VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

Accredited by NBA &NAAC, Approved by AICTE & Permanently affiliated to JNTUH

Aziz Nagar Gate, C.B. Post, Hyderabad - 500 075, Telangana.

ACADEMIC REGULATIONS, COURSE STRUCTURE & SYLLABUS

For

B. Tech MECHANICAL

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

B.TECHFIRST YEAR COURSE STRUCTURE & SYLLABUS
DEPARTMENT OF MECHANICAL ENGINEERING

B.Tech I Year I Semester

S. No	Course Category	Course Code	Course Title	L	T	P	Credits
1	B S – 1	A51002	Mathematics – I	3	1	0	4.0
2	B S – 2	A51003	Engineering Physics	3	1	0	4.0
3	BS Lab – 1	A51082	Physics Lab	0	0	3	1.5
4	H & S – 1	A51001	English	2	0	0	2.0
5	H&S Lab -1	A51081	English Language Skills Lab (ELSL)	0	0	2	1.0
6	E S -1	A51501	Progror Problem Solving – I	2	0	0	2.0
7	ES-Lab -1	A51581	Programming for Problem Solving Lab – I	0	0	2	1.0
8	E S – 2	A51301	Engineering Graphics & Modeling	1	0	3	2.5
Total				**11**	**2**	**10**	**18**

B.Tech I Year II Semester

S .No	Course Category	Course Code	Course Title	L	T	P	Credits
1	B S - 3	A52007	Mathematics – II	3	1	0	4.0
2	B S - 4	A52009	Chemistry	3	1	0	4.0
3	BS Lab - 1	A52086	Chemistry Lab	0	0	3	1.5
4	E S - 3	A52303	Engineering Mechanics	4	0	0	4.0
5	ES Lab - 2	A52382	Engineering Workshop	0	1	3	2.5
6	H&S Lab - 2	A52084	English Communication Skills Lab (ECSL)	0	0	2	1.0
7	E S - 4	A52502	Programming for Problem Solving – II	2	0	0	2.0
8	ES Lab - 3	A52582	Programming for Problem Solving Lab – II	0	0	2	1.0
Total				12	3	10	20

DEPARTMENT OF MECHANICAL ENGINEERING

R21 COURSE STRUCTURE

B.TECH II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	A53011	Numerical Methods and Partial Differential Equations	3	0	0	3
2	A53304	Materials Technology	3	0	0	3
3	A53305	Mechanics of Solids	3	1	0	4
4	A53306	Thermodynamics	3	0	0	3
5	A53307	Production Technology	3	0	0	3
6	A53010	Professional Communication	2	0	0	2
7	A53383	Metallurgy and Mechanics of Solids Lab	0	0	2	1
8	A53384	Production Technology Lab	0	0	2	1
9	A53MC1	Environmental Sciences	2	0	0	0
Total			**19**	**1**	**4**	**20**

B. TECH. II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	A54018	Probability and Statistics	3	0	0	3
2	A54207	Basic Electrical Engineering	3	0	0	3
3	A54308	Machine Drawing & Drafting	3	0	0	3
4.	A54309	Kinematics of Machinery	3	0	0	3
5	A54310	Thermal Engineering	3	0	0	3
6	A54311	Mechanics of Fluids and Hydraulic Machines	3	0	0	3
7	A54385	Mechanics of Fluids and Hydraulic Machines Lab	0	0	2	1
8	A54286	Basic Electrical Engineering Lab	0	0	2	1
9	A54MC2	Gender Sensitization	2	0	0	0
Total			**20**	**0**	**4**	**20**

MECHANICAL ENGINEERING
R21 Course Structure

III B.Tech. I Semester

S.No	Category	Subject Code	Course Title	L	T	P	Credits
1	PC – 8	A55311	Metrology & Machine Tools	3	0	0	3
2	PC – 9	A55312	Dynamics of Machinery	3	0	0	3
3	PC – 10	A55313	Design of Machine Members-I	3	0	0	3
4	PC -11	A55314	Applied Thermodynamics	3	0	0	3
5	PE – 1	A55315 A55316 A55317	Automobile Engineering Mechatronics Additive Manufacturing	3	0	0	3
6	OE – 1	A54318 A54319	Elements Of Mechanical Engineering Product Engineering	3	0	0	3
7	PC Lab - 5	A55386	Thermal Engineering Lab	0	0	2	1
		A55387	Metrology & Machine Tools Lab				
8	H & S- Lab3	A55087	Advanced Communication Skills Lab	0	0	2	1
9	Value Added Course – 1	A55TP1	Personality Development & Behavioural Skills	2	0	0	1
Total				**20**	**0**	**4**	**21**

III B.Tech. II Semester

S. No	Category	Subject Code	Course Title	L	T	P	Credits
1	PC – 12	A56320	Design of Machine Members-II	3	0	0	3
2	PC – 13	A56321	Heat Transfer	3	0	0	3
3	H&S –3	A56023	Managerial Economics and Financial Analysis	3	0	0	3
4	PC – 14	A56322	Finite Element Method	3	0	0	3
5	PE – 2	A56323 A56324 A56325	Refrigeration and Air Conditioning Industrial Management Automation In Manufacturing	3	0	0	3
6	OE – 2	A56326 A56327	Maintenance and Safety Engineering Industrial Engineering	3	0	0	3
7	PC Lab – 6	A56388	Heat Transfer Lab	0	0	2	1
8	PC Lab – 7	A56389	Computer Aided Engineering Lab	0	0	2	1
9	Value Added Course – 2	A56TP2	Quantitative Methods & Logical Reasoning	2	0	0	1
Total				**20**	**0**	**4**	**21**

Department of Mechanical Engineering

COURSE STRUCTURE FOR B.TECH IV YEAR

B. Tech. IV Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	PC - 15	Instrumentation and Control Systems	3	0	0	3
2	PC - 16	CAD/CAM	3	0	0	3
3	PE - 3	Robotics	3	0	0	3
		Gas Dynamics				
		Production And Operations Management				
4	PE - 4	Operations Research	3	0	0	3
		Energy Conservation And Management				
		Fluid Power Systems				
5	OE - 3	Basic Automobile Engineering Material Science And Engineering	3	0	0	3
6	PC Lab - 8	CAD/CAM Lab	0	0	2	1
7	PC Lab - 9	Production Drawing Practice and Instrumentation Lab	0	0	2	1
8	PC-17	Industry Oriented Mini Project	0	0	0	3
Total			**15**	**0**	**4**	**20**

B. Tech. IV Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	PC– 18	Production Planning & Control	3	0	0	3
2	PC – 19	Unconventional Machining And Processes	3	0	0	3
3	PC– 20	Technical Seminar	0	2	0	2
4	PC – 21	Comprehensive Viva Voce	0	0	0	2
5	PC– 22	Major Project work	0	0	20	10
Total			**6**	**2**	**20**	**20**

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

MATHEMATICS - I

(Matrices and Calculus)

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year I Semester

L	T	P	C
3	1	0	4

Course Code: A51002

Course Outcomes:

1. Write the matrix representation of system of linear equations and identify the consistency of the system of equations.
2. Find the Eigen values and Eigen vectors of the matrix and discuss the nature of the quadratic form.
3. Analyze the convergence of sequence and series.
4. Discuss the applications of mean value theorems to the mathematical problems, Evaluation of improper integrals using Beta and Gamma functions.
5. Examine the extrima of functions of two variables with/ without constraints.

UNIT-I:

Matrices and Linear System of Equations: Matrices and Linear system of equations: Real matrices Symmetric, skew symmetric, orthogonal. Complex matrices: Hermitian, Skew Hermitian and Unitary. Rank-Echelon form, Normal form. Solution of Linear Systems Gauss Elimination, Gauss Jordan & LU Decomposition methods.

UNIT-II:

Eigen Values and Eigen Vectors: Eigen values, Eigen vectors properties, Cayley-Hamilton Theorem (without Proof) Inverse and powers of a matrix by Cayley-Hamilton theorem Diagonalization of matrix Quadratic forms: Reduction to Canonical form, Nature, Index, Signature.

UNIT-III:

Sequences & Series:

Basic definitions of Sequences and series, Convergence and divergence, Ratio test, Comparison test, Cauchy's root test, Raabe's test, Integral test, Absolute and conditional convergence.

UNIT-IV:

Beta & Gamma Functions and Mean Value Theorems: Gamma and Beta Functions-Relation between them, their properties evaluation of improper integrals using Gamma / Beta functions. Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Generalized Mean Value theorem (all theorems without proof) Geometrical interpretation of Mean value theorems.

UNIT-V:

Functions of several variables: Partial Differentiation and total differentiation, Functional dependence, Jacobian Determinant- Maxima and Minima of functions of two variables with constraints and without constraints, Method of Lagrange Multipliers.

Text Books:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 36th Edition, 2010
2. Advanced Engineering Mathematics by Jain &Iyengar NarosaPublications.

Reference Books:

1. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2nd Edition), MichaelD.Greenberg

APPLIED PHYSICS

(Common for ECE & EEE)

B.Tech I Year I Semester

Course Code: A51004

L	T	P	C
3	1	0	4

Course Outcomes:

1. Identify various optical phenomena of light
2. Discuss the basic principles of quantum mechanics
3. Classify solids based on the band theory
4. Elucidate the characteristics of semiconductors and semiconductor devices
5. Explain the working principle of optical fibers and lasers

UNIT – I:

Wave Optics: Principle of Superposition, coherence. Interference - Interference in thin films by reflection, Newton's Rings. Diffraction - Fraunhofer and Fresnel Diffraction, Farunhofer diffraction due to single slit, Plane Diffraction Grating, resolving power of grating (qualitative treatment). Polarization - Polarization of light waves, Plane of vibration, plane of polarization, Double refraction, Nicol's Prism, Applications of Polarization.

UNIT-II:

Free electron theory and Introduction to Quantum Mechanics: Classical free electron Theory, Electrical Conductivity and Ohm's Law -Drawbacks.Introduction to quantum physics: Black body radiation and Planck's Law(qualitative treatment), wave-particle duality, de-Broglie hypothesis of matter waves, Heisenberg uncertainty principle, time independent Schrodinger equation, Born interpretation of wave function, particle in an infinite potential well (one dimension).

UNIT-III:

Band theory of solids and Semiconductors: Kronig-Penny model(qualitative treatment), E-k diagram, Energy bands in solids, classification of materials into metals, semiconductors, and insulators, Effective mass, Densityof States(qualitative treatment), Fermi distribution function, Fermi level and its importance.Intrinsic semiconductors, carrier concentration in intrinsic semiconductors, energy band diagram and position of Fermi level in intrinsic semiconductors, equation for electrical conductivity of semiconductors, extrinsic semiconductors (qualitative treatment).

UNIT-IV:

Semiconductor Devices: Direct and indirect band-gap semiconductors, Formation of p-n junction, energy diagram of PN junction, I-V characteristics of PN junction diode, Photo diode, solar cell-efficiency, light emitting diode and their characteristics, semiconductor laser: device structure and characteristics, Hall effect and its applications.

