Stresses in Rectangular Beams, Shear Stresses in Webs of Beams with flanges.(6)

Analysis of Stress and Strain: Plane Stress, Principal Stresses and Maximum Shear Stress, Mohr's Circle for Plane Stress, Hooke's Law for Plane Stress, Unit Volume change, Strain Energy Density. Plane Strain, Mohr's Circle for Plane Strain. (6)

TEXT BOOKS:

1. Mechanics of Materials by Gere and Timoshenko, C B S Publishers

2. Mechanics of Solids by Singh, Pearson Education.

REFERENCE:

1. Strength of materials by Sadhu Singh, Khanna Publishers.

ME 213 MATERIAL SCIENCE & METALLURGY

II Year B.Tech. (Mech) First Semester

Lectures / Tutorials : 3+1 Periods / week   Sessional Marks   : 30
University Exam.   : 3 hrs.   University Exam. Marks : 70

UNIT I

Crystallography: Classification of crystals – Bravi's lattices – Miller Indices – Packing factor in cubic systems – coordination number – crystal imperfections – crystal deformation – Slip and Twinning. (6)

Phase Diagrams: Binary phase diagrams – Phase rule – one component system, two component system, isomorphous, eutectic, eutectoid, peritectic and peritectoid systems, concept of Ternary diagrams. (6)

UNIT II

Heat Treatment of Steels: Iron–Iron carbide equilibrium diagram, TTT diagrams for eutectoid, hypo and hyper eutectoid steels, martensite and bainitic transformation. (6)

Heat Treatment: Annealing, normalizing, hardening, tempering, surface hardening, age hardening, austempering, martempering and hardenability concept and experimental determination. (6)

UNIT III

Strengthening Mechanisms: Strain hardening, solid solution strengthening, grain refinement, dispersion strengthening. (6)

Composite Materials: Properties and applications of Particulate-reinforced composites, fibre reinforced composites, Laminar composites and metal matrix composites. (6)

UNIT – IV

Powder Metallurgy: Powder metallurgy process, preparation of powders, characteristics of metal powders, mixing, compacting, sintering, Applications of Powder Metallurgy. Forming and shaping of plastics – Extrusion and Injection moulding. (12)

UNIT – V

Ferrous And Non Ferrous Materials: Composition, properties and application of ferrous and non ferrous metals and their alloys. Brief study of cast iron, steels, copper, aluminum, Nano materials – Introduction and Applications (12)

TEXT BOOKS:

1. Introduction to Physical Metallurgy - Avner, McGrawHill
2. Material Science and Metallurgy - V. Raghavan, Pearson Education / PHI.
3. Material Science and Metallurgy - R.B.Choudary - Khanna Pub.

REFERENCE BOOK:

1. Material Science and Metallurgy - Dr.V.D.Kodgire, Everest Publishers
2. Nano materials – J.Dutta & H.Hofman
3. Manufacturing Engineering & Technology – Kalpak Jain & Schmid, Pearson / PHI

ME 214 BASIC THERMODYNAMICS

II Year B.Tech. (Mech)First Semester

Lectures / Tutorials :   3+1 Periods / week   Sessional Marks   : 30

University Exam.   :   3 hrs.   University Exam. Marks : 70

UNIT I

Fundamental Concepts and Definitions: Introduction, Macroscopic and microscopic points of view, Thermodynamic system and control volume, Perfect gases, properties and state of a substance, Thermodynamic equilibrium and Quasi-static Process, thermodynamic path, reversible and irreversible processes, factors that render a process irreversible, cycle, Zeroth law of thermodynamics, concept of temperature. (8)

Work and Heat: Definitions and units, system, closed system, open system, surrounding, universe, Work done at the moving boundary of a system,Work done in various non-flow processes, comparison of heat and work.(4)

UNIT II

First Law of Thermodynamics for Non-Flow Systems: First law for a system undergoing a cycle and for a change in state of system, internal energy and enthalpy, constant volume and constant pressure specific heats and their relation to internal energy and enthalpy of ideal gases. (8)

First Law of Thermodynamics for Flow Systems: Control mass and control volume, first law of thermodynamics for a control volume, Steady flow energy equation and itsApplication to engineering equipment. (4)

UNIT III

Second Law of Thermodynamics: Limitations of first law, PMM of first kind**,** Heat engines and Refrigerators, Statements of Second law, PMM of second kind, Carnot cycle and Carnot theorems, Thermodynamic temperature scale. (8)

Pure Substance: Definition**,** process of steam generation, P-v, T-s and h-s diagrams,Properties of saturated and superheated steam,Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction (4)

UNIT IV

Entropy: Inequality of Clausius, Entropy change in reversible process, T-ds relations,Entropy change of a system during an irreversible process, Principle of increase of entropy,Applications, Entropy change of an ideal gas, Availability, Maximum work. (12)

UNIT V

Gas Power Cycles: Air standard Carnot cycle, Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson 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.(12)

TEXT BOOKS:

1. Engineering Thermodynamics- P.K.Nag, TMH, New Delhi.
2. Thermal Science and Engineering- D.S.kumar, S.K.Katariapubl, New Delhi.
3. Thermodynamics—Rajput, LaxmiPubl, New Delhi.

REFERENCE BOOKS:

1. Fundamentals of Engineering Thermodynamics-Rathakrishnan-PHI, New Delhi.
2. Thermodynamics -- J.P.Holman, MGH, New York.

Note: Use of Steam Tables is permitted in University Examinations

ME215 MANUFACTURING PROCESSES

II Year B.Tech. (Mech) First Semester

Lectures   :   3+1 Periods / week   Sessional Marks   : 30
University Exam. :   3 hrs.   University Exam. Marks   :70

UNIT I

Metal Casting: Introduction, advantages of Casting method, pattern: types, materials and allowances. Sand moulding procedure, Moulding materials and equipment. Preparation, control and testing of moulding sands.Cores, Cupola: Description, operation and zones. (12)

UNIT- II

Gating Design: Design Considerations

Special Casting Methods: Permanent Mould Casting, Die Casting, Centrifugal casting, Investment casting, shell moulding, CO_2 process and continuous casting. Fettling of castings, casting defects : causes, remedies and testing.(12)

UNIT- III

WELDING: Gas and arc welding - Principles of oxy-acetylene welding, oxyacetylene flame cutting, MMAW(Manual metal arc welding), TIG, MIG, submerged arc welding. Resistance welding principles - Butt welding, Spot welding, Seam welding. Thermit Welding, Electro slag welding. Laser beam welding. Brazing & Soldering, welding defects - causes and remedies.(12)

UNIT- IV

Metal Working Processes: Introduction, Hot and Cold working of metals.

Rolling : Types of rolling mills, roll passes

Forging : Types, description and types of forging, defects in forged parts.

Extrusion : Classification, description and application of extrusion process   Tube making, Swaging Spinning, Coining, Embossing and Wire drawing

Explosive forming and electro hydraulic forming.(12)

UNIT- V

Additive manufacturing: Rapid prototyping and rapid tooling(5)

Unconventional Machining Processes: Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining, principles and process parameters, Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining (7)

Text Books:

1. Manufacturing Technology-Vol- I by PN Rao,TMH
2. Workshop Technology Vol.1 by S.K.HazraChowdary. Khanna Publishers
3. A course in Work shop technology, Vol-I by B.S.Raghuvanshi, Dhanpatrai& Sons.

Reference Books:

1. Welding Technology by Little, TMH
2. Principles of Metal Casting by Heine, Loper, Rosenthal, TMH.
3. Manufacturing Engineering & Technology, Kalpakjain, Pearson Education / PHI

ME216 CONSTITUTION OF INDIA

II Year B.Tech. (Mech) First Semester

Lectures   :   4 Periods / week   Sessional Marks   : 30
University Exam. :   3 hrs.   University Exam. Marks   : 70

UNIT-I
Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

LEARNINGOUTCOMES:
After completion of this unit student will
- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT-II
Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

LEARNING OUTCOMES:- After completion of this unit student will
- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-III
State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

LEARNING OUTCOMES:- After completion of this unit student will
- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secrateriate

UNIT-IV
A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

LEARNING OUTCOMES:- After completion of this unit student will
- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zilla panchayat block level organisation

UNIT-V
Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

LEARNING OUTCOMES:- After completion of this unit student will
- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-RESOURCES:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

ME 251 MACHINE DRAWING LABORATORY

II Year B.Tech. (Mech) First Semester

Practicals	*:*	*3 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*:*	*3 hrs.*	*University Exam. Marks*	*: 70*

MACHINE DRAWING:

1. **Sectional views :** Introduction, full & half section

2. **Screwed fasteners:** Screw thread nomenclature – types & classification of screw threads, Square & Hexagonal headed bolted joints.

3. **Keys, Cotters and Pin joints** : Saddle & Sunk Keys, Cotter Joint with sleeve ,Knuckle Joint

4. **Assembly Drawings** : Stuffing Box , Screw Jack , Eccentric .

Text Book:

1. Machine Drawing by K.L.Narayana, P.Kannaiah & K.Venkata Reddy

Reference Books:

1. Machine Drawing by K.R.Gopala Krishnan

ME 252 BASIC MANUFACTURING PROCESSES LABORATORY
II Year B.Tech. (Mech) First Semester

Practicals	*:*	*3 Periods / week*	*Sessional Marks* *: 30*
University Exam.	*:*	*3 hrs.*	*University Exam. Marks : 70*

PATTERN MAKING : Solid pattern , Split pattern .

MOULDING : Stepped cone pulley, Hand wheel, Bush.

FITTING : Six Standard Exercises

TURNING: Plain, Step and Taper turning, Right-hand and Left-hand threads, Eccentric turning, Knurling and contour turning.

ME 253 STRENGTH OF MATERIALS LABORATORY

II Year B.Tech. (Mech) First Semester

Practicals : *3 Periods / week* *Sessional Marks* : *30*
University Exam. : *3 hrs.* *University Exam. Marks* : *70*

Note: A minimum of 10 experiments shall be conducted done and record.

1. To study the stress – strain characteristics of mild steel bars by UTM.
2. To find young's modulus of the given material (steel or wood) by conducting bending test on simply supported beam.
3. To find modulus of rigidity by conducting torsion test on solid circular shaft.
4. To find the hardness of the given material by Brinnel's Hardness Tester.
5. To determine the hardness of the given material by Vicker's / Rockwell hardness tester.
6. To find impact resistance of the given material by conducting Charpy / Izod test on impact testing machine.
7. To determine the ultimate shear strength of steel rod in single and double shear.
8. To determine the modulus of rigidity of the spring.
9. Compression test on wood.
10. To determine fatigue strength of Mild steel.
11. To determine stress concentration factor.
12. Compression test on concrete Cubes.

ME254 CATIA 2D DRAFTING

(Skill Course)

II/IV B.Tech (Mech.) :: First Semester

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 30*
University Exam	*: 3 hrs*	*University Exam Marks*	*: 70*

Sketcher

 1. Introduction to CATIA, History, Basics, GUI, Use of mouse buttons, Sketcher, constraints, profile, setting workbench

2. Standard toolbar, how to open sketcher, sketch details and important toolbar for sketch

3. Profile toolbar, Types of constraints, constraint application, and constraint colour

4. Sketch constraint, view toolbar, Operation toolbar

5. Specification tree use, selecting toolbars

6. Sketch toolbar, Visualisation toolbar

7. Toolbar setting, plane size setting, graphics properties toolbar.

8. 3D introduction, important toolbar

9. Sketch based features toolbar

ME 221 STRENGTH OF MATERIALS- II

II Year B.Tech. (Mech) Second Semester

Lectures   :   3 +1 Periods / week   Sessional Marks   : 30

University Exam. :   3 hrs.   University Exam. Marks   : 70

UNIT I

Deflections of Beams : Introduction, Differential Equations of the Deflection Curve, Deflections by Integration of the Bending Moment Equation, Deflections by integration of the Shear Force and Load equations. Introduction to Moment Area Method, Macaulay's Method   (10)

UNIT II

Columns : Buckling and Stability, Columns with Pinned ends, Columns with other support conditions, Limitations of Euler's Formula, Rankine's Formula, Columns with eccentric Axial Loads, Secant formula.   (8)

UNIT III

Statically Indeterminate Beams : Statically indeterminate Beams, Analysis by thedifferential equations of the Deflection curve, Moment Area Method. (9)

Continuous Beams : Clapeyron's theorem of three moments, Beams with constant andvarying moments of inertia. (9)

UNIT IV

Pressure Vessels: Thin Spherical and Cylindrical Pressure Vessels [Biaxial Stresses], Thick Cylinders: Lame's theory, Radial Deflection, Compound Cylinders.   (8)

Curved Beams : Stresses in Beams of small and large initial curvature, The Winkler-Bachtheory, Stresses in Crane Hook and C-Clamp with Rectangular, Circular and Trapezoidal cross-sections.   (10)

UNIT V

Shear Centre : Bending Axis and Shear Centre, Position of Shear Centre, Shear flow,

Shear Centre of Channel section, Angle section, T- section and I- section.   (9)

Centrifugal Stresses : Introduction, Rotating Ring, Rotating Disc, Rotating Disc of uniformstrength.(9)

TEXT BOOK :
1. Mechanics of Materials by Gere and Timoshenko, CBSPublishers& Distributors.
2. Mechanics of Solids by Singh, Pearson Education.