UNIT-V:

Fiber Optics and Lasers: Introduction, total internal reflection, acceptance angle and numerical aperture, step and graded index fibers, applications of optical fibers.Introduction to interaction of radiation with matter: stimulated absorption, spontaneous emission and stimulated emission, characteristics of a laser, population inversion, important components of a laser: active medium, pumping source, optical resonator. Construction and working of Ruby laser, He-Ne laser, applications of lasers.

Text Books:

1. Engineering Physics by P K Palanisamy, Scietech publication.
2. Engineering Physics by V Rajendran, McGraw Hill Education.

Reference Books:

1. Engineering Physics by S O Pillai, Sivakami, New Age International (P) Limited.
2. Physics Volume I & II, Resnick and Halliday, John Wiley and sons, Inc.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

ENGINEERING PHYSICS

(Common for CIVIL & MECH)

B.Tech I Year I Semester

L	T	P	C
3	1	0	4

Course Code: A51003

Course Outcomes:

1. Explain the crystal structure of solids
2. Understand various optical phenomena of matter
3. Explain the working principle of optical fibers and lasers
4. Interpret forced damped harmonic oscillations
5. Apply the knowledge of magnetic behavior of materials

UNIT-I:

Crystallography: Space lattice, Unit cell, Lattice parameters, Crystal systems, Bravais lattices, Atomic radius, Co-ordination number, Structures and Packing fractions of Simple Cubic, Body Centered Cubic and Face Centered Cubic crystals. Miller Indices for Crystal planes and directions, Inter planar spacing of orthogonal crystal systems.

UNIT-II:

Wave Optics: Principle of Superposition, coherence. Interference - Interference in thin films by reflection, Newton's Rings. Diffraction - Fraunhofer and Fresnel Diffraction, Farunhofer diffraction due to single slit, Plane Diffraction Grating, resolving power of grating (qualitative treatment). Polarization - Polarization of light waves, Plane of vibration, plane of polarization, Double refraction, Nicol's Prism, Applications of Polarization.

UNIT-III:

Fiber Optics and Lasers: Introduction, total internal reflection, acceptance angle and numerical aperture, step and graded index fibers, applications of optical fibers. Introduction to interaction of radiation with matter: stimulated absorption, spontaneous emission and stimulated emission, characteristics of a laser, Population inversion, components of a laser: active medium, pumping source, optical resonator. Construction and working of Ruby laser and He-Ne laser. Applications of Lasers.

UNIT-IV:

Waves and Oscillations: Simple harmonic motion, equation of simple harmonic motion, Simple Pendulum, Torsional pendulum, damped harmonic motion-heavy, critical and light damping, energy decay in a damped harmonic oscillator (qualitative treatment), power dissipation, quality factor. Forced vibration, steady state motion of forced damped harmonic oscillator. Amplitude of forced vibration, Resonance.

UNIT-V:

Magnetic Properties of Materials: Introduction to magnetism - Basic definitions, Origin of magnetic moment, Bohr magneton. Classification of magnetic materials-Dia, Para, Ferro, Antiferro and Ferri magnetic materials, Domain theory of ferromagnetism, Hysteresis curve, Soft and Hard magnetic materials and their applications.

Text books:

1. Engineering Physics, Hitendra K Malik, A. k. Singh, Mcgraw Hill Edition Private Limited.
2. Engineering Physics, P K Palanisamy, Scietech publication.

Reference books:

1. A Text book of Engineering Physics, M N Avadhanulu, P G Kshrsagar, S Chand.
2. Physics Volume I & II, Resnick and Halliday, John Wiley and sons, Inc.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

PHYSICS LAB

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year I Semester

Course Code: A51082

L	T	P	C
0	0	3	1.5

Course Outcomes:

1. Apply optical phenomena to characterize optical sources and components.
2. Characterize semiconductors and semiconductor devices.
3. Study transient response of RC circuit.
4. Study the properties and resonance mechanisms in mechanical and electrical systems.
5. Evaluate the magnetic Induction along the axis of current carrying coil.

List of Experiments

1. Newton's rings: Determination of the radius of curvature of a given lens by forming Newton's rings.
2. Diffraction grating: Determination of wavelength of a given source using a plane diffraction grating.
3. Dispersive power: Determination of dispersive power of given prism.
4. Single Slit Diffraction using Lasers- Determination of wavelength of a Monochromatic Source (LASER).
5. Energy gap of P-N junction diode: Determination of the energy gap of a semiconductor diode.
6. Light emitting diode: Study of V-I and P-I characteristics of a given light emitting diode.
7. Photo diode: Study of V-I characteristics of photo diode at different intensities.
8. Melde's Experiment: Determination of frequency of electrically maintained tuning fork.
9. Sonometer: Determination of frequency of AC source.
10. Torsional pendulum: Determination of rigidity modulus of a given material.
11. Fly-wheel: Determination of moment of inertia of flywheel.
12. Stewart & Gee's experiment - Determination of magnetic field along the axis of current carrying coil.
13. LCR Circuit- Determination of the resonance frequency of forced electrical oscillator.
14. RC- Circuit – Determination of the time constant of RC-circuit.
15. Optical fiber: Determination of the numerical aperture of optical fiber.

Note: Any 10 experiments are to be performed.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

ENGLISH

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year I Semester

Course Code: A51001

L	T	P	C
2	0	0	2

Course Outcomes:

1. Infer the importance of scientific discoveries in promoting social responsibilities.
2. Comprehend the given texts and respond appropriately for technical and professional purposes.
3. Communicate confidently and transfer information into various forms of writing.
4. Understand the importance of health and nutrition for a better society.
5. Present various forms of business writing skills for successful careers.

UNIT-I:

'The Raman Effect' from the prescribed textbook **'English for Engineers'**

Grammar: Articles & Prepositions

Reading : Reading and Its Importance- Techniques for Effective Reading.

Writing : Organizing principles of paragraphs in documents.

Vocabulary: The concept of word Formation, synonyms, antonyms, and standard abbreviations.

UNIT-II:

'Ancient Architecture in India' from the prescribed textbook **'English for Engineers'**

Reading : Improving Comprehension Skills – Techniques for good comprehension

Writing :Sentence Structures, Use of phrases and clauses in sentences

Writing Formal Letters-Eg. Letter of Complaint, Letter of Requisition,

Job Application with Resume.

Vocabulary: Root words and acquaintance with prefixes and suffixes from foreign languages in English, to form derivatives

UNIT-III:

'Blue Jeans' from the prescribed textbook **'English for Engineers'**

Grammar: Tenses: Types and uses.

Reading : Sub-skills of Reading- Skimming and Scanning

Writing :Identifying Common Errors in Writing

Subject-Verb agreement in number, gender and person

Information Transfer-Process writing

UNIT-IV:

'What Should You Be Eating' from the prescribed textbook **'English for Engineers'**

Reading : Intensive Reading and Extensive Reading

Writing : Nature and Style of Sensible Writing

Describing & Defining

Identifying common errors in writing

UNIT-V:

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook **'English for Engineers'**

Vocabulary : Technical Vocabulary and their usage

Reading : Reading Comprehension-Exercises for Practice

Writing : Cohesive Devices

Précis Writing

Technical Reports-Introduction, Characteristics of a Report –

Categories of Reports, Formats- Structure of Reports (Manuscript Format) –Types of Reports - Writing a Report.

Text Books:

1. English for Engineers,Sudarshana, N.P. and Savitha, C. Cambridge University Press, 2018.

Reference Books:

1. Effective Technical communication, Muhammed Rizvi, TMH, 2008.
2. Advanced English Grammar, Hewings, Cambridge University Press, 2010.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

ENGLISH LANGUAGE SKILLS LAB

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year I Semester

Course Code: A51081

L	T	P	C
0	0	2	1

Course Outcomes:

1. Reproduce speech sounds and improve fluency in language.
2. Understand syllables and consonant clusters for appropriate pronunciation.
3. Exhibit effective professional skills with rhetoric eloquence.
4. Deliver enthusiastic and well-practiced presentation.
5. Learn Task-Based Language Learning (TBLL) through various language learning activities effectively.

Exercise-I:

CALL Lab

Introduction to Pronunciation- Speech Sounds, Vowels and Consonants- Practice for Listening

ICS Lab:

Ice-Breaking activity and JAM session

Exercise-II:

CALL Lab

Silent Letters, Consonant Clusters, Homographs

ICS Lab:

Common Everyday Situations: Conversations and Dialogues

Exercise-III:

CALL Lab

Syllables

ICS Lab

Communication at Workplace, Social and Professional Etiquette

Exercise-IV:

CALL Lab:

Word Accent and Stress Shifts

ICS Lab:

Formal Presentations, Visual Aids in Presentations

Exercise-V:

CALL Lab:

Intonation, Situational dialogues for practice

ICS Lab:

Interviews, Types of Interviews

Reference Books:

1. A textbook of English Phonetics for Indian Students, T. Balasubramanian, Macmillan Publishers, 2010.
2. Speaking English Effectively, Mohan, Macmillan Publishers, 2010.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING-I

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year I Semester

L	T	P	C
2	0	0	2

Course Code: A51501

Course Outcomes:

1. Design Algorithms and Flowcharts for real world applications using 'C'.
2. Know the usage of various operators in Program development.
3. Design programs involving decision and iteration structures.
4. Apply the concepts code reusability using Functions.
5. Analyze various searching and sorting techniques using Arrays.

UNIT-I:

Problem Solving Using Computers: Introduction, Algorithms, Flowcharts and Pseudo code, Applications of C language.

Overview of C Language: Introduction, Salient Features of C Language, Structure of a "C" Program.

C Language Preliminaries: Keywords and Identifiers, Constants, Variables, Data Types, and Input/ Output Statements with suitable illustrative "C" Programs.

UNIT-II:

Operators: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative "C" Programs.

UNIT-III:

Statements in C:Conditional/Decision Statements: if, if-else, Nested if-else, else-if ladder, and Switch-Statement with suitable illustrative "C" Programs.

Loop Control Statements: while, do-while and for with suitable illustrative "C" Programs.

UNIT-IV:

Functions: Introduction to Functions, benefits of functions, types of functions, Function calls, return vs exit( ), Parameter Passing mechanism: Call-by-Value, Recursion, Storage Classes.

UNIT-V:

Arrays: Introduction to Arrays, One-Dimensional Arrays, Two-Dimensional Arrays, Arrays and Functions.

Searching and Sorting: Linear Search, Binary Search, Bubble Sort, Insertion Sort.

Text Books:

1. COMPUTER SCIENCE: A Structured Programming Approach Using C, B.A.Forouzon and R.F. Gilberg Third edition, CENGAGE Learning, 2016.
2. C and Data Structures, Ashok N. Kamthane, "Pearson Education. 2010.

Reference Books:

1. Problem Solving Using C, M.T.Somashekara, PHI, 2nd Edition 2009.
2. Computer Fundamentals and Programming in C, A.K.Sharma, 2nd Edition, University Press.
3. Programming in C 2/e, Pradip Dey and Manas Ghosh, Oxford University Press, 2nd Edition 2011.
4. The Fundamentals of Computers Rajaraman V.,, 4th Edition, Prentice Hall of India, 2006.
5. Programming in C, R S Bichker, University Press, 2012.

PROGRAMMING FOR PROBLEM SOLVING LAB – I

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year I Semester

L	T	P	C
0	0	2	1

Course Code: A51581

Course Outcomes:

1. Apply the specification of syntax rules for numerical constants and variables, data types.
2. Know the Usage of various operators and other C constructs.
3. Design programs on decision and control constructs.
4. Develop programs on code reusability using functions.
5. Implement various searching and sorting techniques using arrays.

Week 1

Ubuntu and Linux Commands.

Week 2

Designing of flowcharts and algorithms using raptor tool

1. Areas of Polygons.
2. Calculation of Simple and Compound Interest.
3. Swapping of Two numbers with and without temporary variable.
4. Checking whether a number is even or odd.
5. Sum of first 'n' natural numbers.
6. Checking a number whether it is divisible by any given number.
7. Evaluation of mathematical expressions.
8. Programs using scanf( ) and printf( ) statements.

Week 3

Programs on operators. (Minimum 4 Programs)

Week 4, 5 & 6

Programs on Conditional Statements. (Minimum 12 Programs)

Week 7,8 & 9

Programs on Control Statements. (Minimum 12 Programs)

Week 10 &11

Programs on Functions. (Minimum 6 Programs)

Week 12

Programs on One Dimensional Arrays. (Minimum 3 Programs)

Week 13

Programs on Two Dimensional Arrays. (Minimum 2 Programs)

Week 14

Implementation of Linear Search and Binary Search.

Week 15

Implementation of Bubble Sort and Insertion Sort.

Week 16

Review

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

ENGINEERING GRAPHICS & MODELING

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year I Semester

L	T	P	C
1	0	3	2.5

Course Code: A51301

Course Outcomes:

1. Understand the concepts of engineering drawing of planes, solids and the CAD drawing software.
2. Conceptualize and draw the projections of points and straight lines.
3. Visualize and project different views of a planes and solids.
4. Analyze given solids and represent sectional views.
5. Generate isometric and corresponding orthographic views of any given component.

UNIT- I:

Introduction to Engineering Drawing: Principles of engineering graphics and their significance, usage of drawing instruments, conic sections, including the rectangular hyperbola general method only. Cycloid, Epicycloid, Hypocycloid. Scales plain & diagonal only.

Introduction to CAD: Introduction to CAD software and its importance, standard toolbar/menus and navigation tools used in the software, using basic commands limits ,units, grid, test , move, offset ,mirror, rotate, trim, extend, fillet etc. drawing lines using line command. Drawing spline, ellipse, circle, rectangle etc.. Concept of layers and dimensioning.

UNIT- II:

Principles of Orthographic Projections: Conventions. Projections of points, projections of lines (first angle projection) inclined to both planes (traces and midpoint problem to be excluded).

Implementation of CAD: Drawing orthographic projections of points and lines using a CAD package.

UNIT – III:

Projections of the Planes: Projections of regular planes inclined to both the planes.

Projections of Solids: Projections of regular solids inclined to both the planes (prisms, pyramids, cones and cylinders, Change of potion method only).

Implementation in CAD: Drawing orthographic projection of planes and regular solids using a CAD package.

UNIT- IV:

Sections and Sectional Views of Right Angular Solids: Prism, Cylinder, Pyramid, Cone. Development of surfacesof right regular solids - Prism, Pyramid, Cylinder and Cone.

Implementation in CAD: Concept of hatching, drawing sectional views of solids and the development of right regular solids using a CAD package.

UNIT-V:

Principles of Isometric projection: Isometric scale, isometric views, conventions, isometric views of lines, planes, simple solids, conversion of isometric views to orthographic views and vice-versa, conventions.

Implementation in CAD: Drawing isometric views of simple solids. Drawing isometric views from giving orthographic views and vice-versa using a CAD package.

Note: Implementation in CAD (For Internal Evaluation Weightage Only)

Text Books:

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Charotar Publishing House.

Reference Books:

1. Engineering Graphics, Agrawal B. & Agrawal C. M. (2012), TMH Publication Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
2. Engineering Drawing and Computer Graphics, Shah, M.B. & Rana B.C. (2008), Pearson Education.
3. http://docs.autodesk.com/ACDMAC/2013/ENU/PDFs/acdmac_2013_users_guide.pdf

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

MATHEMATICS - II

(Ordinary Differential Equations and Vector Calculus)

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year II Semester

L	T	P	C
3	1	0	4

Course Code: A52007

Course Outcomes:

1. Classify the various types of differential equations of first order and first degree and apply the concepts of differential equations to the real world problems.
2. Solve higher order differential equations and apply the concepts of differential equations to the real world problems.
3. Find the Laplace Transform of various functions and apply to find the solutions of differential equations.
4. Evaluate the multiple integrals and identify the vector differential operators physically in engineering problems.
5. Evaluate the line, surface and volume integrals and converting them from one to another by using vector integral theorems.

UNIT-I:

First order Ordinary Differential Equations and their Applications: Formation of Differential equations, Differential equations of first order and first degree: exact, linear and Bernoulli, Applications of ODE: Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

UNIT-II:

Higher Order Linear Differential Equations: Linear differential equations of second and higher order with constant coefficients, RHS term of the type f(X) = $e^{ax}, \sin ax, \cos ax \text{ and } x^k, e^{ax}V(x), x^kV(x)$. Method of variation of parameters

UNIT-III:

Laplace transforms: LaPlace transform of standard functions- Inverse transform- first shifting Theorem, Transforms of derivatives and integrals- Unit step function- second shifting theorem- Dirac's delta function -Convolution theorem Periodic function - Differentiation and integration of transforms.Application of Laplace transforms to ordinary differential equations.

UNIT-IV:

Multiple Integrals & Vector Differentiation:

Multiple integrals -double and triple integrals -change of order of integration (Only Cartesian form)- change of variables (Cartesian to Polar for double integral, Cartesian to Spherical for triple integral).

Gradient- Divergence- Curl and their related properties- Potential function Laplacian and second order operators.

UNIT-V:

Vector Integration: Line integral, work done, Surface and Volume integrals. Vector integrals theorems: Green's, Stoke's and Gauss Divergence Theorems (Only Statements & their Verifications).

Textbooks:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 36th Edition, 2010
2. Advanced Engineering Mathematics by Jain &Iyengar NarosaPublications.

Reference Books:

1. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2nd Edition),MichaelD.Greenberg

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

CHEMISTRY

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year II Semester

L	T	P	C
3	1	0	4

Course Code: A52009

Course Outcomes:

1. Acquire knowledge of atomic, molecular and electronic changes related to conductivity.
2. Apply the various processes of treatment of water for both domestic and industrial purpose.
3. Apply the knowledge of electrode potentials for the protection of metals from corrosion.
4. Analyze the major chemical reactions that are used in the synthesis of compounds.
5. Apply the knowledge of polymers in every day's life.

UNIT (I)
Atomic and molecular structure

Introduction, Concept of atomic and molecular orbitals, Crystal field theory- Crystal field splitting patterns of transition metal ion d- orbital- tetrahedral & octahedral geometries.
LCAO, Molecular orbitals of di-atomicmolecules, Molecular orbital energy level diagrams of diatomic molecules (N_2, O2& F_2). Pi-molecular orbitals of butadiene and benzene.

UNIT II:
Water Technology

Hardness of water, expression of hardness ($CaCO_3$ equivalent), units and types of hardness. Estimation of temporary and permanent hardness of water by EDTA method. Numerical problems based on hardness of water. Potable water: characteristics, treatment of water for domestic supply. Desalination of brackish water: reverse osmosis. Alkalinity of water and its determination. Boiler feed water and its treatment: Internal treatment (colloidal, phosphate calgon conditioning of water). External treatment (ion –exchange process).

UNIT (III):
Electrochemistry and corrosion

Electrode, electrode potential, galvanic cell, cell reactions and cell notation, cell EMF, types of electrodes (Calomel electrode and Quinhydrone electrode),Determination of P^H using quinhydrone electrode. Nernst equation, Numerical problems.

BATTERIES: Introduction to cell and battery, Primary (lithium cell) and secondary cells, (lead-Acid cell, and lithium-ion cells). Fuel cells – Methanol – Oxygen fuel cell, advantages and engineering applications of fuel cells.
Corrosion: Introduction, types of corrosion: chemical and electrochemical corrosion, factors affecting the rate of corrosion: nature of the metal, position of metal in galvanic series, purity of metal, nature of corrosion product, nature of environment: effect of temperature, effect of pH, humidity. Corrosion control methods: Cathodic protection: sacrificial anode method and impressed current cathode method. Protectivecoatings: metallic coatings (anodic and cathodic), methods of application on metals-electroless plating of Ni.

UNIT (IV):
Stereochemistry

Structural isomers and stereoisomers, configurations,symmetry and chirality, enantiomers, diastereomers, optical activity. Conformations of n-butane.
Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution(SN1 & SN2), addition(addition of HBr to propene, Markownikoff and Anti Markownikoff addition), elimination, oxidation(oxidation of alcoholsusing $KMnO_4$& CrO_3), reduction(reduction of carbonyl compounds by $LiAlH_4$& $NaBH_4$). Synthesis of a commonly used drug molecule- paracetamol and Asprin.

UNIT (V):
Polymer Chemistry

Introduction, classification of polymers, types of polymerization (addition and condensation, mechanisms not included). Plastics- types of plastics -thermoplastics and thermosetting plastics. Preparation, properties and engineering applications of PVC, Teflon and Bakelite. Fibers: Nylon 6, 6 and Terelene (Dacron). Elastomers: natural rubber, structure, vulcanization. Synthetic rubbers: Buna-S& Butyl rubber.Conducting polymers: classification, polyacetylene and applications.
Biodegradable polymers: Types, examples: Polyhydroxy butyrate (PHB),Polyglycolic acid (PGA), Polylactic acid (PLA). Applications of biodegradable polymers.

Text Books:

(i) Engineering Chemistry by P.C Jain & Monica Jain, Dhanpat Rai Publishing Company.
(ii) Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company.

Reference Books:

(i) Physical Chemistryby P. W. Atkins, W. H. Freeman and Company.
(ii) Text book of Engineering Chemistry byDr.M.Tirumala Chary& Dr. E.Laxminarayana, Scitech Publications (India) Pvt Ltd.
(iii) Engineering Chemistry (NPTEL Web-book)by B.L. Tembe, Kamaluddin and M.S.Krishnan

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

CHEMISTRY LAB

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year II Semester

L	T	P	C
0	0	3	1.5

Course Code: A52086

Course Outcomes:

1. Determination of parameters like hardness, alkalinity and chloride content in water.
2. Estimation of rate constant of a reaction from concentration-time relationships.
3. Determination of physical properties like adsorption, surface tension and viscosity.
4. Synthesize a small drug molecule and analyze a salt sample.
5. Calculation of strength of compound using instrumentation techniques.