REFERENCE:
1. Strength of materials by Sadhu Singh, Khanna Publishers
2. Advanced Solid Mechanics by L.S. Srinath

ME 222 KINEMATICS OF MACHINES
II Year B.Tech. (Mech) Second Semester

Lectures / Tutorials :   *3+1 Periods / week*   *Sessional Marks*   *: 30*
University Exam.   :   *3 hrs.*   *University Exam. Marks : 70*

UNIT I
Introduction: Mechanisms and machines, Rigid and resistant bodies, Link, Kinematic pair, Degrees of Freedom, Classifications of Kinematic pairs, kinematic-chain, Linkage, Mechanism, and structure, Classification of mechanisms, Equivalent Mechanisms, Four -
Link (bar) Mechanism, Inversions of Slider - Crank Chain, Double – Slider Chain.(6)

Instantaneous centre: Notation, Number of I - Centres, Kennedy's theorem, Locating   I - Centres, Angular velocity by I - Centre Method. (6)

UNIT II
Velocity Analysis: Introduction, Absolute and Relative Motion, Vectors, Addition and subtraction of Vectors, Motion of a Link, Four Link Mechanism, Angular Velocity of Links, Velocity of Rubbing, Slider - Crank Mechanism, Crank and Slotted Lever Mechanism. (12)

UNIT III
Acceleration Analysis: Acceleration, Four-Link Mechanism, Angular acceleration of Links, Acceleration of Intermediate and offset points, slider-Crank Mechanism, Coriolis acceleration component, Crank and slotted lever Mechanism. (12)

UNIT IV
Cams Definitions of cam and followers - their uses - types of followers and cams - types of follower motion - uniform velocity, simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above three cases. (8)

Analysis of motion of followers: Tangent cam with Roller follower - circular arc cam with straight, concave and convex flanks.   (4)

UNIT V
Gears: Introduction, Classification gear terminology, Law of Gearing, Velocity of Sliding, Forms of Teeth, Cycloidal Profile Teeth, Involute Profile Teeth, Path of contact, Arc of contact, Number of pairs of Teeth in contact, Interference in Involute Gears, Minimum number of Teeth, Interference between Rack and Pinion, Undercutting, Comparison ofCycloidal and Involute tooth forms. (8)

Gear Trains: Introduction, simple Gear Train, Compound Gear Train, Reverted Gear train, Planetary or Epicyclic Gear Train, Analysis of Epicyclic Gear Train, Torques in Epicyclic Trains. Tabular method (4)

TEXT BOOKS:
1.   Theory of Machines of by S.S.Rattan. TMH.
2.   Theory of Mechanisms and Machines by C.S.Sharma, KamleshPurohit, PHI

REFERENCE BOOK:
1. Theory of Mechanisms and Machines by Ghosh and Mallik
2. Mechanism and Machine Theory by J.E. Shigley, MGH

ME 223 FLUID MECHANICS & HYDRUALIC MACHINES
II Year B.Tech. (Mech) Second Semester

Lectures / Tutorials :   3+1 Periods / week   Sessional Marks   : 30

University Exam.   :   3 hrs.   University Exam. Marks   : 70

UNIT I

Introduction: Definition of fluid, Properties of a fluid – density, specific weight, specific gravity, viscosity, compressibility, surface tension, capillarity, vapor pressure, Classification of fluids. (5)

Fluid Statics: Pressure, variation of pressure in fluid, measurement of pressure – simple and differential manometers, pressure head, Pascal's law, Total pressure and center of pressure on submerged plates, Buoyancy and Metacentric height.   (7)

UNIT II

Fluid Kinematics: Type of fluid flow, flow patterns, Rotation and irrotational flow, velocity potential, stream function, flow net, continuity equation & Bernoulli's equation   (4)

Fluid Dynamics: Introduction, Euler's equation of motion, Bernoulli's equation, Pitot tube, Venturimeter, Orifice meter, orifice-various coefficients of an orifice (6)

Impulse Momentum Equation: Impulse momentum Principle, Equation and Application,Force on pipe bend. (2)

UNIT Ill

Flow Through Pipes: Laws of fluid friction, minor losses, hydraulic gradient line, total energy line, pipes in series and parallel, water hammer (7)

Impact Of Jets: Introduction, Force exerted by a fluid jet on stationary and moving flat plate and curved vanes, flow over radial curved vanes.(5)

UNIT IV

Hydraulic Turbines: Elements of hydro-electric power plants: Heads and Efficiencies of Pelton wheel, Francis turbine and Kaplan turbine. (6)

Performance Of Turbines: Performance under unit quantities, Performance under specific conditions - Specific speed, Performance characteristic curves.(4)

Pumps: Working principles of Centrifugal and Reciprocating Pumps. (2)

UNIT V

Dimensional Analysis & Model Similitude: Introduction, Buckingham's Pi theorem, Types of similarities, Force ratios, Dimensionless numbers, Model Laws-Reynolds and Froude law, Types of models, Scale effect.(Qualitative treatment only)   (7)

Boundary Layer Concepts: Introduction, boundary layer thickness, displacement thickness, momentum thickness, energy thickness, boundary layer growth on a flat plate, separation of boundary layer.(5)

TEXT BOOK:

1.   Hydraulics and Fluid Mechanics --P.N.Modi& S.M. Seth,
2.   Fluid Mechanics & Fluid Power Engineering - D.S.Kumar, SK Kataria&sons, New Delhi.
3.   Fluid Mechanics and Fluid machines – Agarwal, TMH.

REFERENCE BOOKS:

1.   Fluid Mechanics & Hydraulic Machines - R.K.Bansal
2.   Fluid mechanics including Hydraulic machines - A.K.Jain.
3.   Fluid Mechanics-K.L.Kumar

ME 224 APPLIED THERMODYNAMICS

II Year B.Tech. (Mech) Second Semester

Lectures	*: 3+1Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT I

Vapor Power Cycles: Rankine cycle, Effect of pressure and temperature on the Rankine cycle, reheat cycle, regenerative cycle. (8)

Steam Boilers: Function, classification, working of Babcock and Wilcox boiler, Mountings &Accessories.(4)

UNIT II

Steam Nozzles: Types of nozzles, isentropic flow through nozzles, Effect of friction, Nozzle efficiency, Critical pressure ratio and maximum discharge, calculation of throat and exit areas using Mollier diagram. (7)

Steam Condensers: Jet and Surface condensers, condenser vacuum and vacuum efficiency, Condenser efficiency, Thermodynamic analysis, Air pumps, Capacity of air extraction pump. (5)

UNIT III

Steam Turbines: Types of steam turbines, Impulse turbines, pressure and velocity compounding, velocity diagrams, work output, power, blade efficiency and stage efficiency, Reaction turbines, velocity diagrams, degree of reaction, work output, power, blade efficiency and stage efficiency, Governing of turbines, Overall efficiency and reheat factor.(12)

UNIT IV

Refrigeration: Need for Refrigeration, Definitions, Methods of refrigeration, Working of Refrigerator& Heat pump, Bell - Coleman cycle, Refrigerating effect, COP , vapor compression refrigeration system, influence of various parameters on cycle performance, Vapor absorption refrigeration cycle.   (12)

UNIT V

Psychrometry and Air Conditioning: -Introduction, Psychrometric properties, Psychrometric chart, Psychrometric processes, Applications of Psychrometric processes. Types of Air conditioning systems. (12)

TEXTBOOKS:

1. Treatise on Heat Engineering-V.P.Vasandani and D.S.Kumar, Metropolitan Book co, New Delhi.
2. Thermal Engineering ---Rajput, LaxmiPubl, New Delhi.
3. Thermal Science and Engineering- D.S.kumar, S.K.katariaPubl, New Delhi.

REFERENCE BOOKS:

1. Engineering Thermodynamics----Cengel and Boles, TMH.
2. Refrigeration and Air Conditioning -- C.P. Arora, TMH.
3. Engineering Thermodynamics—Achuthan, PHI, New Delhi.

Note: Use of Steam Tables and Refrigeration and Air-Conditioning Tables is permitted in University Examinations.

ME 225 PROFESSIONAL ETHICS AND HUMAN VALUES
II Year B.Tech. (Mech) Second Semester

Lectures	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT – I

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

UNIT – II

Engineering Ethics: Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT – III

Engineering as Social Experimentation: Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT - IV

Safety, Responsibility and Rights: Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and reducing risk.

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

UNIT – V

Global Issues: Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (ISTE), India, etc.

Text Books:

1. R.S. Naagarazan "A Textbook on Professional ethics and Human Values", New Age International Publihers, 2006.
2. Govindarajan. M, Natarajan. S, Senthilkumar. V.S, "Engineering Ethics", Prentice Hall of India, 2004.

References:

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Jersey, 2004 (Indian Reprint).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thompson Learning, United States, 2000 (Indian Reprint now available).
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

ME 261 FLUID MECHANICS & HYDRAULIC MACHINES LABORATORY

II Year B.Tech. (Mech) Second Semester

Lectures / Tutorials :   3 Periods / week   Sessional Marks   : 30
University Exam.   :   3 hrs.   University Exam. Marks   : 70

Note: A minimum of 10 experiments are to be performed

1. Verification of Bernoulli's theorem
2. Venturimeter&Orificemeter:: Determination of coefficient of discharge
3. Orifices: Determination of coefficient of discharge by steady and unsteady flow methods.
4. Mouthpieces: Determination of coefficient of discharge by steady and unsteady flow methods.
5. Characterization of laminar and turbulent flows by Reynolds apparatus
6. Determination of friction factor of pipes
7. Determination of loss of head in pipes due to bends, sudden contractions and sudden expansion.
8. Measurement of force due to impact of jets on vanes of different types
9. Performance studies on Pelton turbine
10. Performance studies on Francis turbine / Kaplan turbine
11. Performance studies on single stage centrifugal pump
12. Performance studies on Reciprocating pump.

ME 262 MODELING LABORATORY

II Year B.Tech.(Mech.) Second Semester

Practicals   :   3 Periods / week   Sessional Marks: 30
University Exam. : 3 hrs.   University Exam. Marks: 70

3D modelling using any of the modelling packages like CATIA, Creo, Uni-Graphics, Solid Works, Ideas, AutoDesk Inventor etc.

List of Modules to be Covered:

SKETCHER

PART MODELLING

WIREFRAME MODELLING

SURFACE MODELING

ASSEMBLY MODELLING

DRAFTING

With examples of Assembly drawings.

     1) **Screw Jack**.   2) **Stuffing Box.**   3) **Eccentric.**

Parts and Assemblies can be chosen from

1. A Text book of "Machine Drawing" by K. L. Narayana, P. Kannaiah, K. Venkata Reddy.

2. Pro/Engineer (CREO Parametric 2.0) for Engineers and Designers, by Prabhakar S.T.

Dream Tech Press

ME 263 Advanced English Communication Skills Lab

II Year B.Tech. (Mech) Second Semester

Practicals   :   3 Periods / week   Sessional Marks   : 30
University Exam. :   3 hrs.   University Exam. Marks : 70

Course Objectives:

The main course objective of *Advanced English Communication Skills Lab* is to develop the student's Non-Verbal Communication, Cognitive and Poignant Skills, Interview Skills, Employability and Interpersonal skills, which relate to situations in the work place. The skills imparted to the learners are body language, leadership, time management, team management, assertive skills, group discussions, interview techniques and positive work ethics ...etc.

The methodology includes Interactive sessions, Role Play, Team Work/Group Work/Pair Work and Peer Evaluation. The emphasis is on learning by doing to improve the learners' life skills.