Choice of 10-12 experiments from the following:

1. Estimation of total hardness of water by EDTA method.
2. Determination of alkalinity of water.
3. Determination of chloride content of water.
4. Estimation of HCl by conductometric titration.
5. Estimation of mixture of acids by conductometric titration.
6. Estimation of HCl by potentiometric titration.
7. Estimation of Fe^{2+} by potentiometry using $KMnO_4$.
8. Determination of the rate constant of a reaction.
9. Determination of surface tension.
10. Determination of viscosity of a lubricant.
11. Chemical analysis of a salt.
12. Synthesis of a polymer/drug.
13. Adsorption of acetic acid by charcoal.
14. Determination of Saponification /acid value of an oil.

TEXT BOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis

2. Essentials of experimental engineering chemistry, Shashi Chawla, Dhanpat Rai & Co

REFERENCE BOOKS:

1. Text Book of engineering chemistry by R. N. Goyal and Harrmendra Goel.

2. A text book on experiments and calculations. S.S. Dara.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

BASIC ELECTRICAL ENGINEERING

(Common for ECE & EEE)

B.Tech I Year II Semester

L	T	P	C
3	0	0	3

Course Code: A52202

Course Outcomes: At the end of the course the student will be able to

1. Understand the fundamentals of basic circuit components and their characteristics.
2. Analyze basic electrical circuits with A.C excitation.
3. Understand the concepts of magnetic circuits and transformers.
4. Acquire the basic concepts of electrical motors.
5. Understand the concept of A.C generator and low voltage electrical installations.

UNIT I:

Introduction to Electrical Engineering And Dc Circuits: Basic definitions, types of elements, types of sources, Kirchhoff's Laws, resistive networks, inductive networks, series, parallel circuits, Star- Delta and Delta- Star transformation, Network theorems- Superposition, Thevenin's - simple problems.

UNIT II:

Ac Circuits: Representation of sinusoidal waveforms, peak, RMS and average values Elementary treatment of single-phase AC circuits consisting of R, R-L, R-C, R-L-C combinations (series and parallel) Phase representation, real power, reactive power, apparent power, resonance concept. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III:

Magnetic Circuits &Transformers:

Magnetic circuits: Magnetic materials, Faraday's laws of Electromagnetic Induction, BH characteristics, Magnetic Circuits - concept of Self & Mutual Inductance.

Transformers: Ideal and practical single phase transformer, OC-SC tests, equivalent circuit, losses in transformer, regulation and efficiency - simple problems.

UNTI IV:

Dc Machines and Induction Motors: DC Machines: Construction, Principle and Operation of DC Motor, Voltage- torque equations - simple problems.

Three Phase Induction Motor: Construction, Principle and working of three phase Induction Motor, torque slip characteristics, - simple problems.

Single Phase Induction Motor: Single phase Induction Motor construction and working principle, capacitor start - applications

UNIT V:

Ac Generator & Electrical Installation: AC Generator: Construction, Principle of operation of Synchronous Generator, Pitch Factor- Distribution Factor (or winding factor) - EMF equation simple problems.

Electrical Installation: Fuse, Circuit breakers, difference between fuse and circuit breaker, Types of Batteries, battery backup.

Text Books:

1. Basic Electrical Engineering, D.P Kothari & I.J Nagrath, Tata McGraw Hill Publishing Company Limited-2nd Edition.
2. Basic Electrical Engineering, T.K. Nagsarkar and M.S. Sukhija, Oxford University Press-3rd Edition.

Reference Books:

1. Circuits and Networks, A.Sudhakar&ShyamMohan.S, Tata McGraw Hill Publishing Company limited, 5th Edition.
2. Basic Electrical Engineering, K.Uma Rao and A.Jayalakshmi, Pearson Publications.
3. Basic Electrical Engineering by D C Kulshreshtha, McGraw Hill Education Private limited, 1st Edition.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

BASIC ELECTRICAL ENGINEERING LAB

(Common for ECE & EEE)

B.Tech I Year II Semester

L	T	P	C
0	0	2	1

Course Code: A52282

Course Outcomes:

1. Get an exposure to basic electrical laws.
2. Understand the response of different types of electrical circuits to different excitations.
3. Understand the measurement, calculation and relation between the basic electrical parameters.
4. Understand the performance characteristics of D.C electrical machines.
5. Understand the performance characteristics of A.C electrical machines.

List of experiments/ demonstrations

Any 5 experiments from Part-A and Part-B should be conducted (Total 10 Experiments)

Part A

1. Verification of Ohms law
2. Verification of KVL and KCL
3. Verification of Thevenin's Theorem
4. Verification of Superposition Theorem
5. Transient Response of Series R- L and R - C circuits using DC excitation
6. Determination and Verification of Impedance and Current of RL and RC series circuits

Part B

1. Transient Response of R-L-C Series circuit using DC excitation
2. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
3. OC & SC Test on Single phase transformer
4. Brake test on DC shunt motor
5. Brake test on Three Phase Squirrel cage induction motor.
6. OCC of Three phase alternator.

Reference Books:

1. Circuits and Networks by A.Sudhakar&ShyamMohan.S, Tata McGraw Hill Publishing Company Limited, 5th Edition.
2. Basic Electrical Engineering - by T.K. Nagsarkar and M.S. Sukhija, Oxford University Press, 3rd Edition
3. Basic Electrical Engineering by D.P Kothari & I.J Nagrath, Tata McGraw Hill Publishing Company Limited, 2nd Edition

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

ENGINEERING MECHANICS

(Common for CIVIL & MECH)

B.Tech I Year II Semester

L	T	P	C
4	0	0	4

Course Code: A52303

Course Outcomes:

1. Understand and apply the concepts of force, moment and their resolutions.
2. Analyze and apply the concepts of friction.
3. Calculate area and mass Moment of Inertia for given cross-sections.
4. Analyze the motion of bodies considering the cause of motion. Appreciate and apply the concept of Work-Energy method.
5. Understand the kinetics of rigid body in translation and rotation

UNIT-I:

Introduction to Engineering Mechanics Force Systems: Basic concepts, particle equilibrium in 2D & 3D, rigid body equilibrium, system of forces, coplanar concurrent forces, components in space, resultant, moment of forces and its application, couples and resultant of force system, equilibrium of system of forces, free body diagrams, equations of equilibrium of coplanar systems.

UNIT-II:

Friction: Types of friction, limiting friction, laws of friction, static and dynamic friction, motion of bodies, wedge friction.

UNIT-III:

Centroid and Centre of Gravity: Centroid of lines, areas and volumes from first principle, centroid of composite sections, centre of gravity and its implications. Theorem of Pappus.

UNIT-IV:

Area Moment of Inertia: Definition, Moment of inertia of plane sections from first principles, theorems of moment of inertia, moment of inertia of standard sections and composite sections, Parallel Axis Theorem, Perpendicular Axis Theorem

Mass Moment of Inertia: Mass moment of inertia of composite bodies.

UNIT-V:

Review of Particle Dynamics: Rectilinear motion, Plane curvilinear motion, Relative motion, Work-kinetic energy, power, potential energy.

Kinetics of Rigid Bodies: Basic terms, general principles in dynamics, types of motion, D'Alembert's principle.

Text Books:

1. Engineering Mechanics, S.S Bhavikatti& K. G. Rajashekarappa New Age International Publishers.

Reference Books:

1. Engineering Mechanics, Timoshenko S.P and Young D.H., McGraw Hill International Edition, 1983.
2. Engineering Mechanics, Tayal A.K., - Statics & Dynamics, Umesh Publications, 2011.
3. Engineering Mechanics, Shames and Rao (2006), Pearson Education.
4. Singer's Engineering Mechanics: Statics & Dynamics, K.Vijaya Kumar Reddy and J.Suresh Kumar. B.S.Publications, 3rd edition 2013.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

ENGINEERING WORKSHOP

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year II Semester

L	T	P	C
0	1	3	2.5

Course Code: A52382

Course Outcomes:

1. Understanding the tools and methods of using to fabricate engineering components
2. Applying the measuring techniques to verify the dimensional accuracy
3. Evaluating various methods and trades of workshop in the component building

(i) Lectures & videos:

Detailed contents:

1. Manufacturing Methods- Metal Forming, Machining, Advanced manufacturing methods (2 lectures)
2. CNC machining, Additive manufacturing (2 lectures)
3. Fitting operations & power tools (1 lecture)
4. House wiring (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding(1 lecture)
7. Metal casting (1 lecture)
8. Welding (1 Lecture)

(ii) Workshop Practice:

Detailed contents:

1. Machine shop (Lathe machine)
2. Fitting shop
3. Carpentry
4. House Wiring
5. Welding shop (Arc welding)
6. Tin Smithy

Reference Books:

1. Elements of Workshop Technology, Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Manufacturing Engineering and Technology, Kalpakjian S. And Steven S. Schmid, 4th edition, Pearson Education India Edition, 2002.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

ENGLISH COMMUNICATION SKILLS LAB

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year II Semester

L	T	P	C
0	0	2	1

Course Code: A52084

Course Outcomes:

1. Understand the variants in pronunciation.
2. Identify the diverse purposes of listening and speaking.
3. Discuss ideas in diverse communicative settings.
4. Exhibit increased confidence in public speaking.
5. Display critical thinking, problem solving and decision making skills through GD's

Exercise-I:

CALL Lab:Spoken vs. Written language-Formal and Informal English- Introducing Oneself and Others.

Exercise-II:

CALL Lab: Listening Skill- Its importance Purpose- Process- Types- Barriers- Effective Listening.

ICS Lab: Features of Good Conversation – Strategies for Effective Communication Role-Play-Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise-III:

CALL Lab: Information Transfer

ICS Lab: Descriptions-Narrations-Giving Directions and Guidelines-Giving Instructions-Seeking Clarifications-Asking for and Giving Directions-Thanking and Responding-Agreeing and Disagreeing-Seeking and Giving Advice-Making Suggestions.

Exercise-IV:

CALL Lab:Past Tense Marker and Plural Marker

ICS Lab: Public Speaking- Exposure to Structured Talks - Non-verbal Communication- Making a Short Speech - Extempore

Exercise-V:

CALL Lab: Intonation- Sentence Stress -Weak Forms and Strong Forms.

ICS Lab: Group Discussion, Mock Group Discussion sessions

Reference Books:

1. A textbook of English Phonetics for Indian Students, T. Balasubramanian, Macmillan Publishers, 2010.
2. Speaking English Effectively, Mohan, Macmillan Publishers, 2010.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING-II

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year II Semester

L	T	P	C
2	0	0	2

Course Code: A52502

Course Outcomes

1. Identify various string handling functions in 'C'.
2. Develop programs with user defined data types.
3. Use Dynamic memory allocation functions with pointers.
4. Distinguish between Stacks and Queues.
5. Analyze various Dynamic Data Structures.

UNIT – I

Overview of Arrays and Functions.

Strings: Introduction to Strings, String I/O, String Operations with and without built-in functions (strlen( ), strcmp( ), strcat( ),strcpy( ) and strrev( )).

UNIT -II

Structures: Definition and Initialization of Structures, Accessing structure members, Nested Structures, Array of Structures, Structures and Functions, Unions, typedef, Enumerated Data types.

UNIT-III

Pointers: Introduction to Pointers, Pointer Arithmetic, Pointers and Arrays, Pointer to Structure, Pointers and Strings, Parameter passing mechanism: Call by Reference, Pointer to Pointer, Dynamic Memory Allocation.

UNIT-IV

Introduction to Data Structures: Lists and Operations, Linear and Nonlinear Data structures.

Stacks- Introduction to Stacks, Operations, Implementation of Stack using Arrays.

Queues- Introduction to Queues, Operations, Implementation of Queue using Arrays.

UNIT-V

Linked Lists: Introduction to Linked List, Operations on Single Linked List (search, Insertion & Deletion).

Files: Introduction to Files, File Operations (Open, Close, read &Write).

Text Books:

1. COMPUTER SCIENCE: A Structured Programming Approach Using C, B.A.Forouzon and R.F. Gilberg Third edition, CENGAGE Learning, 2016.
2. C and Data Structures, Ashok N. Kamthane, "Pearson Education. 2010.

Reference Books

1. Problem Solving Using C, M.T.Somashekara, PHI, 2nd Edition 2009.
2. Computer Fundamentals and Programming in C, A.K.Sharma, 2nd Edition, University Press.
3. Programming in C 2/e, Pradip Dey and Manas Ghosh, Oxford University Press, 2nd Edition 2011.
4. The Fundamentals of Computers Rajaraman V.,, 4th Edition, Prentice Hall of India, 2006.
5. Programming in C, R S Bichker, University Press, 2012.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING LAB – II

(Common for ECE, EEE, CIVIL & MECHANICAL)

B.Tech I Year II Semester

L	T	P	C
0	0	2	1

Course Code: A52582

Course Outcomes:

1. Build programs on various string handling functions.
2. Develop applications on user defined data types.
3. Apply dynamic memory allocation through pointers.
4. Implement linear data structures through stacks and queues.
5. Create linked list dynamically through stacks and queues.

Week 1

Programs on Arrays and Functions. (Minimum 3 Programs)

Week 2 & 3

Programs on Strings with and without string built-in Functions. (Minimum 6 Programs)

Week 4

Programs on Accessing Structures and Nested Structures. (Minimum 3 Programs)

Week 5 & 6

Programs on Array of Structures, Structures and Functions. (Minimum 5 Programs)

Week 7

Programs on Unions, typedef and enum. (Minimum 4 Programs)

Week 8

Programs on Pointers, pointer arithmetic, pointer expression, One Dimensional and Two-dimensional arrays. (Minimum 4 Programs)

Week 9

Programs on Pointer to structure, Call by Reference, Pointer to Pointer. (Minimum 3 Programs)

Week 10

Programs on Dynamic Memory Allocation Functions. (Minimum 3 Programs)

Week 11

Programs on Stacks and Queues using Arrays.

Week 12 & 13

Programs on Single Linked List.

Week 14 & 15

Programs on File Operations. (Minimum 6 Programs)

Week 16

Review

MATERIALS TECHNOLOGY

B. Tech. II Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the structure of metals and constitution of alloys with phases.
2. Understand the basic concepts of phase transformation during solidification and phase diagrams.
3. Understand different heat treatment processes and their influence on properties of metals and alloys.
4. Understand classifications of steels, cast irons and their alloys. Analyze the structure and properties of different non-ferrous metals.
5. Evaluating the applications of composite and ceramic materials.

UNIT - I

Structure of Metals: Crystal structures-BCC, FCC and HCP, Crystal imperfections – point, line, surface and volume imperfections. Atomic diffusion: Phenomenon, Fick's laws of diffusion, Factors affecting diffusion.

Mechanical Behavior of Materials: Stress-Strain diagram for ductile and brittle materials, Fatigue: Description of the phenomenon, S-N diagram. Creep: Description of the phenomenon, creep curve.

UNIT – II

Phase Diagrams: Necessity of alloying, Hume - Rothery rules, Types of solid solutions, Phase rule. Construction and interpretation of phase diagrams, Lever rule, Binary phase diagrams,

Isomorphous, Eutectic, Eutectoid, Peritectic, Peritectectoid transformations with examples. Detailed study of Iron-Carbon phase diagram and different phases with microstructures. Identification of zones of steel and cast iron in the diagram.

UNIT - III

Heat Treatment: Principles of heat treatment, Annealing, Normalizing, Hardening and Tempering. TTT curves, Continuous Cooling curves, Austempering, Martempering, Hardenability, Effect of Alloying elements.

UNIT – IV

Ferrous Materials: Classification of steels: Plain, low alloy and high alloy steels including stainless steels, tool steels and die steels. Cast Iron: Properties, composition and uses of grey cast iron, malleable iron, SG iron.
Non-Ferrous Materials: Properties, composition and uses of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT - V
Ceramic Materials and Polymers: Crystalline ceramics, Cermets: Structure, properties and applications. Classification, Properties and Applications of Polymers.
Composite Materials and Nanomaterials: Classification, properties and applications of composites. Nanomaterials

Text Book:

1. Foundations of Materials Science and Engineering, Smith, 4th Edition, McGraw Hill, 2009.

Reference Books:

1. The Science and Engineering of Materials, Donald R. Askland and Pradeep.P.Phule, Cengage Learning, 4lh Ed., 2003.
2. Material Science and Engineering and Introduction, William D. Callister, Wiley, 2006.
3. Materials Science and Engineering, V.Raghavan, PHI, 2002
4. Engineering Materials and Metallurgy, U.C. Jindal, Pearson, 2011.

MECHANICS OF SOLIDS

B. Tech. II Year I Semester - MECH

L	T	P	C
3	1	0	4

Course Outcomes:

1. Understand the concepts of stress, strain and material properties. Derive basic stress strain equations with appropriate assumptions.
2. Appreciate the concepts of shear force and bending moments. Generate shear force and bending moment diagrams for any given beam problem.
3. Determine the stresses and strains in the members subjected to bending and shear and interpret the stress distribution across various beams like rectangular, circular, triangular, I, T and angle sections.
4. Calculate and analyze principal stresses and strains. Determine the slope and deflection of beams under different types of loadings.
5. Analyze and compute stresses and strains in thin and thick cylinders

UNIT – I

Simple Stresses & Strains:

Elasticity and plasticity Types of stresses & strains Hooke's law stress strain diagram for mild steel Working stress Factor of safety Lateral strain, Poisson's ratio & volumetric strain Elastic module & the relationship between them Bars of varying section composite bars Temperature stresses. Strain energy Resilience Gradual, Impact and shock loadings.

UNIT – II

Shear Force and Bending Moment:

Definition of beam Types of beams Concept of shear force and bending moment S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads Point of contra flexure

UNIT – III

Flexural Stresses:

Theory of simple bending Assumptions Derivation of bending equation: M/I = f/y = E/R Neutral axis –Determination bending stresses section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections.

Shear Stresses:

Derivation of formula Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

UNIT – IV

Principal Stresses and Strains:

Introduction-stress on an inclined section of a bar under axial loading- compound stresses-Normal and tangential stresses on an inclined plane for biaxial stresses by using Mohr's circle method

Deflection of Beams:

Bending into a circular arc slope, deflection and radius of curvature Differential equation for the elastic line of a beam Double integration and Macaulay's methods Determination of slope and deflection for cantilever and simply supported beams subjected to point loads and U.D.L

UNIT – V

Thin Cylinders:

Thin seamless cylindrical shells Derivation of formula for longitudinal and circumferential stresses hoop, longitudinal and volumetric strains changes in diameter, and volume of thin cylinders

Thick Cylinders:

Lame's equation cylinders subjected to inside & outside pressures compound cylinders.

Text Book:

1. Strength of Materials, S.S. Rattan, Mc Graw Hill.

Reference Books:

1. Strength of Materials, R.Subramanian, Oxford University Press.
2. Fundamentals of Solid Mechanics, M.L. Gambhir, PHI.
3. Strength of Materials, R.K. Bansal, Lakshmi Publications.
4. Engineering Mechanics of Solid, Egor P, Popov, PHI New Delhi, 2001

THERMODYNAMICS

B. Tech. II Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Identify thermodynamic systems, understand concepts of zeroth law, first law, work and heat interactions.
2. State and illustrate second law of thermodynamics. Identify and explain concepts of entropy, enthalpy, specific energy, reversibility, availability and irreversibility.
3. Understand the concepts of phase transformation of pure substance.
4. Appreciate the concepts of perfect gas laws. Analyze mixtures of perfect gases.
5. Understand power cycles and evaluate the performance.

UNIT – I

Introduction: Basic Concepts: System, Control volume, Surrounding, boundaries, Universe. Types of systems, Macroscopic and Microscopic view points, Concept of Continuum. Thermodynamic Equilibrium, state, Property, Process, Cycle – Reversibility – Quasi – static Process, irreversible process, Causes of irreversibility – Energy in state and Transition, Types , Work and heat, Point and path function. Zeroth Law of Thermodynamics – Concept of quality of temperature – Principles of Thermometry – Reference points – Constant. Volume gas thermometer – Scales of temperature, Ideal gas scale.

First Law of Thermodynamics – Corollaries – First law applied to a process – applied to a flow system – Steady flow energy equation.

UNIT – II

Second Law of Thermodynamics - Limitations of the first law – Thermal Reservoir, Heat pump, Parameters of performance, Second law of thermodynamics, Kelvin planck and Clausius Statements and their Equivalence/ Corollaries, PMM of second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of temperature, Clausius inequality.

Entropy - Principle of Entropy increase – Energy equation, Availability and irreversibility – Thermodynamic Potentials, Gibbs and Helmhoultz functions, Maxwell Relations, Tds equations – Elementary Treatment of the third law of thermodynamics.

UNIT – III

Pure Substances - P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation, Property tables, Mollier charts – Various thermodynamic processes, Joules Thomson co-efficient – Steam calorimetry.

UNIT –IV

Perfect Gas Laws – Equation of State, specific and universal Gas constants – various Non-flow processes, properties, end states, Heat and work Transfer, changes in internal energy – Throttling and free Expansion Processes – Flow processes – Deviations from perfect Gas Model – Vander walls Equation of State – Compressibility charts – variable specific Heats – Gas tables.

Mixtures of Perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas constant. Molecular internal Energy, Enthalpy, specific. Heats and Entropy of Mixture of perfect Gases.

UNIT – V

Power Cycles : Otto, Diesel and Dual combustion cycles, – comparison, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis.

Text Book:

1. Engineering Thermodynamics, PK Nag, TMH.

Reference Books:

1. Thermodynamics, an Engineering Approach, YunusCengel& Boles, TMH
2. Thermodynamics, J.P Holman, McGrawHill
3. Engineering Thermodynamics, Jones & Dugan, PHI
4. Engineering thermodynamics, P. Chattopadhyay, Oxford University press

PRODUCTION TECHNOLOGY

B. Tech. II Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the basic concepts of casting processes to make different engineering components of industrial applications.
2. Differentiate the types of welding processes and decide which type of process to be selected for any given industrial application.
3. Recognize the differences between hot working and cold working processes and understand the processes of various forging operations.
4. Understand the basic principles of sheet metal operations and known the principles of drawing and extrusion processes.
5. Appreciate the process of high velocity forming and understand different types of plastics.