Course Outcomes:

CO1	To realize the importance of communication skills in job arena To enhance the students ability to communicate
CO2	Able to learn vocabulary for GRE, TOEFL, IELTS,IES etc
CO3	Capable to participate in all recruitment procedures
CO4	Able to communicate effectively over a phone and proficient to demonstrate telephoning skills
CO5	Able to describe procedures and improves analytical thinking
CO6	Able to know the importance of personality development

Syllabus:

Module-l Communication Skills

I.   Verbal

a) Types of Communication
b) Barriers to Communication
c) Strategies for effective communication

II.   Nonverbal Skills -

a) Body Language – Voluntary and Involuntary

b) Kinesics
c) Facial Expressions
d) Proxemics
e) Oculesics
f) Haptics and Chronemics

Module-2: Advanced Vocabulary

a) Word list (GRE & TOEFL related)
b) One Word Substitutes
c) Idioms

Module-3: Employability Skills (Ref: 6)

a) Interview Skills
b) Group Discussion
c) Resume Writing

Module-4: Telephonic Skills

a) Formal &Informal interaction

b) Receiving Messages & Complaints

c) Tone modulation

Module-5: Descriptions
a) Process Description
b) Pictures
c) Narration

Module-6: Behavioural Skills

a) Emotional Intelligence
b) Positive Attitude
c) Team Work
d) Organization Skills

ME264 MATLAB for Mechanical Engineering

(SKILL COURSE)

II Year B.Tech.(Mech.) Second Semester

Practicals	*: 3 Periods / week*	*Sessional Marks: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks: 70*

1. Introduction to MATLAB
2. MATLAB Syntax and Commands
3. Use of MATLAB to Solve Engineering Problem & Algorithms, Conditional Statement,Repetition Loops, Subprograms, Matrix Manipulation.
4. Write MATLAB commands to analyse arithmetic, logical and Boolean operations.
5. Write MATLAB commands to analyse vector operations and magic matrix's.
6. Write a MATLAB program to demonstrate if and else if statement for comparing Two numbers.
7. Analyze the following operations in MATLAB.

   a) Colon operator b) Line Plotting c) 2D plotting
8. Write MATLAB code to observe Regression and Polynomial functions.

ME 311 DESIGN OF MACHINE ELEMENTS
III Year B.Tech. (Mech) First Semester

Lecturers / Tutorials: 4+1 periods / Week   *Sessional Marks : 30*
University Exam: 3 hrs   *University Exam Marks : 70*

UNIT I

Basics: Basic procedure of machine design, requirements and design of machine elements, traditional design methods. Design synthesis, use of standards in design, manufacturing considerations in machine design, preferred numbers and significance. (6)

Materials & their Properties : Mechanical properties of materials, Common engineering materials and their properties. (4)

Design for Static Strength : Simple Stresses - Combined stresses - Torsional and Bending stresses - stress strain relation, various theories of failure - Factor of safety and its importance in design. (5)

UNIT II

Design for Fatigue Strength : Stress concentration, stress concentration factors, reduction of stress concentration, fluctuating stresses, fatigue failure, endurance limit, low cycle and high cycle fatigue, notch sensitivity, endurance – approximate estimation, reversed stresses – design for finite and infinite life, cumulative damage in fatigue, Soderberg and Goodman lines, modified Goodman diagrams, Gerber equation, fatigue design under combined stresses, impact stresses. (9)

UNIT III

Fasteners: Riveted joints, Boiler Joints & Lozenge Joint, Design of joints under eccentric loading, Welded joints, Eccentrically loaded welded joints. (15)

UNIT IV

Threaded Joints – basic types, bolt of uniform strength, materials and manufacture, eccentrically loaded bolted joints in shear, eccentric load perpendicular to axis of bolt, eccentric load on circular base. (11)

UNIT V

Power Screws: Types - Mechanics of power screws, efficiency, Design of Screw Jack and turnbuckle. (6)

Cotter Joints: Sleeve and Socket & Spigot cotter joints, Gib & cotter joint.. (4)

TEXT BOOKS:
1. Design of machine elements by Bhandari, Tata McGraw Hill book Co.
2. Machine Design by P.C. Sharma & D.K. Agarwal.
3. Design of Machine Elements by Sharma & Purohit ,PHI
HAND BOOKS TO BE ALLOWED IN UNIVERSITY EXAMINATION:
1. Design data book, P.S.G. College of Technology, Coimbatore
2. Design data book, Mahadevan &Balaveera Reddy - CBS Pub.

ME312   DYNAMICS OF MACHINES

III Year B.Tech. (Mech) First Semester

Lectures / Tutorials   :   3+1 Periods / week   Sessional Marks   : 30
University Exam.   :   3 hrs.   University Exam. Marks   : 70

UNIT I

Dynamic Force Analysis : Introduction, D'Alembert's Principle, Equivalent Offset Inertia Force, Dynamic Analysis of Slider - Crank mechanism (Using Analytical method) Velocity and Acceleration of piston, Angular velocity and Angular Acceleration of Connecting Rod, Piston Effort (Effective Driving Force), Crank Effort. Turning Moment on Crankshaft, Inertia of connecting Rod. , Turning Moment diagrams, Fluctuation of energy and Flywheels   (10)

UNIT II

Governors: Introduction, Types of Governors, Watt Governor, Porter Governor, Hartnell Governor, Sensitiveness of a Governor, Hunting, Isochronism, Stability, Controlling force, Power of a Governor (8)

Gyroscopes : Angular Velocity,   Angular   Acceleration,   Gyroscopic   Torque,   Gyroscopic Effect on Naval Ships, Stability of a two wheel vehicle.(6)

UNIT III

Balancing : Introduction, Static balancing, Dynamic balancing, Transferring of a Force from one plane to another, Balancing of Several Masses in Different planes, Primary & Secondary
Balancing of Reciprocating Mass ,   Balancing a locomotive, effect of Partial Balancing,
Balancing of In line Engines and V Engines.(12)

UNIT IV

Fundamentals of Vibration:- Introduction, Definitions, Vector method of representing
Harmonic Motions, Addition of two simple Harmonic motion of the same frequency.   (6)

Undamped Free Vibrations of Single Degree of Freedom Systems:- Introduction, Derivations of differential equations, solution of differential equation, Torsional vibrations,
Equivalent stiffness of spring combinations, Energy method.   (6)

Damped Free Vibrations of Single Degree of Freedom Systems:- Introduction, Different types of damping, Free vibrations with viscous damping, Logarithmic Decrement, Viscous dampers, Coulomb damping, Structural damping, Interfacial damping.   (6)

UNIT V

Forced Vibrations of Single Degree of Freedom Systems:- Introduction, Forced vibrations with constant Harmonic excitation, Forced vibration with rotating and reciprocating unbalance, forced vibrations due to excitation of the support, Critical speed of a light shaft having a single disc without damping, critical speed of a light shaft having a single disc with damping, Vibration, isolation and transmissibility, vibration measuring instruments.(14)

Two Degrees of Freedom Systems: Introduction, Principal modes of vibration, undamped dynamic vibration absorber.(4)

<u>TEXT BOOKS:</u>

Theory of Machines by S.S. Rattan
Mechanical Vibrations – G.K.Groover
Mechanical Vibrations – Rao V.Dukkipati, J.Srinivas, PHI

<u>REFERENCE BOOKS:</u>

Theory of Machines by T. Bevan
Theory of Mechanisms and Machines by A. Ghosh and A.K. Mallik.
Mechanical Vibration – S.S.Rao.

ME313 METAL CUTTING AND MACHINE TOOLS

III Year B.Tech. (Mech) First Semester

Lectures: 3 Periods / week	*Sessional Marks*	*: 30*
University Exam. : 3 hrs.	*University Exam. Marks*	*: 70*

UNIT I

Machining Processes and Machine Tools: Introduction, Primary and Auxiliary Motions in machine tools, parameters defining working motions of a machine tool. (3)

Lathe: Constructional details, specifications, classification of lathes**. (3)**

Lathe Mechanisms: Spindle speed Mechanisms in Belt driven and All Geared Head stock,Apron and Half-nut mechanisms. Lathe accessories – various work holding devices. Lathe operations including taper turning and thread cutting and related problems. (9)

UNIT II

Drilling Machines: Types and specifications, spindle feed mechanism, drilling operations, drilling time. (4)

Shaping and Planing: Constructional details, types of shapers and planers, specifications, Quick Return Mechanism and automatic feed mechanisms. (4)

UNIT III

Grinding Machines: General Principles, Wheel materials, Selection and specification of grinding wheels, Truing and Dressing of grinding wheels, types of grinding machines. (7)

Surface Finishing Operations: Honing and Lapping operations. (3)

UNIT IV

Milling Machines: Working Principle, Size and Specification, Up and Down Milling, Typesof milling machines, Description and working of Universal Milling machine, Milling operations, Milling cutters, Indexing methods and Indexing Head, related problems. (12)

Cutting Tool Materials: Requirements of Tool materials and types, economics of machining. (3)

UNIT V

Theory of Metal Cutting: Introduction, Basic elements of machining, Nomenclature ofsingle point cutting tool, Tool Geometry, Mechanics of chip formation, Types of chips. Determination of shear angle and chip thickness ratio, stress and strain in the chip, velocity relations, Merchant's theory of orthogonal cutting forces, related simple problems.   (6)

Tool wear, Tool life and Tool life criteria.   (3)

Heat Generation and temperature distribution in metal cutting,cutting fluids- types and required characteristics. (3)

<u>**TEXT BOOKS:**</u>

1. Workshop Technology Vol. II by HazraChowdary
2. Production Engineering by P.C. Sharma, S.Chand& Co.

<u>**REFERENCE BOOKS:**</u>

1. Materials and Processes in Manufacturing by E.Paul De Garmo, J.T.Black and Ronald A.Kohser.
2. Machining and machining process by PN.Rao, TMH.
3. Manufacturing Science by Ghosh &Mallick.

ME 314/A I.C. ENGINES & GAS TURBINES

III Year B.Tech. (Mech) First Semester

Lecture   : 3+1 Periods / week   *Sessional Marks   : 30*

University Exam. 3 hrs.   *University Exam.Marks : 70*

UNIT I

I.C. Engines: Introduction, Basic engine nomenclature, Review and classification of I.C.Engines, working principles of S.I. and C.I. Engines (both 4 stroke and 2-stroke) - valve timing and Port Timing diagrams - Differences between S.I. & C. I. and 2 stroke & 4 stroke engines.

UNIT II

Fuel Supply Systems: S.I. Engines- Chemically correct air-fuel ratio, Air-fuel mixture requirements, Carburetion, Simple float type carburetor, injection system, types, electronic fuel injection system, MPFI

C. I. Engines-Air- fuel requirements, fuel supply and injection systems, Bosch fuel pump, electronic injection system, CRDI.

Combustion Processes: S.I. Engines- Normal combustion, abnormal combustion, Knock rating and Octane number.C.I. Engines-Ignition delay, combustion knock in C.I. engines, Knock rating and Cetane number

UNIT III

Testing of I.C. Engines: Indicator diagram, evaluation of Indicated Power, Brake power, Fuel consumption, SFC, Mechanical & thermal efficiencies, mean effective pressure, air-fuel ratio, Heat balance, Engine performance curves, Variables affecting engine performance for both S.I. & C.I. Engines.

UNIT IV

Reciprocating Air Compressors: Classification, Operation, Effect of clearance volume, compression ratio, volumetric efficiency, power input, Single-stage and Multi-stage compressors, Effect of inter-cooling, optimum intermediate pressure in a two-stage compressor.

 Rotary Compressors: Introduction, Types and their applications, principles of working, static and total head values, Centrifugal compressor- velocity vector diagrams, pressure coefficient, pre whirl, Axial flow compressor - polytropic efficiency, Surging, Choking and Stalling, Centrifugal compressor versus axial flow compressor.

UNIT V

Gas Turbines: Closed and Open cycle gas turbines, analysis of closed cycle gas turbine, efficiencies of Compressor and turbine, cycles with inter-cooling, reheat and regeneration.

Jet & Rocket Propulsion: Basic principles of Jet propulsion - specific thrust, propulsive efficiency and overall thermal efficiency of a jet engine, Principles of Rocket propulsion, Types of rocket propulsion.

TEXT BOOKS:

1.   Treatise on heat Engineering -Vasandani& Kumar-Metropolitan Book Company, Delhi

2.   Thermal Engineering- Rajput - Laxmi Pub, New Delhi

3.   Fundamentals of I.C.Engines – H.N. Gupta, PHI, New Delhi.

REFERENCE BOOKS:

1.   Fundamentals of I.C. Engines - P.W. Gill, J.H. Smith &Ziurys- IBH & Oxford publ,

2.   A Course in I.C. Engines - M.L.Mathur&R.P.Sharma - Dhanpat Rai & Sons-New Delhi.

3.   Gas Turbine Theory - Cohen, Rogers and Sarvanamuttu.

4.   I.C. Engines -V.Ganesan - T.M.H., New Delhi.

ME 314/B ELEMENTS OF AEROSPACE ENGINEERING

III Year B.Tech. (Mech) First Semester

Lecture   : 3+1 Periods / week   *Sessional Marks   : 30*

University Exam. 3 hrs.   *University Exam.Marks : 70*

UNIT I

HISTORICAL EVOLUTION AND AIRCRAFT CONFIGURATIONS: History- Early Planes-Developments in aerodynamics- Multi-planes, biplanes and monoplanes-Components of an Airplane and Their functions, Types of Flight Vehicles, Classification-Standard Atmosphere, Altitude, Hydrostatic Equation, Geopotential and Geometric Altitudes FLIGHT VEHICLE STRUCTURES: Introduction, Fuselage-Monocoque, Semi-Monocoque Structures, Components of Wing-Spars, Ribs, Longerons, Stringers, Bulkheads, Aircraft Materials-Metallic and Non-Metallic Materials, Use of Aluminium Alloy, Titanium, Stainless Steel and Composite Materials.