UNIT I

Casting: Steps involved in making a casting, Advantages of casting and its applications. Patterns and pattern making types of patterns, materials used for patterns, pattern allowances. Principles of gating gating ratio and design of gating systems, Risers types, function and design. Solidification of casting.Special casting processes centrifugal, die-casting and investment; Fettling of casting, casting defects causes and remedies.

UNIT II

Welding: classification of welding processes, types of welded joints and their characteristics.

Arc welding – types, gas welding –equipment and types of flames, Resistance welding- types, Solid -state welding – types, Thermit welding.

Heat affected zones in welding, welding defects – causes and remedies, Destructive and Non-destructive tests of welds.

UNIT III

Metal Forming: hot working and cold working, strain hardening, recovery, recrystallization and grain growth.

Rolling – theory of rolling, types of rolling mills and products, forces in rolling and power requirements.

Forging – tools and dies, types of forging – smith forging, drop forging, roll forging and rotary forging, forging defects.

UNIT IV

Extrusion and Drawing : Basic Extrusion process and it's characteristics, hot extrusion and cold extrusion, forward extrusion and backward extrusion, Impact extrusion, Hydrostatic extrusion.

Drawing and its types – wire drawing and tube drawing.

Sheet metal operations –spring back effect, stamping operations – blanking, piercing, coining, embossing, bending and spinning.

UNIT V

High Velocity Forming: Explosive forming, Hydraulic forming, Magnetic pulse forming high velocity forming.

Plastics: Types, properties, applications and their processing methods.

Text Book:

1. Manufacturing Technology, P N Rao Vol. 1, TMH.

Reference Books:

1. Production Technology, R K Jain, Khanna.
2. Manufacturing Engineering & Technology, SeropeKalpakjian, Steven R. Schmid, Pearson
3. Fundamentals of Modern Manufacturing: Materials, Processes, and Systems,Mikell P. Groover, Wiley.
4. Workshop Technology, HazraChowdry, Vol.1, Standard Publishers.

METALLURGY AND MECHANICS OF SOLIDS LAB

B. Tech. II Year I Semester - MECH

L	T	P	C
0	0	2	1

Course Outcomes:

1. Understand and identify microstructure of metals and measure their mechanical properties.
2. Analyze the microstructure and mechanical properties of metals by applying metallurgical principles.
3. Compare the hardness and mechanical properties of treated and untreated steels tested.

(A) Metallurgy :

1. Preparation and study of the Microstructure of pure metals like iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steel, low carbon steels, high Carbon steels.
3. Study of the Microstructure of Cast irons.
4. Study of the Microstructure of Non-Ferrous alloys.
5. Study of the Microstructure of Heat treated steels.
6. Hardenability of steels by Jominy End Quench test.
7. To find out the hardness of various treated and untreated steels.

(B) Mechanics of Solids :

1. Direct tension test
2. Bending test on
   a) Simple supported b) cantilever beam
3. Torsion test
4. Hardness test
   a) Brinell's hardness test, b) Rockwell hardness test.
5. Test on springs
6. Impact test

Reference Book:

1. Metallurgy and Material science, Raghavan, Prentice Hall of India (P) ltd.

PRODUCTION TECHNOLOGY LAB

B. Tech. II Year I Semester

L	T	P	C
0	0	2	1

Course Outcomes

1. Understand the operating methods of welding mechanical press and moulding machines.
2. Measuring the properties of moulding sand.
3. Evaluate the quality of welded joints and products made by mechanical press.

I. Metal Casting:

1. Pattern Design and making – for one casting drawing.
2. Sand properties testing – Exercise for strengths and permeability
3. Moulding Melting and Casting

II. Welding :

1. Spot Welding
2. Gas Welding
3. Soldering and Brazing

III. Mechanical Press Working:

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press: Deep drawing.
3. Bending operations.

IV. Processing of Plastics:

1. Injection Moulding
2. Blow Moulding

Reference Book:

1. Manufacturing Technology, P.N.Rao,TMH.

MACHINE DRAWING & DRAFTING

B. Tech. II Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes

1. Prepare the engineering drawings by employing conventional representation.
2. Develop the assembly drawings using part drawings of machine components.
3. Applying the drawing practice using solid works software.

PART-A:

Drawing of Machine Components:

1. Conventional representation of materials, machine components and popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cotter joints and knuckle joint.
3. Riveted joints for plates : chain and Zig-Zag
4. Shaft couplings: flanged coupling, flexible coupling, universal coupling, oldham coupling
5. Journal, Bushed journal bearing and Foot step bearings.

PART-B:

Assembly Drawing :

Draw different views of assembly drawings

1. Steam engine parts – stuffing box, steam engine cross head, Eccentric.
2. Machine tool parts: Tail stock, Square Tool Post, Machine Vice.
3. Other machine parts - Screw jack, Pipe vice, Plummer block, Connecting rod.
4. Machine drawing practice using SOLIDWORKS software.

Text Book:

1. Machine Drawing, K.L Narayana, P.Kannaiah&K.Venkata Reddy, New Age publishers.

Reference Books:

1. Machine Drawing, P.S. Gill, Kataria& Sons Publishers
2. Machine Drawing, N.D Bhatt, Charotar
3. Machine Drawing, Ajeet Singh, TMH.
4. A Textbook of Machine Drawing, R. K. Dhawan, S. Chand

KINEMATICS OF MACHINERY

B. Tech. II Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand working principles of different lower and higher pairs, mechanisms and their inversions.
2. Mathematical modeling of mechanisms to compute velocity and accelerations of links.
3. Understanding various steering gear mechanisms and Hooke's joint.
4. Appreciate different cams and followers used in mechanical systems.
5. Appreciate the concepts of velocity in gearing systems.

UNIT-I

Mechanisms: Elements or links Classification Rigid Link, Flexible and fluid link Types of kinematic pairs Types of constrained motion kinetic chain. Mechanism machine Structure inversions of mechanism inversions of quadric cycle chain, single and double slider crank chains, Mechanical advantage Grubler's Criterion.
Straight-Line Motion Mechanism: Exact and approximate copied and generated types Peaucellier Hart Scott Russel Grasshopper Watt Tchebicheff's and Robert Mechanism Pantographs

UNIT-II

Kinematics: Velocity and acceleration Motion of link in machine Determination of Velocity and acceleration Graphical method Application of relative velocity method.
Plane Motion of Body: Instantaneous center of rotation centrodes and axodes , three centers in the line theorem Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.

UNIT-III

Steering Gears: Conditions for correct steering Davis Steering gear, Ackermann's Steering gear.
Hooke's Joint: Single and double Hooke's joint velocity ratio application problems

UNIT-IV

Cams: Definitions of cam and followers their uses Types of followers and cams Terminology 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.

UNIT-V

Higher Pair: Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding.

Gear Trains: Introduction– Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box – Differential gear for an automobile.

Text Book:

1. Theory of Machines, Rattan .S.S, TMH, 2009 Edition

Reference Books:

1. Mechanism and Machine Theory, JS Rao and RV Dukkipati, NewAge
2. Theory of Machines and Mechanisms, Joseph E. Shigley, Oxford.
3. Theory of Machines, Thomas Bevan, CBS
4. Theory of Machines, R S Khurmi, S K Gupta, S Chand publications

THERMAL ENGINEERING

B. Tech. II Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the concepts of actual cycles and their analysis.
2. Analyze the combustion phenomenon in SI engines.
3. Analyze the combustion phenomenon in CI engines.
4. Understand the testing and performance of IC engines.
5. Know about the alternative fuels and appreciate the recent trends in IC engines.

UNIT – I

I.C. Engines: Introduction- Classification- Valve and Port Timing Diagrams

Fuel Air Cycles and Their Analysis

Introduction- Significance- Composition of cylinder gases- Variable specific heats- Dissociation- Effect of number of moles- Comparison of Air Standard and Fuel Air Cycles- Effect of operating variables

Actual Cycles and Their Analysis

Introduction- Comparison between Air Standard and Actual Cycles- Time Loss Factor- Heat Loss Factor- Exhaust blow down- Loss due to Rubbing Friction- Actual and Fuel-Air Cycles of I.C. Engines.

UNIT – II

Combustion in S.I. Engines

Homogeneous mixture- Heterogeneous mixture- Stages of combustion- Flame front propagation- Factors influencing the flame speed- Rate of pressure rise- Abnormal combustion- Phenomenon of Knock- Types of Combustion chambers- Fuel requirements and fuel rating

UNIT – III

Combustion in C.I Engines

Combustion process- stages of combustion- Delay period and its importance- Factors affecting Delay period- Diesel Knock- Comparison of Knock in C.I and S.I engine- Combustion chambers in C.I. Engine- Fuel requirements and fuel rating

UNIT – IV

Measurements and Testing

Friction power- Indicated power- Brake power- Fuel consumption- Air consumption- Speed- Exhaust and Coolant temperature

Performance Parameters and Characteristics

Introduction- Engine power- Engine efficiencies- Engine Performance characteristics- Variables affecting Performance characteristics- Methods of improving engine performance- Heat balance

UNIT-V

Fuels

Classification of fuels- Complete combustion equation- Air fuel ratio and equivalence ratio- Flue gas analysis- Enthalpy of formation- Adiabatic flame temperature

Alternate Fuels

Liquid fuels: Alcohol- Methanol- Ethanol- Gaseous fuels: Hydrogen-Natural gas-CNG-LPG

Recent trends in IC Engines: HCCI, VTC, VVT, VCR engines

Text Book:

1. I.C Engines, V. Ganesan, TMH

Reference Books:

1. IC Engines, Mathur & Sharma, Dhanpath Rai & Sons.
2. I.C Engines, Heywood, Mc GrawHill.
3. High Speed Combustion Engines, Heldt P.M., Oxford & IBH.
4. Internal Combustion Engines & Air Pollution, R. Yadav, Central Book Publishers

MECHANICS OF FLUIDS AND HYDRAULIC MACHINES

B. Tech. II Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand fluid properties and fluid statics.
2. Understand the principles of flow and energy momentum equations.
3. Analyze the losses in pipe flow, boundary layer, separation of flows, forces on different vanes. Able to quantify the flow of fluid in flow measurement instruments.
4. Understand the working of hydraulic machinery and analyze their characteristic curves.
5. Appreciate the working principles of pumps and their applications

UNIT - I

Fluid Properties and Fluid Statics: Density, Specific weight, Specific gravity, viscosity, Vapour pressure, compressibility, Surface tension Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Hydro static law, Piezometer, Simple and differential manometers.

UNIT - II

Fluid Kinematics: Stream line, path line, streak line, stream tube, classification of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, one, two and three dimensional flows.

Fluid Dynamics: Surface and Body forces, Euler's and Bernoulli's equation derivation, Application of Bernoulis Equation: Venturimeter, Orifice meter, Pitot tube, Navier stokes equation (explanation only), Momentum equation applications.

UNIT - III

Close Conduit Flow: Reynolds Experiment, Darcy's equation, Minor losses - pipes in series, pipes in parallel, total energy line and hydraulic gradient line, numerical problems.

Boundary Layer Concepts: Definition, thickness, characteristics along thin plate, laminar and turbulent layers (No Derivation) boundary layer in transition, and separation of boundary layer submerged objects drag and lift.

UNIT - IV

Impact of Water Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and a tip-velocity triangles at inlet and outlet expressions for work done and efficiency, Series vanes, Radial flow turbines.

Hydraulic Turbines: Overshot and undershot water wheels, classification of Water turbines, Pelton Wheel, work done and working proportions, Francis, Kaplan turbines, draft tubes, types & its efficiency.

Performance of Turbines: Performance under unit head, unit quantities, performance under specific conditions, specific speed, performance characteristic curves, model testing of turbines, cavitation, governing of turbines, surge tanks. Water hammer.

UNIT - V

Centrifugal Pumps: Types Component parts and working, work done by the impeller, Manometric head losses and efficiencies, minimum starting speed, Specific speed, Multistage Pumps, characteristics curves, NPSH, Cavitation, priming devices, pump troubles and remedies.

Reciprocating Pumps: Main components and working of a reciprocating pump, types of reciprocating pumps, power required driving the pump, coefficient of discharge and slipping indicator diagram.

Text Book:

1. Fluid mechanics and Hydraulics Machinery MODI and SETH. Rajsons Publication.

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering, D.S Kumar, Kotaria&Sons.
2. Fluid Mechanics and Machinery, D. Rama Durgaiah, New Age International.
3. Fluid Mechanics, John F.Douglas, Janusz M. Gasiorek, John A. Swaffield, Lynne B. Jack, Pearson
4. Hydraulic Machines, Banga & Sharma, Khanna Publishers.

MECHANICS OF FLUIDS AND HYDRAULIC MACHINES LAB

B. Tech. II Year II Semester - MECH

L	T	P	C
0	0	2	1

Course Outcomes:

1. Test performance of different turbines.
2. Test performance of different pumps.
3. Evaluate the test results of hydraulic machinery with the standard reference values.

List of Experiments:

1. Impact of jets on Vanes
2. Performance test on Pelton wheel
3. Performance test on Kaplan Turbine.
4. Performance test on single stage centrifugal pump.
5. Performance test on Multi stage centrifugal pump.
6. Performance test on Reciprocating pump.
7. Calibration of Venturimeter.
8. Calibration of Orifice meter.
9. Determination of friction factor for a given pipe line.
10. Determination of loss of head due to sudden contraction in a pipeline.
11. Verification of Bernoulli's theorems.

Reference Book:

1. Fluid Mechanics and Fluid Machinery, Modi & Seth, SBH Publication

METROLOGY & MACHINE TOOLS

B. Tech. III Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes

1. Understand the mechanics of metal cutting and working principles of lathe machines.
2. Understand the working, classification, specifications and kinematic schemes of shaping, planing, drilling and boring machines.
3. Practicing the operations of milling, grinding, lapping, honing and broaching machines.
4. Understand the concepts of limits, fits and interchangeability. Design of GO and NO GO gauges.
5. Measuring different parameters of surface roughness and the working of Coordinate Measuring Machine.

UNIT – I

Metal Cutting: Introduction, elements of cutting process orthogonal cutting, merchant circle, oblique cutting, Geometry of single point tools. ASA system. Chip formation and types of chips.

Engine Lathe: Principle of working, types of lathe, specifications. Taper turning Lathe attachments. Capstan and Turret lathe Single Spindle and Multi-Spindle automatic lathes tool layouts.

UNIT – II

Drilling and Boring Machines: Principles of working, specifications, types, operations performed; twist drill. Types of Boring machines and applications.

Shaping, Slotting and Planning Machines- Principles of working machining time calculations.

UNIT – III

Milling Machines: Principles of working Types of milling machines Geometry of milling cutters methods of indexing, machining time calculations.

Grinding: Theory of grinding classification of grinding machines. Types of abrasives, bonds. Selection of a grinding wheel. Lapping, Honing, comparison and Constructional features.

UNIT – IV

Limits, Fits and Tolerances: Unilateral and bilateral tolerance system, hole and shaft basis system. Interchangeability and selective assembly. Limit gauges**:** Taylor's principle, Design of GO and NO GO gauges. Measurement of angles, Bevel protractor, Sine bar. Measurement of flat surfaces: optical flat, auto collimator.

UNIT – V

Surface Roughness Measurement: Roughness, Waviness. CLA Values. Methods of measurement of surface finish, Talysurf. Screw thread measurement, Gear measurement; Machine Tool Alignment Tests on lathe, milling and drilling machines.

Coordinate Measuring Machines: Types and Applications of CMM.

Text Book:

1. Manufacturing Technology Vol.2, P.N. Rao, McGraw Hill

Reference Books:

1. Engineering Metrology, M. Mahajan, Danpat Rai Publishers
2. Production Technology, Hindustan Machine Tools, McGraw Hill
3. Principles of Machine Tools, Bhattacharya A and Sen.G.C. New Central Book Agency.
4. Fundamentals of Modern Manufacturing: Materials, Processes, and Systems,Mikell P. Groover, Wiley.

DYNAMICS OF MACHINERY

B. Tech. III Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand gyroscopic effects of rotating bodies for aero planes, naval ships, automobiles, and two wheelers. Appreciate the working of brakes and dynamometers.
2. Compute frictional torque in clutches and understand the applications of Governors in mechanical systems.
3. Perform static and dynamic force analysis of planar mechanisms. Diagrammatically represent turning moment and design flywheels.
4. Understand how to balance rotating and reciprocating masses in different planes.
5. Perform calculations pertinent to several parameters of free and forced vibrations.

UNIT-I

Precession: Gyroscopes, effect of precession, motion on the stability of moving vehicles such as motor car, motor cycle, aeroplanes and ships.

Brakes and Dynamometers: Simple block brakes, internal expanding brake, band brake of vehicle, Dynamometers – absorption and transmission types.

UNIT–II

Clutches: Friction clutches Single Disc or plate clutch, Multiple Disc clutch, Cone clutch, Centrifugal clutch.

Governors: Watt, Porter and Proell governors, Sensitiveness, isochronisms and hunting.

UNIT-III

Static and Dynamic Force Analysis of Planar Mechanisms: Introduction Free Body Diagrams Conditions for equilibrium two, three and four force Members Inertia forces and D' Alembert's Principle planar rotation about a fixed center.

Fly Wheels Fluctuation of energy fly wheels and their design.

UNIT-IV

Balancing: Balancing of rotating masses, single and different planes. Balancing of Reciprocating Masses, Primary and secondary balancing of reciprocating masses. Analytical and graphical methods unbalanced forces and couples Multi cylinder in line and radial engines, balancing of locomotive.

UNIT-V

Vibration: Free Vibration of mass attached to vertical spring Forced damped vibration, Vibration isolation & Transmissibility Whirling of shafts, critical speeds, Torsional vibrations of two and three rotor systems.

Text Book:

1. Theory of Machines, S.S. Ratan, Mc Graw Hill.

Reference Books:

1. Theory of Machines, Shigley, Mc Graw Hill.
2. Theory of Machines, Thomas Bevan, CBS Publishers
3. Mechanism and Machine Theory, JS Rao and RV Dukkipati ,Newage
4. Theory of Machines,R S Khurmi,S K Gupta,S Chand publications

DESIGN OF MACHINE MEMBERS-I

B. Tech. III Year I Semester - MECH

L	T	P	C
3	0	0	3

NOTE: Design Data books are not permitted in the Examinations.

Course Outcomes:

1. Understand the design procedure and selection of material for a specific application. Analyze the simple stresses and strains in components.
2. Appreciate variable stresses in mechanical components, fatigue analysis and fatigue theories of failure.
3. Design fastened joints like riveted and welded joints.
4. Design various joints like bolted joints, keys, cotter joints and knuckle joint.
5. Design shafts for strength and rigidity. Design rigid and flexible shaft couplings.

UNIT – I

Introduction: General considerations in the design of engineering components Materials and their properties selection manufacturing consideration in design.

Stresses in Machine Members: Simple stresses Complex stresses impact stresses stress strain relations static theories of failure factor of safety Design for strength and rigidity. The concept of stiffness in tension, bending, torsion and combined situations.

UNIT – II

Stresses Due to Fatigue Loading: Stress concentration Theoretical stress Concentration factor Fatigue stress concentration factor notch sensitivity Design for fluctuating stresses Endurance limit Estimation of Endurance strength Fatigue theories of failure Goodman and Soderberg.

UNIT – III

Riveted Joints: Modes of failure of riveted joints Strength equations efficiency of riveted joints eccentrically loaded riveted joints.

Welded Joints: Design of Fillet welds axial loads Circular fillet welds bending and torsion eccentrically loaded joints.

UNIT – IV

Bolted Joints: Design of bolts with pre-stresses Design of joints under eccentric loading bolt of uniform strength, Cylinder cover joints.

Axially Loaded Joints: Keys, cotters and Knuckle joints: Design of keys-stresses in keys Cotter joints-spigot and socket, sleeve and cotter, jib and cotter joints, Knuckle joints.

UNIT – V

Design of Shafts: Design of solid and hollow shafts for strength and rigidity Design of shafts for complex loads Shaft sizes BIS code Design of shaft for a gear and belt drives.

Design of Shaft Couplings: Rigid couplings Muff, split muff and flange couplings, Flexible couplings Pin Bush coupling.

Text Book:

1. Machine Design, V.Bhandari, TMH Publishers

Reference Books:

1. Machine Design, Pandya &Shah,Charotar Publishing House Pvt. Ltd
2. Machine Design, R.L.Norton, Mc Graw Hill
3. Design of Machine Elements, Kulkarni, Mc Graw Hill.
4. Shigley's Mechanical Engineering Design, Richard G. Budynas, J. Keith Nisbett, Mc Graw Hill.

APPLIED THERMODYNAMICS

B. Tech. III Year I Semester - MECH

L	T	P	C
3	0	0	3

Note: Steam Table Book are Permitted in the Examinations.

Course Outcomes:

1. Understand the working of steam power plants and boilers.
2. Perform Thermodynamic analysis of nozzles and condensers.
3. Analyze impulse and reaction steam turbines and subsequently apply to real time scenarios.
4. Understand working of different types of compressors and gas turbines.
5. Appreciate different types of propulsive engines and rockets.

UNIT – I

Steam Power Plant: Rankine cycle - Schematic layout, Thermodynamic analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance Regeneration & reheating.

Boilers: Classification working principles with sketches including H.P.Boilers Mountings and Accessories Working principle. Boiler horse power, Equivalent Evaporation, Efficiency and Heat balance

UNIT – II

Steam Nozzles: Function of nozzle Applications and Types- Flow through nozzles- Thermodynamic analysis-Velocity at nozzle exit-Ideal and actual expansion in nozzle- Condition for maximum discharge- Critical pressure ratio-Super saturated flow, its effects, Degree of super saturation and Degree of under cooling - Wilson Line

Steam Condensers: Requirements of steam condensing plant Classification of condensers Working principle of different types-Vacuum efficiency and Condenser efficiency Air leakage, sources and its affects, Air pump- Cooling water requirement

UNIT – III

Steam Turbines: Impulse Turbine Mechanical details Velocity diagram Effect of friction Power developed, Axial thrust, Blade or diagram efficiency Condition for maximum efficiency, De-Laval Turbine - its features, Methods to reduce rotor speed

Reaction Turbine: Mechanical details Principle of operation, Thermodynamic analysis of a stage, Degree of reaction Velocity diagram Parson's reaction turbine Condition for maximum efficiency.