UNIT II

BASIC AERODYNAMICS: Continuity equation, Incompressible and Compressible flow, Momentum equation, Energy equation, Speed of sound, Measurement of air speed, Compressible flow, Compressibility, Introduction to viscous flow, Laminar and Turbulent boundary layer, compressibility effect on Skin friction, Flow separation- Introduction-Airfoils - Airfoil Nomenclature, Classifications of NACA Airfoils, Wing Geometry, Aerodynamic Forces, Lift, Drag and Moment Coefficients, Co-Efficient of Pressure, Centre of Pressure, Aerodynamics Centre, Pressure Distribution Over Aerofoil, Types of Drag.

UNIT III

PROPULSION: Introduction, Propeller, Reciprocating Engine, Jet Propulsion-The Thrust Equation, Elements of Turbojet Engine-Turbofan Engine-Rocket Engine, Rocket Propellants- Liquid Propellants, Solid Propellants, Rocket Staging

UNIT IV

ELEMENTS OF AIRPLANE PERFORMANCE: Introduction: The Drag polar, Equations of Motion-Thrust required for Level, Unaccelerated Flight, Thrust available and Maximum Velocity-Power required for Level, Unaccelerated Flight, Power available and Maximum velocity- Altitude effects on Power required and Available, Rate of Climb, Gliding Flight, Absolute and Service Ceilings, Time of Climb, Range and Endurance-Propeller Driven Airplane , Jet Airplane

UNIT V

PRINCIPLES OF STABILITY AND CONTROL: Introduction, Definition of Stability and Control – Static stability, Dynamic stability, Control- Moments on the Airplane-Absolute angle of attack, Criteria for Longitudinal Static Stability Directional static stability –Lateral Static stabililty SPACE FLIGHT: Introduction, Orbit Equation, Basic Aspects of Space Vehicle Trajectories, Kepler's Laws, Earth and Planetary Entry,Space Explorations- Space Vehicles and Its Types, Reusable Space Vehicles, Space Shuttle, Satellites, Types of Satellites and Their Functions.

TEXT BOOK:

 Anderson. J. D, Introduction to Flight, Eighth Edition, McGraw-Hill Education,2017.

REFERENCE BOOKS:

1. Houghton. E. L., Carpenter P.W., Aerodynamics for Engineering Students, Seventh Edition, Butterworth-Heinemann,2017.
2. Kermode. A. C, Mechanics of Flight, Eleventh Edition, Pearson Education,2007.
3. Kermode, A.C., "Flight without Formulae", McGraw Hill, 1987.
 4. Clancy, L.J., "Aerodynamics", Pitman, 1986

WEB RESOURCES:

 http://nptel.ac.in/

ME 314/C COMPUTIONAL FLUID DYNAMICS

III Year B.Tech. (Mech) First Semester

Lecture   : 3+1 Periods / week   *Sessional Marks   : 30*

University Exam. 3 hrs.   *University Exam.Marks : 70*

UNIT I

Importance and applications of CFD, Models of flow, governing equations of fluid flow – Navier Stokes and Euler's equations: Continuity, Momentum and Energy equations in differential form, Physical boundary conditions.

 UNIT II

Classification of partial differential equations, Discretization techniques- FDM, FEM, FVM, Finite Difference equations- Taylor series, order of accuracy, forward, backward and central differences for first order and second order differential equations.

UNIT III

 Difference equations, Explicit and Implicit approaches, Thomas Algorithm (TDMA). Analysis of stability, VN stability criteria for parabolic (1-D unsteady heat equation) and Hyperbolic (1st order wave equation) equations, Courant number.

UNIT IV

Simple CFD techniques: Lax-Wendroff technique, MacCormack's technique and Iterative and Relaxation techniques.

UNIT V

 Pressure correction technique, staggered grid, SIMPLE algorithm, Boundary conditions for pressure correction method. Applications of CFD. CFD Software packages

TEXT BOOKS:

 1. Computational Fluid Dynamics - Basics with Applications - John. D. Anderson, JR. McGraw Hill Education (India) Edition 2012.

2. Computational Fluid Dynamics - T. J. Chung, Cambridge University Press, 2nd Edition, 2014.

REFERENCE BOOKS:

 1. Introduction to computational fluid mechanics - Niyogi, Chakravarty, Laha, Pearson pub. 1st Edition, 2009.

2. Numerical heat transfer and fluid flow - S.V. Patankar, Hemisphere Pub., 1st Edition.

 3. Computational Fluid flow and Heat transfer - K. Muralidhar and T. Sundararajan-, Narosa Pub. 2nd Edition, 2003

WEB RESOURCES:

1. http://ocw.mit.edu/courses/mecharlical-engineering/2-29-numerigal-fluidmechanicsfall2011/

2. http:/inptel.ac.in/courses/112105045/ (IIT Kharagpur)

3. http://nptel.ac.in/courses/112107080/ (IIT Roorkee)

4. http://nptel.ac.in/courses/112104030/ (IIT Kanpur)

ME 315/A OPERATIONS RESEARCH

III Year B.Tech. (Mech)   First Semester

Lectures / Tutorials : 3+1 Periods / week   *Sessional Marks*   *: 30*

University Exam.: 3 hrs.   *University Exam. Marks*   *: 70*

UNIT I

Linear Programming: Definition and Scope of Operations Research, Mathematical formulation of the problem, graphical method, Simplex method, artificial basis technique, duality, dual Simplex method. Degeneracy, alternative optima, unbounded solution, infeasible solution.(18)

UNIT II

Transportation Problem: Introduction to the problem, LP formulation of a transportation problem. Basic feasible solution by north-west corner method, Vogel's approximation method, least cost method. Finding optimal solution by MODI method, degeneracy, unbalanced transportation matrix and Maximization in transportation model. (15)

Unit III

Assignment Problem: Introduction to the problem, LP formulation of a Assignment problem. One-to-one assignment problem, optimal solution, unbalanced assignment matrix. Flight scheduling problems, Traveling salesman problem. (15)

UNIT IV

Queing Theory: Queuing systems and their characteristics. Analysis of Markovian chains, Transition diagram, M/M/1 : FCFS/ µ / µ and M/M/1 : FCFS/ µ / N queuing models.

Project Planning Through Networks: Arrow (Network) Diagram representation. Rules for constructing an arrow diagram, Pert and CPM, Critical path calculations, earliest start and latest completion times, Determination of critical path, determination of floats, Probability considerations in project (18)

UNIT V

Simulation: Definition and applications. Monte-Carlo simulation. Random numbers and random number generation: Mixed congruential method, additive congruential method and multiplicative congruential method. Application problems in queuing and inventory.

Game Theory: Definition of Game, Strategy, pure strategy, mixed strategy, pay off matrix, Maxmin and Minmax criteria of optimality. Two person zero sum games: Pure and Mixed strategies, Dominance Property, Arthimatic method, algebraic method for 2x2 games, solution of 2xn or mx2 games (18)

TEXT BOOKS:
1. Operations Research – H.A. Taha
2. Introduction to Operations Research – Hiller and Liberman

REFERENCES:

1. Introduction to Operations Research – Phillips, Ravindran, James Solegerg.
2. Optimization Theory and Applications – S.S. Rao
3. Operations Research – S.D. Sharma
4. Operations Research – Gupta and Hira
5.   Pert and CPM Principles and Applications – L.S. Srinath

ME 315/B PROCESS PLANNING AND COST ESTIMATION

III Year B.Tech. (Mech)	First Semester
Lectures / Tutorials : 3+1 Periods / week	*Sessional Marks*	*: 30*
University Exam.: 3 hrs.	*University Exam. Marks*	*: 70*

UNIT I

Introduction of Process Planning- methods of process planning, drawing interpretation, material evaluation, steps in process selection, production equipment and tooling selection

UNIT II

Process planning activities- process parameter calculation for various production processes,selection of jigs and fixtures, selection of quality assurance methods, documents for processplanning, economics of process planning, case studies

UNIT III

Introduction to cost estimation- importance of costing and estimation, methods of costing,elements of cost estimation, types of estimates, estimating procedure, estimation of laborcost, material cost, allocation of overhead charges, calculation of depreciation cost, break even analysis and related problems

UNIT IV

Machining time estimation- importance of machine time calculation, machining time fordifferent lathe operations, drilling and boring time calculations, Machining time calculation for Milling, Shaping, Planing and Grinding

UNIT V

Production costs- different production processes for different jobs, estimation of forging cost,estimation of welding cost, estimation of foundry cost, estimation of machining cost

TEXT BOOKS:

1. Peter Scalon, Process Planning, Design/ Manufacture Interface, Elsevier Sci.&Tech. 2002.

2. Ostwaal P.F. and Munez J., Manufacturing Processes and Systems, 9th ed., John Wiley 1998.

3. Chitale A.V. and Gupta R.C., Product Design and Manufacturing, 2nd ed., Prentice Hall 2002

ME 315/C TOTAL QUALITY MANAGEMENT

III Year B.Tech. (Mech)	First Semester	
Lectures / Tutorials : 3+1 Periods / week	*Sessional Marks*	*: 30*
University Exam.: 3 hrs.	*University Exam. Marks*	*: 70*

UNIT I

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

UNIT II

TQM PRINCIPLES- Leadership – Strategic quality planning, Quality statements - Customer focus–Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employeeinvolvement– Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performanceappraisal.

UNIT III

Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering,Supplier selection, Supplier Rating.
The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology,applications to manufacturing, service sector including IT.

UNIT IV

Bench marking– Reason to bench mark, Benchmarking process – FMEA – Stages, Types.
Quality circles – Quality Function Deployment (QFD) – the voice of the customer, house of quality, QFDprocess.

UNIT V

 TPM Concepts, improvement needs – Cost of Quality – Taguchi quality loss function - Performance measures.Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS9000 – ISO 14000 – Concepts, Requirements and Benefits Case studies of TQM, Implementation inmanufacturing and service sectors including IT.

TEXT BOOK:

1.Dale H.Besterfiled, at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

REFERENCE BOOK(s):

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3 rd Edition, 2003.
3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt.
5. Girish Pathak ,"Total Quality Management- Macmillan publishers India Ltd.

ME351 MACHINE SHOP PRACTICE LABORATORY

III Year B.Tech. (Mech) First Semester

Practicals	*: 3 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

TURNING :

Multi-start threading, Drilling, Boring and Internal threading

DRILLING &TAPPING :

Drilling and Tapping of Different threads

MILLING :

Key-way, Spur and Helical Gear Milling, Gear Hobbing.

SHAPING :

At least three models involving production of flat surface, Stepped surface, Cutting dovetail and rectangular grooves.

PLANING AND SLOTTING :

Working on Planing and Slotting Machines

GRINDING :

At least one model on surface grinder, cylindrical grinder or tool and cutter grinder.

ME 352 FUELS& I.C. ENGINES LABORATORY
III Year B.Tech. (Mech) First Semester

Practical: 3 periods / Week   *Sessional Marks   : 30*

University Exam: 3 hrs   *University Exam Marks   : 70*

Any **Ten** Experiments out of the following are to be performed:

1. Viscosity Measurement using Redwood No.I or No. II viscometer

2. Viscosity Measurement using Saybolt viscometer

3. Carbon residue test using Conradson's carbon residue apparatus.

4. Calorific value of gas using Junker's gas calorimeter.

5. Measurement of flash point using Pensky Martin's and Abel's apparatus.

6. Measurement of flash and fire points using Cleveland's apparatus.

7. Valve timing and port timing diagrams.

8. Air compressor - To determine Volumetric and Isothermal efficiencies.

9. Blower test Rig. - To determine Overall efficiency.

10. Single cylinder Diesel engine - Load test and Heat Balance Test.

11. Multi cylinder Petrol engine - Load Test, Heat Balance and Morse test

12. Multi cylinder Petrol engine - Economic speed test and variable speed test.

13. Single cylinder Diesel engine - variable compression ratio test.

14. Multi cylinder Diesel engine - Load test and Heat Balance test.

15. Two stroke petrol engine - Load test and Heat Balance test.

ME 353 SOFT SKILLS LABORATORY
III Year B.Tech. (Mech) First Semester

Practical: 3 periods / Week   *Sessional Marks   : 30*

University Exam: 3 hrs   *University Exam Marks   : 70*

Unit I Self-Development

Introduction to soft skills, Self-Management: Self-Evaluation, Self-Discipline, Self-Criticism, Self-awareness, Self-Esteem, Positive Thinking, Perceptions and Attitudes, Values and Belief Systems, Personal success factors, Handling failure, Knowing Yourself, identifying one's strengths and weaknesses, SWOT analysis, Career Planning & Goal setting

Unit II Presentation & Public Speaking

Presentation skills: Professional Presentation, Nature of Oral Presentation, Planning a Presentation, Preparing the Presentation, Delivering the Presentation.

Public Speaking, Group discussion, Interview preparation, Book Review and PPT (a review on any book in form of PPT 5 slides)

Unit III Writing Skills

Business Writing: Letter writing, Writing Formal Letters, Technical Report Writing, Memo, Notices/Circulars Agenda and Minutes of a Meeting, E-Mail, Job Application, Preparation of CV and Resume writing.

Unit IV Stress and Time Management

Introduction, Stress in Today's Time: Identify the Stress Source, Signs of Stress, Ways to Cope with Stress : Healthier Ways to Combat Stress, Steps to be Taken in the Organizations : Open communication, Time Management, Working towards Your Goals, Smart Work, Prioritize your Tasks,4 Ds of Decision Making

Unit V Ethics, Etiquette and Mannerism

Professional Etiquette: Etiquette at Meetings, Etiquette at Dining. Involuntary Awkward Actions, Public Relations Office(PRO)'s Etiquettes, Technology Etiquette : Phone Etiquette, Email Etiquette, Social Media Etiquette, Video Conferencing Etiquette, Interview Etiquette, Dressing Etiquettes : for Interview, offices and social functions, Ethical Values: Importance of Work Ethics, Problems in the Absence of Work Ethics.

ME 321 DESIGN OF TRANSMISSION ELEMENTS

III Year B.Tech. (Mech)Second Semester

Lectures / Tutorials: 3 + 1 Periods / week   *Sessional Marks   : 30*

University Exam.   : 3 hrs.   *University Exam. Marks   : 70*

UNIT I
Shafts: Design of solid and hollow shafts for strength – For Bending, Torsion, Combined bending and torsion and combined bending, torsion and axial loads.   (7)

Keys: Introduction, Design of square and flat keys   (3)

UNIT II
Shaft Couplings: Regid couplings – Muff Coupling, Flange coupling, Flexible coupling – Modified Flange coupling   (5)

UNIT III
Bearings and Lubrication: Lubrication, Types of lubrications, types of lubricants, properties of lubricants, types of Bearings, Bearing materials, Journal bearing design (using Mckee's equation and Raymond and Boyd charts & tables)   (8)

Ball and Roller Bearings: Static load, Dynamic load, Equivalent radial load, selection of ball and roller bearings   (7)

UNIT IV
Belt Drives : Flat and V-belts, Belt constructions, Geometrical relationships, Analysis of belt tensions, condition for maximum power, Selection of V-belts – Selection of Pulleys.(11)

CHAIN DRIVES: Introduction, Chain drives, Advantages of chain drives over belt drives, Polygonal effect, Selection of roller chains.   (4)

UNIT V
Spur Gears : Classification of gears, Terminology of spur gear, standard systems of Gear Tooth, Force analysis, Gear tooth failures, Selection of material, Beam Strength of gear teeth, lubrication, Lewis Equation.   (6)

Helical Gears: Terminology of helical gears, virtual number of teeth, Tooth proportions, force analysis, Beam Strength of helical gears, effective load on gear tooth, wear strength of helical gears. Lewis Equation.   (3)

Bevel Gears: Terminology, force analysis, Beam Strength of bevel gears, wear strength. Lewis Equation.   (3)

Worm Gears: Terminology, Force analysis, Strength rating of worm gears, Wear rating of worm gears.   (3)

TEXT BOOKS:
1.Design of machine elements by Bhandari, Tata McGraw Hill book Co.
2.Machine Design by P.C. Sharma & D.K. Agarwal.

HAND BOOKS TO BE ALLOWED IN UNIVERSITY EXAMINATION:
1. Design data book, P.S.G. College of Tech, Coimbatore
2. Design data book, Mahadevan &Balaveera Reddy - CBS Pub.

ME 322 HEAT TRANSFER

III Year B.Tech. (Mech)Second Semester

Lectures	:	*3+1 Periods / week*	*Sessional Marks: 30*
University Exam.	:	*3 hrs.*	*University Exam. Marks: 70*

UNIT I

Introduction: Basic Modes and Laws of Heat transfer, thermal conductivity, Steady stateHeat Conduction, General conduction equation in Cartesian, Cylindrical and Sphericalcoordinates, initial and boundary conditions.   (5)

One-Dimensional Steady State Heat Conduction: Heat flow through plane wall andcylinder with constant thermal conductivity, Heat flow through composite slab and Cylinders, Thermal resistance, Electrical analogy, Thermal contact resistance, problems on variablethermal conductivity, critical insulation thickness, uniform heat generation in slabs.(8)

UNIT II

Extended Surfaces: Types, Applications, Fin materials, Heat transfer from fins with uniformcross section, Fin efficiency and Effectiveness.(5)

Transient Heat Conduction: (One dimensional only) - Lumped heat capacity systems. (4)

UNIT III

Forced Convection: Introduction, Principles of convection, Mass, Momentum and Energyequations for boundary layer, Hydrodynamic and thermal boundary layers and their thicknesses, concept of turbulence. Correlations for heat transfer in Laminar and Turbulent flows over a flat plate, and in pipes, relation between fluid friction and heat transfer in laminar & turbulent flows-Reynolds-Colburn Analogy.   (14)

UNIT IV

Natural Convection: Approximate analysis for laminar film on a vertical plate, Correlations for vertical plates, horizontal plates, vertical and horizontal cylinders, inclined surfaces. (9)

RS: Classification, types of heat exchangers, Flow arrangement, Temperature distribution,Overall heat transfer coefficient, Fouling factor, LMTD and NTU methods of Heat exchanger analysis, correction for LMTD for use with multi pass and cross flow Heat Exchangers, Effectiveness.   (9)

UNIT V

Radiation: Fundamentals of Radiation: Basic Concepts and definitions, Absorptivity,Reflectivity, Transmissivity, concept of Black body, Laws of Radiation, Kirchhoff's law, Planck's law, Wein's law, Stefan Boltzman's law. (9)

Radiant Heat Transfer: Heat Exchange by radiation between two finite parallel surfaces,Electrical analogy, solid angle and Radiation intensity, radiant heat transfer between two finite black and gray surfaces, shape factor, Radiation shields. (9)

TEXT BOOKS:

1. Heat and Mass Transfer – Sachdeva, New Age India, New Delhi
2. Heat Transfer—Rajput, Laxmipubl, New Delhi.

REFERENCE BOOKS:

1. Heat transfer   -   J.P.Holman, MGH, New York.

2. Heat transfer   -   S.P.Sukhatme, TMH.

3. Heat Transfer – Cengel and Boles, TMH, New Delhi

NOTE: Heat and Mass Transfer Data Book by Kothandaraman and Subramanian to be allowed in University Examinatio

ME323 ADVANCED MANUFACTURING ENGINEERING

III Year B.Tech. (Mech) Second Semester

Lectures   :   3+1 Periods / week   Sessional Marks   : 30
University Exam. :   3 hrs.   University Exam. Marks   : 70

UNIT – I

Jigs &Fixtures: Introduction, design considerations in jigs & fixtures. The principle of sixpoint location, locating pins. Clamping and clamping devices. A few examples of drilling jigs like box type, template jig, Inverted jig, indexing jig, fixtures-Lathe, milling.   (8)

UNIT – II

Gear Manufacturing: Introduction to various gear manufacturing methods, gear shaping, gear hobbing, bevel gear generation-principles and methods, gear finishing methods.   (5)

Thread Manufacturing Processes: Thread rolling, thread milling, thread grinding.   (2)

UNIT – III

SURFACE TREATMENT: Scope, Cleaners, Methods of cleaning, Surface coating types, ceramic and organic methods of coating, and economics of coating. Electro forming, Chemical vapor deposition, Physical vapor deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding.

UNIT – IV

Press Working Tools : Major components of a press, shear action in die cutting operation, Blanking and Punching operations, clearance and shear as applied to punching / blanking operations, centre of pressure and its calculation, crap strip layout for blanking, simple related problems. (6)

Types of Dies-compound die, combination die, progressive die. (3)

Drawing die – Calculation of blank size, number of draws, percentage reduction, radius on punch and die, total drawing force. (3)

Bending die – Bending methods, spring back, bending allowance, bending force.(3)

UNIT – V

Computer Aided Inspection: Types of CMM (Coordinate Measuring Machines), CMM construction, CMM operation and programming, CMM software, Flexible inspection systems, CMM applications and benefits. (8)

Machine vision: principle and introduction to stages in machine vision, image acquisition and digitization, image processing and analysis, interpretation, machine vision applications.(7)

Text Books:

A Text book of Production Engineering by P.C.Sharma, S.Chand& Co.

Manufacturing Science by Ghosh &Mallik,

Reference Books:

Manufacturing engineering & technology by Kalpak Jain, Pearson Education / PHI

Engineering metrology by R.K.Jain, Dhanpathrai& Sons

Automation, production systems & CIM by M.P.Groover, Pearson Education / PHI.

ME324/AINDUSTRIAL ENGINEERING AND MANAGEMENT

III Year B.Tech. (Mech) Second Semester

Lectures	*: 3+1Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT -I

Forecasting: Forecasting variables, forecasting procedure, methods of forecasting: moving average, least squares, simple exponential smoothing, linear regression, correlation coefficient, problems.   (6)

Production systems: Continuous and intermittent production. Mass and flow production, batch production, job order production.   (3)

Plant Location and Facilities layout: Necessary factors governing plant location, principles of plant layout, types of layouts   (3)

UNIT – II

Materials Management and MRP: Functions of materials management, purpose of inventories, types of inventories, relevant costs in inventory control, ABC and VED analysis, Single period inventory model.   (6)

Materials requirement planning (MRP): Importance of MRP and CRP, MRP system inputs and outputs, bill of materials, MRP logic   (3)

Productivity: Definition, methods to measure productivity, measures to improve productivity.

                                                                        (3)

UNIT – III

General Management: Principles of scientific management, Principles of general management, Levels of Management, Managerial skills, brief treatment of managerial functions: planning, organizing, staffing, directing, coordinating and controlling.   (6)

Forms of Business Organization: Salient features of sole proprietorship,partnership, Joint Stock Company: private limited and public limited companies.   (6)

UNIT – IV

Marketing Management: Concept of selling and marketing – differences, functions of marketing, market research, Purchasing methods,selection of vendor,advertising and sales promotion methods, distribution channels-types, product life cycle.   (6)

Financial Management: Functions of finance, simple and compound interest, depreciation, common methods of depreciation: straight line method , declining balance method, sum of years digits method,Types of depriciation   (6)

UNIT-V

Supply Chain Management: Introduction, need for supply chain management, Elements of supply chain management, Logistics, E-commerce, Steps in creating an effective supply chain, supplier management.   (6)

Personnel Management: The personnel Management function, job analysis and job design, job description, job specification,recruitment,selection, performance appraisal.   (6)

Text Books :
1. Introduction to work study – ILO
2. Engineering Economy – Theusen&Theusen
3. Fundamentals of Marketing – Williams J Stanton

4. Operations Management – Joseph G.Monks, Tata McGraw Hill
5. Production and Operations Management by Stevenson

Reference Books :

1. Materials Management – Gopalakrishnan and Sudhakaresan
      .

ME324/B PRODUCTION PLANNING AND CONTROL

Lectures	: 3+1 Periods / week	*Sessional Marks*	: 30
University Exam. :	3 hrs.	*University Exam. Marks*	: 70

UNIT I

INTRODUCTION: Definition – Objectives of production Planning and Control – Functions of production planning and control – Elements of production control – Organization of production planning and control departmentProduction systems: Continuous and intermittent production. Mass and flow production, batch production, job order production, production functions (12)

UNIT II

Project Planning through networks: Arrow (Network) diagram representation, rules for constructing an arrow diagram, PERT, CPM, Critical path calculations, Determination of critical path, Determination of floats, Probability considerations in project.(12)

UNIT III

 Introduction to CrashingMaterials Management, inventory control and MRP: Functions of materials management, inventory control, Inventory control techniques - ABC, VED and FSN analysis. Materials requirement planning (MRP): Importance of MRP, MRP system inputs and outputs, bill of materials, MRP logic. (12)

UNIT IV

Aggregate planning: Long range, intermediate range and short range plans, the aggregate planning problem, aggregate planning methods, mathematical planning models, theoretical planning models (LDR) and heuristic and computer search models, problems. Master Production Schedule; Master Schedule formation – inputs and outputsRouting: Routing procedure – Route sheets– Factors affecting routing. (12)

UNIT V

  Scheduling –definition –Difference with loading, Scheduling and loading guidelines, Standard scheduling methods – forward scheduling and backward scheduling, Johnson's rules.Dispatching – activities of dispatcher – dispatching procedure – follow up –definition –for existence of functions – types of follow up, applications of computer in production planning and control. (12)
TEXT BOOK(s):
1. Elements of Production, Planning and Control by Samuel Eilon
2. Operations management by Joseph G.Monks,Tata McGraw-Hill Inc,
REFERENCE BOOK(s):
 1. Production and Operations management by R.Pannerselvam,PHI, 2nd edition, 2006.
 2. Production and Operations Management by S.N.Chary, TMH(4th edition).
 3. Production Planning and Control, Mukhopadyay, PH

ME324/CPRODUCT LIFECYCLE MANAGEMENT

III Year B.Tech. (Mech)   Second Semester

Lectures	*: 3+1 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*:70*

UNIT I

INTRODUCTION TO PRODUCT LIFE CYCLE MANAGEMENT (PLM) Definition, PLM Lifecycle model, Threads of PLM, Need for PLM, Opportunities and benefits of PLM, Views, Components and Phases of PLM, PLM feasibility study, PLM visioning –PLM Concepts, Processes and Workflow: Characteristics of PLM, Environment driving PLM,PLM Elements, Drivers of PLM, Conceptualization, Design, Development, Validation, Production, Support of PLM (12)

UNIT II

 PRODUCT DATA MANAGEMENT (PDM) PROCESS AND WORKFLOW PDM systems and importance, reason for implementing a PDM system, financial justification of PDM implementation. Versioning, check-in and checkout, views, Metadata, Lifecycle, and workflow. Applied problems and solution on PDM processes and work flow Collaborative Product Development: Engineering vaulting, product reuse, smart parts, engineering change management, Bill of materials and process consistency, Digital mock-up and prototype development, design for environment, virtual testing and validation, marketing collateral. (12)

UNIT III

TOOLS OF COMMUNICATION FOR COLLABORATIVE WORK Creation of 3DXML and CAD drawing using CAD software. Creation of an animation for assembly instructions on 3D via composer, creation of an acrobat 3D document. Applied problems and solutions on tools of communication for collaborative work.(12)

 UNIT IV

KNOWLEDGE AND OPTIMIZATION OF DESIGN PRODUCTS Know how, best practices, parameterization of design, Applied problems and Solution on optimization of products using power copy, publication, parameters, formula, rule, check, design table, configuration, reaction. (12)

UNIT V

DIGITAL MANUFACTURING – PLM Digital manufacturing, benefits manufacturing, manufacturing the first-one, Ramp up, virtual learning curve, manufacturing the rest, production planning. Developing a PLM strategy and conducting a PLM assessment: Strategy, Impact of strategy, implementing a PLM strategy, PLM initiatives to support corporate objectives. Infrastructure assessment, assessment of current systems and applications. (12)

TEXT BOOKS:

1. Grieves, Michael. "Product Lifecycle Management", McGraw-Hill, 2006.
2. Burden, Rodger "PDM: Product Data Management":, Resource Pub, 2003

REFERENCE BOOKS:

1. Fabio Guidice, Guido La Rosa, "Product Design for the environment- A life cycle approach", Taylor and Francis 2006

2. Robert J. Thomas, "New product development: managing and forecasting for strategic success", J.Wiley, 1993.

3. Gerd Hartmann, Ulrich Schmidt, "Product life cycle management" with SAP, Galileo Press, Incorporated, 2005.

4. Stark, John, "Product Life Cycle Management: Paradigm" for 21st Century Product Realization, Springer-Verlag, 2004.

5. Saaksvuori, Antti and Immpnen, Anselmi. "Product Lifecycle Management", Springer-Verlag, 2004

ME 325/A MECHANICAL MEASUREMENTS &METROLOGY

III Year B.Tech. (Mech) Second Semester

Lectrures: 3+1 Periods / week   *Sessional Marks: 30*

University Exam .: 3 hrs University   *Exam. Marks: 70*

UNIT - I

Metrology: Introduction, Elements of engineering measurements, Linear and angular measurements, standards of length, end and line standards.(7)

Linear and Angular Measurements: Precision measurement, bore gauges, straight edges, slip gauges, angle gauges, sine bars, spirit levels, auto collimator. (8)

UNIT – II

Strain Measurement: Introduction, electrical resistance strain gauges principle, Method offixing and bridge circuits for measuring strain changes, Gauge factor, Temperaturecompensation strain gauge. Rosette, Strain gauge applications.(8)

Pressure Measurement: Introduction, pressure measurement terms, Pressure units, Bourdontube pressure gauge, Diaphragm and Bellows, Bridgeman gauge, Low pressure measurement: McLeod gauge, thermal conductivity gauge.   (7)

UNIT – III

Comparators: Mechanical comparators, Reed comparator, Sigma comparator, electrical and electronic comparators, solex pneumatic gauge, projectors, tool makers microscope.   (7)

Metrology of Screw Threads And Gears: Measurement of various elements of threads, major, minor and effective diameter, thread micrometer, measurement of pitch, gear inspection, measurement of tooth thickness, gear tooth caliper.   (8)

UNIT – IV

Limits, Fits and Gauges: Limits, fits, tolerance and allowance, theory of limits and fits and their selection, hole bass and shaft basis system, Indian standard system of limits and fits, simple problems. Inter changeability, selective assembly, limit gauges, Taylor's principle of limitgaugeing, plug gauges, ring gauges.   (15)

UNIT – V

Measurement Of Surface Finish: Surface texture, roughness, waviness, Indian standard terminology, Methods of measuring surface finish, Taylor Hobson Talysurf. (8)

Interferometry: NPL flatness interferometry and gauge length interferometer. (3)

Static & Dynamic Alignment Tests : Alignment tests on Lathe, Drilling Machine and Milling Machine. (4)

TEXT BOOKS:

1. Metrology - R.K.Jain , Khanna publishers
2. Hand Book of Industrial Metroloyg by ASTME
3. Mechanical Measurements by R.S.Sirohi&H.C.Radhakrishna

REFERENCE BOOKS:

1. Engg.Metrology – D.M.Antony

2. A text book of Engg.Metrology – I.C.Gupta.

3. Mechanical Measurements – T.B.Beckwith&N.L.Buck

ME 325/BCOMPOSITE MATERIALS

III Year B.Tech. (Mech) Second Semester

Lectrures: 3+1Periods / week   *Sessional Marks: 30*

University Exam .: 3 hrs University   *Exam. Marks: 70*

UNIT I

INTRODUCTION TO COMPOSITES Fundamentals Of Composites – Need For Composites – Enhancement Of Properties – Classification Of Composites – Matrix-Polymer Matrix Composites (PMC), Metal Matrix Composites (MMC), Ceramic Matrix Composites (CMC) – Reinforcement – Particle Reinforced Composites, Fibre Reinforced Composites. Applications Of Various Types Of Composites. Fiber Production Techniques For Glass, Carbon And Ceramic Fibers

UNIT II

Polymer Resins – Thermosetting Resins, Thermoplastic Resins – Reinforcement Fibres – Rovings – Woven Fabrics – Non Woven Random Mats – Various Types Of Fibres. PMC Processes – Hand Lay Up Processes – Spray Up Processes – Compression Moulding – Reinforced Reaction Injection Moulding – Resin Transfer Moulding – Pultrusion – Filament Winding – Injection Moulding. Fibre Reinforced Plastics (FRP), Glass Fibre Reinforced Plastics (GFRP).

UNIT III

Laminates- Balanced Laminates, Symmetric Laminates, Angle Ply Laminates, Cross Ply Laminates.- Applications Of PMC In Aerospace, Automotive Industries
METAL MATRIX COMPOSITES Characteristics Of MMC, Various Types Of Metal Matrix Composites Alloy Vs. MMC, Advantages Of MMC, Limitations Of MMC, Reinforcements – Particles – Fibres. Effect Of Reinforcement – Volume Fraction – Rule Of Mixtures.

UNIT IV

Processing Of MMC – Powder Metallurgy Process – Diffusion Bonding – Stir Casting – Squeeze Casting, A Spray Process, Liquid Infiltration In-Situ Reactions-Interface-Measurement Of Interface Properties-Applications Of MMC In Aerospace, Automotive Industries

UNIT V

CERAMIC MATRIX COMPOSITES AND SPECIAL COMPOSITES Engineering Ceramic Materials – Properties – Advantages – Limitations – Monolithic Ceramics – Need For CMC – Ceramic Matrix – Various Types Of Ceramic Matrix Composites- Oxide Ceramics – Non Oxide Ceramics – Aluminium Oxide – Silicon Nitride – Reinforcements – Particles- Fibres- Whiskers. Sintering – Hot Pressing – Cold Isostatic Pressing (CI Ping) – Hot Isostatic Pressing (HI Ping). Applications of CMC In Aerospace, Automotive Industries Carbon /Carbon Composites – Advantages Of Carbon Matrix – Limitations Of Carbon Matrix Carbon Fibre – Chemical Vapour Deposition Of Carbon On Carbon Fibre Perform. Sol-Gel Technique- Processing of Ceramic Matrix Composites

TEXTBOOKS:

1. Mathews F. L. And Rawlings R. D., "Composite Materials: Engineering And Science", 1st Edition, Chapman And Hall, London, England, 1994.

2. Chawla K. K., "Composite Materials", Second Edition, Springer – Verlag, 1998.

REFERENCE BOOKS:

1. Clyne, T. W. And Withers, P. J., "Introduction To Metal Matrix Composites", Cambridge University Press, 1993.

2. Strong, A.B., "Fundamentals Of Composite Manufacturing", SME, 1989.

3. Sharma, S.C., "Composite Materials", Narosa Publications, 2000.

4. Broutman, L.J. And Krock,R.M., " Modern Composite Materials", Addison-Wesley, 1967. 5. ASM Hand Book, " Composites", Vol.21, ASM International, 2001

ME 325/C FARM MACHINERY AND EQUIPMENT

III Year B.Tech. (Mech) Second Semester

Lectrures: 3+1 Periods / week   *Sessional Marks: 30*

University Exam .: 3 hrs University   *Exam. Marks: 70*

UNIT I

Objectives of farm mechanization. Classification of farm machines. Materials of construction& heat treatment. Principles of operation and selection of machines used for production of crops. Field capacities & economics.

UNIT II

Tillage; primary and secondary tillage equipment. Forces acting on tillage tools. Field operation patterns. Draft measurement of tillage equipment: Earth moving equipment: their construction & working principles viz Bulldozer, Trencher, Excavators etc.; sowing, planting & transplanting equipment - their calibration and adjustments

UNIT III
Fertilizer application equipment. Weed control and Plant protection equipment: sprayers and dusters, their calibration, selection, constructional features of different components and adjustments. Work physiology of men and women.
UNIT IV
Principles & types of cutting mechanisms. Construction & adjustments of shear &impact-type cutting mechanisms. Crop harvesting machinery: mowers, windrowers, reapers, reaper binders and forage harvesters. Forage chopping & handling equipment.
UNIT V

Threshing mechanics & various types of threshers. Threshers, straw combines & grain combines, maize harvesting & shelling equipment, Root crop harvesting equipment: potato, groundnut etc., Cotton picking & Sugarcane harvesting equipment.

TEXT BOOKS:
1. Bosoi, E.S. (1990). Theory, Construction and Calculation of Agricultural Machines (Vol. 1 and 2). Oxonion Press Pvt. Ltd., New Delhi.
2. Donnel Hunt. Farm Machinery and management. Iowa State University Press, Ames, USA
3. Ghosh, P.K, and Swain, S. (1993). Practical Agricultural Engineering. Naya Prokash, Calcutta.
4. Kelnin, N.I.,Popov, I.F., and Sakun, V.A. (1985). Agricultural Machines. Amerind Publishers, New Delhi
5. Srivastava, A.C. (1990). Elements of Farm Machinery. Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
REFERENCE BOOKS:
1. Kepner, R.A., Bainer Roy, and Barges, E.C. (1978). Principals of Farm Machinery, . CBS Publishers and Distributors, Delhi-17.
 2. Kurtz,G.L., Thompson and Claer, P. (1984). Design of Agricultural Machinery. John Wiley & Sons, New York

ME 326 DESIGN THINKING FOR INNOVATION

III Year B.Tech. (Mech) Second Semester

Lectrures: *3+1 Periods / week* *Sessional Marks: 30*
University Exam .: 3 hrs University *Exam. Marks: 70*

UNIT I

Introduction to Design Thinking:

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT II

Design Thinking Process:

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking -person, costumer, journey map, brain storming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT III

Innovation:

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT IV

Product Design:

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT V

Design Thinking in Business Processes:

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business –Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.
Activity: How to market our own product, About maintenance, Reliability and plan for startup.

TEXT BOOKS:
1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons
REFERENCE BOOKS:
1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design-William lidwell, kritinaholden, Jill butter.
4. The era of open innovation –chesbrough.H

ME 361 COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING LABORATORY

III Year B.Tech. (Mech) Second Semester

Practicals	*:*	*3 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*:*	*3 hrs.*	*University Exam. Marks*	*: 70*

Note : Develop programs for the following problems using C- language

SIMULATION EXERCISE: [Any TWO]

- Hart Mechanism
- Paucellier Mechanism
- Robert Mechanism
- Scott Russel Mechanism
- Watt Mechanism
- Pantograph Mechanism
- Four Bar Mechanism
- Slider Crank Mechanism
- Tchibicheff Mechanism

COMPUTER APPLICATIONS: [ANY FOUR]

- Numerical Methods
- Differential Equation solution
- Gauss elimination: General Matrix and skyline.
- Two dimensional stress analysis
- Cylinder subjected to internal pressure.
- 1 D Heat Transfer (conduction)
- 2 D Heat Transfer (conduction)
- O.R. applications like L.P., Queing Theory, CPM, PERT etc..

APPLICATIONS PACKAGES: [ANY ONE]

Simple packages for Fluid flow like fluent, Star CD etc., O.R. Packages like TORA, LINDO, PRIMAERA, Etc., MAT Lab. Any application package in Mechanical Engineering.

ME 362 DESIGNS& METROLOGY LABORATORY

III Year B.Tech. (Mech)Second Semester

Practicals   : 3 periods / Week   Sessional Marks   : 30

University Exam : 3 hrs   University Exam Marks: 70

*Any **Ten** Experiments should be performed:*

1. Angle and taper measurement by Bevel Protractor & Sine Bar.

2. Internal and External taper measurement using Ball & Rollers

3. Measuring effective dia. Of thread using 2 wire, 3 wire method.

4. Measuring gear tooth thickness using gear tooth vernier.

5. Measuring internal dia. using bore dial gauge.

6. Alignment test on lathe machine

7. Alignment test on drilling machine

8. Alignment test on milling machine

9. Measuring external diameters using Micrometer& Plot X & R Charts

10. Measurement of surface finish using surf tester

11. Measuring different parameters of a thread / gear using tooth profile projector

12. Vibration measurements

13. Gyroscope

14. Balancing

15. Whirling of shafts

16. Governor

17. CAM Analysis

18. Wear & Friction measurement

19. Force & Torque measurement

20. Journal Bearing

21. Photo elastic Bench

22. Measurement of cutting forces using lathe tool dynamometer

23. Measurement of cutting forces using drill tool dynamometer.

ME 363 HEAT TRANSFER LABOBORATORY

III Year B.Tech.(Mech.) Second Semester

Practicals	*: 3 Periods / week*	*Sessional Marks: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks: 70*

*Tests on Any **Ten** of the Following are to be conducted:*

1. Refrigeration Test Rig
2. Air Conditioning Test Rig
3. Heat Exchanger – Parallel Flow
4. Heat Exchanger – Counter Flow
5. Composite Slab / Metal Rod
6. Critical Heat flux Apparatus
7. Emissivity Apparatus
8. Pin fin – Natural Convection
9. Pin fin – Forced Convection
10. Insulating powder Apparatus
11. Drop wise and film wise condensation Apparatus
12. Forced Convection Apparatus
13. Stefan – Boltzmann's Apparatus
14. Lagged pipe Apparatus

ME 364 DELMIA & SIMULIA LABORATORY
III Year B.Tech. (Mech) Second Semester

Practical: 3 periods / Week   *Sessional Marks   : 30*

University Exam: 3 hrs   *University Exam Marks   : 70*

1   Course Requisites: DELMIA Manufactured Item Definition Essentials
2   Creating the Manufacturing Bill of Materials Structure
3   Creating Groups
4   Reusing a Manufacturing Assembly Structure
5   DELMIA Process Planning Essentials
6   Setting the Preferences
7   Creating the Process Planning
8   Creating Automatic Line Balancing
9   Managing a Multi-model
10   DELMIA Equipment Allocation Essentials
11   DELMIA Assembly Evaluation Essentials
12   Static simulation of a model
13   creating meterial
14   structural model creation
15   structural senario

ME 411 ADVANCED MACHINE DESIGN

IV Year B.Tech. (Mech): First Semester

Lectrures : 3 +1 Periods / week   *Sessional Marks : 30*

University Exam : 3 hrs University   *Exam. Marks : 70*

UNIT – I
Springs: Introduction; Materials; Types of springs, Helical springs under axial load, Fatigue loading, Torsion springs, Spiral springs, leaf springs. (12)

UNIT – II
Brakes and Clutches:- Introduction to Brakes, Types, Analysis and design of block brakes, band brakes, block and band brakes; Internal shoe brakes, external shoe brakes, pivoted shoe brakes, Temperature rise, Friction materials, Clutches, Analysis and design of simple and multiple disc clutches, cone clutches and centrifugal clutches, friction materials; comparison of brakes and clutches. (12)

UNIT – III
Flywheel: Introduction, construction, Torque analysis, solid flywheel, Rimmed flywheel, stresses in rimmed flywheel, Design of flywheel. (8)

System design: Introduction, Human aspects of design, Standardization, Practical tips for problems encountered in design with examples. (4)

UNIT – IV
I.C.Engine Components: Introduction, Design of trunk type piston, connecting rod and crank shaft. (8)

Reliability and life expectances: Introduction, Method of achieving reliability, Series, Parallel and series and parallel reliability, Analysis (4)

UNIT – V
Optimum design: Optimization function of single variable and multi variables, optimization techniques, Interval halving and Golden section methods, optimum design of tension bar for minimum deflection, cost and weight, Torsion member for minimum deflection, cost and weight. (12)

TEXT BOOKS:
1. Design of machine elements by Bhandari, Tata McGraw Hill book Co.
2. Machine Design by Sharma &Purohit.
3. Machine Design by Khurmi&Guptha

HAND BOOKS TO BE ALLOWED IN UNIVERSITY EXAMINATION:
1. Design data book, P.S.G. College of Tech, Coimbatore
2. Design data book, Mahadevan&Balaveera Reddy - CBS Pub.

ME 412 AUTOMATION& COMPUTER AIDED MANUFACTURING

Lectures	: 3+1 Periods / week	Sessional Marks	: 30
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT – I

Automation:Automation in production systems – automated manufacturing systems,computerized manufacturing support systems, reasons for automating, merits and demerits, automation principles and strategies, manufacturing industries and products, manufacturingoperations – processing and assembly operations, other factory operations.(8)

Introduction to Computer IntegratedManufacturing.(2)

Computer Aided Process Planning:Introduction, retrieval CAPP system, generative CAPPsystems, benefits of CAPP.(3)

UNIT - II

Industrial Robotics:Introduction, robot anatomy, joints and links, common robot andconfigurations, joint drive systems, robot control systems, end effectors, sensors in robotics,applications of robots – material handling, processing, assembly and inspection. (7)

UNIT –III

Numerical Control :Introduction, basic components of an NC system, classifications of NCsystems, nomenclature of NC machine axes, interpolation methods, features of CNC, the machine control unit for CNC, CNC software, direct numerical control, distributed numerical control, applications of NC, advantages and disadvantages of NC, adaptive control machining.(15)

UNIT –IV

NC Part Programming: NC coding systems, manual part programming, simple exampleson drilling, milling and turning operations, computer assisted part programming, part programming with APT language, simple examples in drilling and milling operations.(15)

UNIT – V

Group Technology & Cellular Manufacturing:Introduction, part families, partsclassification and coding, features of parts classification of coding system, OPITZ ,MICLASS, Product Flow Analysis, composite part concept, machine cell design,applications.(6)

Flexible Manufacturing Systems:Introduction, types of FMS, components, FMS layoutconfigurations, computer control system, human resources, applications and benefits.(4)

TEXT BOOK:

1. Automation, Production systems and Computer Integrated Manufacturing by M.P.Groover, Pearson Education / PHI.

REFERENCE BOOKS:

1. CAD/CAM by M.P.Groover and E.W.Zimmers, Pearson Education / PHI.
2. CAD/CAM by P.N.Rao

ME 413 FINITE ELEMENT METHODS

IV Year B.Tech. (Mech) First Semester

Lecturers/ Tutorials: 3+1 periods / Week   *Sessional Marks   : 30*

University Exam : 3 hrs   *University Exam Marks: 70*

UNIT I

Fundamental Concepts: Introduction, historical background, Analysis of 3-D stresses &strains, stress-strain relations, stress cubic, principal stress caliculations, temperature effects, potential energy and equilibrium, the Rayleigh-Ritz method, Weighted Residual Method,Galerkin's method, Saint venant's principle, Von Mises stress.   (18)

UNIT II

Basic Concepts of F.E.M. and One Dimensional Problems : Fundamental concepts, FiniteElement Modeling, Coordinates and Shape functions, The Potential Energy Approach, The Galerkin Approach, Assembly of the Global Stiffness Matrix and Load Vector, Properties of Global Stiffness Matrix, The Finite Element equations; Treatment of boundary conditions,Examples of Axially Loaded Members.   (9)

Analysis Of Plane Trusses: Introduction,*Plane Trusses:*Local and Global Coordinate systems, Element Stiffness Matrix, Stress Calculations, Example of plane Truss with three members. (9)

UNIT III

Two Dimensional Problems : Introduction, Plane Stress and Plane Strain, Finite ElementModeling, Constant Strain Triangle (CST); Iso-parametric representation, Potential Energy Approach, Element Stiffness, Force terms, Galerkin Approach, Stress calculation, Problem modeling and boundary conditions, Examples of plane Stress and plane Strain problems withthree degrees of freedom using CST Element.(12)

Definitions of Iso-parametric and sub-parametric Elements. (6)

UNIT IV

Stiffness of Beam Element.

Axi-Symmetric solids subjected to Axi-Symmetric loading: Introduction, Axi-Symmetric formulation, FEM using triangular element, problem modeling and boundary conditions. (7)

UNIT V

Scalar Field Problems : Introduction, steady-state heat transfer, one-dimensional heatconduction, governing equation, boundary conditions, the one dimensional element, functional approach for heat conduction.(11)

Text Books:

1. Introduction to Finite Elements in Engineering by Chandrupatla&Belegundu, PHI.
2. Finite Element Analysis by P.Seshu, PHI publications

References:

1. Finite Element Analysis by C.S.KrishnaMoorthy.
2. Finite Element Analysis by L.J.Segerlind.
3. David V. Hutton, "Fundamentals of Finite Element Analysis "Mc Graw Hill Company**.**

ME 414/A REFRIGERATION & AIRCONDITIONING

Lectures   :   3+1 Periods / week   *Sessional Marks : 30*
University Exam. :   3 hrs.   *University Exam. Marks : 70*

UNIT I

Introduction to Refrigeration: Necessity and applications, unit of refrigeration and C.O.P,mechanical refrigeration, types of ideal cycle of refrigeration, Refrigerants- desirable

properties, commonly used refrigerants, nomenclature.(6)

Air Refrigeration: Bell Coleman cycle and Brayton cycle, Open and Dense air systems,Actual refrigeration system, refrigeration needs of aircrafts, adoption of air refrigeration, Justification, types of systems, problems.   (9)

UNIT II

Vapour Compression Refrigeration: Working principle, essential components of plant,simple vapor compression refrigeration cycle, Multi pressure systems – multistage compression, multi evaporator system, Cascade system, use of p – h charts, problems

System Components: Compressors- general classification, comparison, advantages anddisadvantages, Condensers - classification, working, Evaporators - classification, working, Expansion devices - types, working. (7)

UNIT III

Vapour Absorption System: Calculation of max COP, description and working of NH_3-water system, Li - Br, H_2O system, principle of operation of three fluid absorption system andsalient features.(10)

Steam Jet Refrigeration: Principle of working, application, merits and demerits.(2)

UNIT IV

Non-Conventional Refrigeration Methods: Principle and operation of thermoelectric refrigerator and Vortex tube or Hirsch tube.(3)

Introduction to Air Conditioning: Psychrometric properties and processes, sensible andlatent heat loads, S–load characterization and SHF, need for ventilation, infiltration, concepts of RSHF, ASHF, ESHF & ADP, concept of human comfort and effective temperature,comfort air conditioning. (9)

UNIT V

Industrial air conditioning requirements, air conditioning loadcalculations. (4)

Air Conditioning Systems: Classification of equipment, cooling, heating, humidificationand dehumidification, filters, grills and registers, deodorants, fans and blowers, heat pump, heat sources, different heat pump circuits, application.(8)

TEXT BOOKS:

1. Refrigeration and air conditioning   - C.P.Arora, TMH.

2. Refrigeration and Air conditioning - Manohar Prasad, New Age India, New Delhi.

3. A course in refrigeration and air conditioning -   S.C.Arora&Domkundwar, Dhanpat

Rai& sons, New Delhi.

REFERENCE BOOKS:

1. Principles of Refrigeration -Dossat.

2. Refrigeration and air conditioning   - Stoecker.

NOTE: Refrigeration and Air conditioning Data book by Manohar Prasad is allowed in the University Examination

ME 414/B AUTOMOBILE ENGINEERING

IV Year B.Tech. (Mech)First Semester **[Program Elective-III]**

Lectures   : 4 Periods / week   Sessional Marks   : 30

University Exam. : 3 hrs.   University Exam. Marks   : 70

UNIT I

Introduction: Classification of vehicles – applications, options of prime movers, transmission and arrangements.   (4)

Engine: Engine Classifications - number of strokes, cylinders, types of combustion chambersfor petrol and diesel engines, valves, valve arrangements and operating Mechanisms, Piston - design basis, types, piston rings, firing order; Crankshafts, Flywheel.(8)

UNIT II

Assorted Equipment: Fuel supply pumps, Mechanical and Electrical type Diaphragm pumps, Air and Fuel Filters, super chargers, Mufflers.(4)

Cooling Systems: Need for cooling system, Air and water cooling.(4)

Lubricating Systems: Various lubricating systems for I.C. Engines.(4)

UNIT III

Electrical System: Ignition system, Spark plugs, Distributor, Electronic Ignition,Alternator, cutout, Current and voltage regulators, charging circuit, starting motors, lighting, instrumentsand accessories.   (6)

Chassis & Transmission Systems: Introduction to Chassis & Transmission, Clutches –Single-plate and Multi-plate clutches, Centrifugal clutches, wet and dry type, actuating mechanisms.(6)

UNIT IV

Transmission: Gear Box - Theory, Four speed and Five Speed Sliding Mesh, Constant mesh& synchromesh type, selector mechanism, automatic transmission, overdrive, propeller shaft, differential - principle of working.   (12)

UNIT V

Suspension Systems: Need for suspension systems, springs, shock absorbers, axles – front and rear, different methods of floating rear axle, front axle and wheel alignment.   (6)

Vehicle Control: steering mechanisms and power steering, types of brakes and brake actuation mechanisms (air and hydraulic).(6)

TEXT BOOKS:

1. Automobile Engineering -G.B.S.Narang.

2. Automobile Engineering - R.B.Gupta
3. Automobile Engineering - Vol I & II - Kirpal Singh

REFERENCE BOOKS:

1. Automotive Mechanics - Joseph Heitner

2. Automobile Engineering - S.Srinivasan

ME 414 /C COMPUTER GRAPHICS

IV Year B.Tech. (Mech) First Semester **[Program Elective-III]**

Lectures   :   4 Periods / week   *Sessional Marks   : 30*

University Exam. :   3 hrs.   *University Exam. Marks : 70*

UNIT I

Geometry and Line Generation: Introduction, Lines, Line segments, Perpendicular Lines, Distance between a point and a Line, Vectors, Pixels and Frame Buffers.   (6)

Graphic Primitives: Introduction, Display devices, Primitive operations, The Display-File Interpreter, Normalized Device Coordinates, Display-File structures.   (6)

UNIT II

Point Plotting Techniques: Coordinate system, Incremental methods, Line Drawing Algorithms, Circle generators.(6)

Line Drawing Displays: The CRT, Inherent-Memory devices, The storage-Tube display, The Refresh Line-Drawing Display.(6)

UNIT III

Polygons: Introduction to Polygons, Polygon representation, Polygon   Interfacing Algorithms, Filling Polygons, Filling with a pattern, Initializing, Antialiasing.(6)

Transformations: Introduction, Scaling Transformations, Rotation, Homogeneous Coordinates and Translations, Coordinate Transformations, Rotation about an Arbitrarypoint, Inverse Transformations.(6)

UNIT IV

Segments: *(Algorithmic Approach only)* **:**Introduction, The Segment table, Segment creation, Closing a Segment, Deleting a Segment, Renaming a Segment.   (12)

UNIT V

Windowing and Clipping: Introduction, The Viewing Transformation, Viewingtransformation implementation, Clipping, The Cohen-Sutherland Algorithm, Clipping of Polygons.   (12)

TEXT BOOK:

Computer Graphics by Steven Harrington.

REFERENCE BOOKS:

1. Procedural elements for Computer Graphics by Rogers.

2. Principles of Interactive Graphics by Newman and Sproull.

ME 415 MOOCS

IV Year B.Tech. (Mech) Second Semester

Lecturers/ Tutorials: 3   *Sessional Marks   : 0*

University Exam: 0   *University Exam Marks   : 100*

ME 415/A OPERATIONS RESEARCH

(Open Elective offered to other branches)
IV Year B.Tech. (Mech)::First Semester

Lectures : *3 +1Periods / week*   *Sessional Marks: 30*

University Exam. : *3 hrs.*   *University Exam. Marks: 70*

UNIT I

Linear Programming: Definition and Scope of Operations Research, Mathematical formulation of the problem, graphical method, Simplex method, artificial basis technique, duality, dual Simplex method. Degeneracy, alternative optima, unbounded solution, infeasible solution.(12)

UNIT II

Transportation Problem: Introduction to the problem, LP formulation of a transportation problem. Basic feasible solution by north-west corner method, Vogel's approximation method, least cost method. Finding optimal solution by MODI method, degeneracy, unbalanced transportation matrix and Maximization in transportation model. (12)

Unit III

Assignment Problem: Introduction to the problem, LP formulation of a Assignment problem. One-to-one assignment problem, optimal solution, unbalanced assignment matrix. Flight scheduling problems, Traveling salesman problem. (12)

UNIT IV

Queing Theory: Queuing systems and their characteristics. Analysis of Markovian chains, Transition diagram, M/M/1 : FCFS/ μ / μ and M/M/1 : FCFS/ μ / N queuing models. (4)

Project Planning Through Networks: Arrow (Network) Diagram representation. Rules for constructing an arrow diagram, Pert and CPM, Critical path calculations, earliest start and latest completion times, Determination of critical path, determination of floats, Probability considerations in project (8)

UNIT V

Simulation: Definition and applications. Monte-Carlo simulation. Random numbers and random number generation: Mixed congruential method, additive congruential method and multiplicative congruential method. Application problems in queuing and inventory. (6)

Game Theory: Definition of Game, Strategy, pure strategy, mixed strategy, pay off matrix, Maxmin and Minmax criteria of optimality. Two person zero sum games: Pure and Mixed strategies, Dominance Property, Arthimatic method, algebraic method for 2x2 games, solution of 2xn or mx2 games (6)

TEXT BOOKS:

3. Operations Research – H.A. Taha

4. Introduction to Operations Research – Hiller and Liberman

REFERENCES:

6. Introduction to Operations Research – Phillips, Ravindran, James Solegerg.
7. Optimization Theory and Applications – S.S. Rao
8. Operations Research – S.D. Sharma
9. Operations Research – Gupta and Hira
10. Pert and CPM Principles and Applications – L.S. Srinath

ME 415/B ROBOTICS
(Open Elective offered to other branches)

IV Year B.Tech. (Mech):: First Semester

Lectures	*: 3+1 Periods / week*	*Sessional Marks: 30*
University Exam. :	*3 hrs.*	*University Exam. Marks: 70*

UNIT – I

Introduction to Robotics, major component so a robot, robotic like devices, classification of robots – Classification by coordinate system and by control method, Specifications of robots,fixed versus flexible automation, economic analysis, overview of robot application. (12)

UNIT – II

Robot End Effectors: Introduction, end effectors, interfacing, types of end effectors, grippers and tools, considerations in the selection and design of remote centered devices. (12)

UNIT – III

Robotic Sensory Devices : Objective, Non-optical position sensors – potentiometers, synchros, inductocyn, optical position sensors – opto interrupters, optical encoders (absolute & incremental) [6]

Proximity Sensors : Contact type , non contact type – reflected light scanning laser sensors. [6]

UNIT – IV

Touch & Slip Sensors : Touch sensors – proximity rod & photo detector sensors, slip sensors – Forced oscillation slip sensor, interrupted type slip sensors, force and torque sensors. [12]

UNIT – V

Transformations and Kinematics: Objectives, homogenous coordinates, basictransformation operations, forward solution – DenavitHartenberg procedure. Simple problems involving planar manipulators, inverse or backward solution – problems involved, techniques. (12)

TEXT BOOKS :

1. Robotic Engineering by Richard D.Klafter
2. Industrial Robotics by MikellP.Groover

REFERENCE BOOKS :

1. Introduction to Robotics – John J.Ceaig
2. Robotics – K.S.Fu, Gonzalez &Hee
3. Robotics for Engineers by YoramKoren.

ME 415/C FLUID POWER & CONTROL SYSTEMS
(Open Elective offered to other branches)

IV Year B.Tech. (Mech) :: Second Semester

Lectures	*:*	*3+1 Periods / week*	*Sessional Marks : 30*
University Exam.	*:*	*3 hrs.*	*University Exam. Marks : 70*

UNIT I
Hydraulic Pumps & Pressure Regulation: Pressure regulation, pump types: Gear Pump,Vane Pump, Piston Pump, Combination Pumps. selection and specification of pumps, pump characteristics (12)

UNIT II
Air Compressors: Types: Piston, Screw rotary and Dynamic compressors .(6)

Hydraulic & Pneumatic Actuators: Linear and Rotary Actuators-Selection, Specification and Characteristics, (6)

UNIT III
Hydraulic and pneumatic accessories (4)

Control and Regulation Elements: Pressure-direction and flow control valves, relief valves,non return and safety valves-actuation systems.(8)

UNIT IV
Hydraulic Circuits: Reciprocation, quick return, Sequencing synchronizing circuits-accumulator circuits-industrial circuits-press circuits-hydraulic milling machine-grinding, planning, copying, forklift (12)

UNIT V
Applications, Advantages and Disadvatages of Hydraulics and pneumatics (4)

Earth mover circuits-design and selection of components-safetyand emergency mandrels. (8)

TEXT BOOK:
1. Andrew Parr, "Hydraulics and Pneumatics", (HB), Jaico Publishing House, 1999

REFERENCES:
1. Antony Espossito, "Fluid power with Applications", Prentice Hall, 1980
2. DudleytA.Pease and John J.Pippenger, "Basic Fluid Power", Prentice Hall, 1987
3. S.Ilango and V.Soundarajan "Introduction to Hydrualics And Pneumatics" PHI Publisher 2014
4. R.Srinivasan"Hydrualics and Pneumatic Controls" Vijay Nicole Imprints PVT. LTD 2004

ME 451 COMPUTER AIDED MANUFACTURING LABORATORY

IV Year B.Tech. (Mech) :: First Semester

Practicals   : 4 periods / Week   *Sessional Marks   : 30*
University Exam: 3 hrs   *University Exam Marks   : 70*

*Any **Ten** Experiments should be performed:*

1. Manual Part Programming examples in plain turning, step turning, taper turning, contour turning, thread cutting, drilling, boring, taper boring, counter boring, parting off with and without using Canned Cycles and sub programs on CNC Lathe

2. Manual Part Programming examples in drilling, pocket milling and profile milling with and without using Canned Cycles and sub programs on CNC Milling Machine.

3. Modelling, part program generation and tool path simulation using any one of the CAM software packages like Master CAM, Edge CAM, Ideas, Pro - E, CATIA etc.,

ME 452 Industrial/ Research Internship (2 Months)

IV Year B.Tech. (Mech) :: First Semester

Practicals :0   *Sessional Marks   : 100*

University Exam :0   *University Exam Marks   : 0*

ME 461: PROJECT WORK

IV Year B.Tech. (Mech) :: Second Semester

Practicals	*:* *6 Periods / week*	*Sessional Marks*	*: 50*
University Exam.	*:* *3 hrs.*	*University Exam. Marks*	*: 100*

  The Project Report has to be submitted at the end of the semester and marks will be awarded based on the Viva-voce examination.

ME 462: SEMINAR

IV Year B.Tech. (Mech) :: Second Semester

Practicals   :   *0 Periods / week*   *Sessional Marks*   *: 50*

University Exam.   :   *0 hrs.*   *University Exam. Marks*   *: 0*

ME 463 MOOCS

IV Year B.Tech. (Mech) Second Semester

Lecturers/ Tutorials: 3   *Sessional Marks   : 0*

University Exam: 0   *University Exam Marks   : 100*