UNIT-IV

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression

Gas Turbines: Simple gas turbine plant Ideal cycle, essential components Parameters of performance Actual cycle Regeneration, Inter cooling and Reheating Closed and Semi-closed cycles.

UNIT – V

Jet Propulsion: Principle of Operation Classification of jet propulsive engines Working Principles with schematic diagrams and representation on T-S diagram Thrust, Thrust Power and Propulsion Efficiency Turbo jet engines Needs and Demands met by Turbo jet Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation Methods.

Rockets: Application Working Principle Classification Propellant Type Thrust, Propulsive Efficiency Specific Impulse Solid and Liquid propellant Rocket Engines.

Text Book:

1. Thermal Engineering, Rajput, Lakshmi Publications.

Reference Books:

1. Thermodynamics and Heat Engines, R. Yadav, Central Book Depot.
2. Thermal Engineering, Ballaney, Khanna Publications.
3. Gas Turbines, V.Ganesan, TMH.
4. Thermal Engineering, Mahesh M Rathore, Mc Graw Hill

AUTOMOBILE ENGINEERING
(Professional Elective – 1)

B. Tech. III Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the components of automobile engines and appreciate the working of lubrication and cooling systems. Know about the fuel systems in SI engine and CI engines.
2. Appreciate the functions and importance of ignition and electrical systems.
3. Elucidate the working principles, types and importance of transmission and suspension systems.
4. Appreciate the working principles, types and importance of braking and steering systems.
5. Understand the environmental implications of automobile emissions and application of various alternative fuels.

UNIT – I

Introduction about Evolution of Modern Automobiles- Components of four wheeler automobile rear wheel drive, front wheel drive, 4 wheel drivetypes of automobile engines.

Engine Lubrication System: Splash and pressure lubrication systems.

Cooling System: Cooling requirements, Air cooling, liquid cooling, Thermo, Water and forced lubrication systemRadiators- Types- Cooling fans- Water pumpThermostatEvaporating cooling- Pressure cooling.

S.I. Engines: Fuel supply systems, Mechanical and electrical fuel pump filters carburetor types air filters petrol injection. M.P.F.I system, GDI system

C.I. Engines: Requirements of diesel injection systems, types of injection systems, Common Rail Diesel injection- fuel pump, nozzle, spray formation, injection timing.

UNIT--II

Ignition System: Function of an ignition system, battery ignition system, auto transformer, Magneto coil ignition system, electronic ignition system, spark advance and retard mechanism.

Electrical System: Charging circuit, generator, current voltage regulator starting system, bendix drive mechanism solenoid switch, lighting system, Horn, Wiper, fuel gauge oil pressure gauge, engine temperature indicator.

UNIT – III

Transmission System: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel gear boxes, types, sliding mesh, construct mesh, synchromesh gear boxes, epicyclic gear box, over drive, torque converter. Propeller shaft Hotch- Kiss drive, Torque tube drive, universal joint, differential, gear axles types wheels and tyres.
Suspension System: Objects of suspension systems rigid axle suspension system, torsion bar, shock absorber, independent suspension system. Chassis-Types-Body of automobile, ergonomics and anthropometry

UNIT – IV
Steering System: Steering geometry camber, castor, King pin rake, combined angle toe-in, center point steering. Steering gears types, steering linkages.
Braking System: Mechanical brake system, Hydraulic brake system, Disc and Drum type Brakes- Master cylinder, wheel cylinder, Requirements of brake fluid, Pneumatic, vacuum, parking and hand brakes.

UNIT – V
Pressure Changes in Engines Super chargers and turbo chargers
Emission from Automobiles Pollution standards National and international Pollution control Techniques. Noise pollution and controls. Energy Alternatives, Solar, Photo-Voltaic, hybrid vehicles

Text Book:
1. Automobile Engineering ,Vol. 1 & Vol. 2 , Kirpal Singh, Standard Publishers Distributors Delhi

Reference Books:
1. Automotive Mechanics, G.B.S.Narang, Khanna Publishers
2. Automobile Engineering , Vol. 1 & Vol. 2 , K.M Gupta, Umesh publication
3. Automotive Mechanics , J.Heitner, CBS Publications
4. Automobile Engineering, William Crouse, TMHILL Publishers.

MECHATRONICS
(Professional Elective – 1)

B. Tech. III Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

On completion of the course, the student will be able to:

1. Interpret the importance of mechatronics and elements involved.
2. Evolve at various drives for typical applications in mechatronics
3. Understand various drives and circuits
4. Predict the importance and functioning of various electronic components.
5. Choose various mechatronic elements to design mechatronics based systems

UNIT – I

Introduction to mechanization & automation. Need of interface of electrical & electronic devices with mechanical elements. The concept of Mechantronics: Flow chart of mechatronics system. Elements of mechatronics system. Drive mechanisms. Actuators. Feedback devices and control system. Application in industries and systems development.

UNIT–II

Drive mechanisms: Feeding and indexing, orientation, escapement and sorting devices, conveyor systems. Introduction to electrical actuators: A.C servo motors, D.C.servo motors, stepper motors.

UNIT–III

Introduction to fluid power systems: Industrial pneumatics and hydraulics. Merits of fluid power. Pneumatic and hydraulic elements symbols. Study of hydraulic control values, pumps & accessories. Hydraulic circuits and mechanical servo control circuits, Electro–hydraulic and Hydro–pneumatic circuits.

UNIT–IV

Introductiontoindustrialelectronicdevices: Diodes, Transistors, Silicon controlled Rectifiers(SCR), Integrated Circuits (IC), Digital circuits. Measurement systems & Data acquisition systems: sensors,

digital to analog and analog– to– digital conversion. Signal processing using operational amplifiers. Introduction to micro processor & micro controller. Temperature measurement interface and LVDT interface. Systems Response.

UNIT–V

Design of Modern CNC machines and elements: machine structures, guide ways, spindles, tool monitoring systems, adaptive control systems. Flexible manufacturing systems. Multipurpose control machines. PLC programming

Text Book:

1. W.Bolton,"Mechatronics",3rdEd.,PearsonEducationIndia.

Reference Books:

1. HMT Limited,"Mechatronics, Tata Mc.Graw–ill Publishing Company Limited; NewDelhi,1998.
2. Michael B Histand & David G.Alciatore, "Introduction to Mechatronics and Measurement systems", 4th Ed.,Tata Mc Graw-Hill International edition, 2012
3. S.RMajumdar,Oil hydraulic systems Principles & Maintenance, Tata McGraw–Hill Publishing Company Limited: NewDelhi, 2006

ADDITIVE MANUFACTURING
(Professional Elective – 1)

B. Tech. III Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the working principle and process parameters of AM processes
2. Understand data formats of additive manufacturing
3. Appreciate Liquid-Based and Solid-Based additive manufacturing systems.
4. Apply the rudiments of Powder Based additive manufacturing Systems
5. Evaluate the applications of additive manufacturing in the industry

UNIT – I

Introduction to Additive Manufacturing: Introduction to AM, Distinction between AM & CNC machining, Steps in AM, ASTM Classification of AM processes, Advantages of AM and Types of materials for AM.

UNIT – II

AM Data Formats: STL file format (Binary and ASCII), Tessellation, Anisotropy**.**

STL File Problems: Unit changing, Vertex-to-vertex rule, Leaking STL files and Degenerated facets.

STL file printing parameters: Top and Bottom layers, Infill types and Shell thickness.

UNIT – III

Vat Photopolymerization AM Processes: Stereolithography(SL), working principle, photopolymers,applications, Process Benefits and Drawbacks.

Material Jetting and **Binder Jetting AM** Processes.

Extrusion-Based AM Processes: Fused Deposition Modelling (FDM), working principle, Materials,Process Modelling, and Applications.

UNIT – IV

Powder Bed Fusion AM Processes: Selective laser Sintering (SLS), working principle, Materials, SLS Metal and ceramic part creation,

Electron Beam melting (EBM)process, Process Benefits and Drawbacks, Applications of Powder Bed Fusion Processes.

Directed Energy Deposition AM Processes: working principle and applications of Laser Engineered Net Shaping (LENS) and Direct Metal Deposition (DMD) processes.

UNIT –V

AM Applications: Application in Engineering, Aerospace Industry, Automotive Industry and Jewelry Industry. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices.

Text Book:

1. Additive Manufacturing Technologies - Ian Gibson, David Rosen, Brent Stucker and Mahyar Khorasani, Springer publications.

Reference Books:

1. Rapid Prototyping and Engineering applications: A tool box for prototype development, Liou L.W. and Liou F.W, CRC Press, 2007.
2. Rapid Prototyping & Engineering Applications, Frank W.Liou, CRC Press, Taylor & Francis Group, 2011.
3. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer , 2001
4. Rapid Prototyping: Principles and Applications - Chua C.K., Leong,World Scientific Publishing Co Pvt. Ltd.

THERMAL ENGINEERING LAB/ METROLOGY & MACHINE TOOLS LAB

B. Tech. III Year I Semester - EMCH

L	T	P	C
0	0	2	1

Course Outcomes:

1. Understand the assembly/disassembly and their working of IC engines for performance measurement.
2. Evaluate performance parameters for consequent applications.
3. Perform the machining operations and the measurement of samples using instruments.

List of Experiments:

SECTION – A

1. Performance Test on Single Cylinder 4 Stroke Petrol Engine
2. Evaluate of Engine Friction by Conducting Morse Test on 4 Stroke Multi Cylinder Petrol Engine
3. Heat Balance Test on Single Cylinder 4 Stroke Diesel Engine
4. Evaluation of Performance and Combustion Characteristics of Duel Fuel Automotive CRDI Engine
5. Performance Test on Reciprocating Air-Compressor Unit
6. Disassembly/ Assembly of Engine

SECTION – B

1. Measurement of Bores by Internal Micrometers and Dial Bore Indicators
2. Angle and Taper Measurements by Bevel Protractor & Sine Bars
3. Thread Measurement by Two Wire / Three Wire Method or Tool Makers' Microscope
4. Step Turning, Taper Turning, Thread Cutting and Knurling on Lathe Machine
5. Shaping, Slotting and Planning
6. Drilling, Tapping and Surface Grinding

Reference Books:

1. Automobile Engineering,Vol. 1 & Vol. 2,KirpalSingh,Standard Publishers Distributors Delhi
2. Engineering Metrology, I C Gupta, Danpath Rai

DESIGN OF MACHINE MEMBERS – II

B. Tech. III Year II Semester - MECH

L	T	P	C
3	0	0	3

NOTE: Design Data books are permitted in the Examinations

Course Outcomes

1. Understand different sliding contact and rolling contact bearings and perform design calculations
2. Analyze design considerations of IC engine parts like piston, connecting rod and cylinder
3. Appraise the design aspects of belt drives and springs
4. Design spur gear drives by calculating different parameters
5. Compute design parameters of helical gear drives

UNIT – I

Sliding Contact Bearings: Types of Journal bearings basic modes of Lubrication Bearing construction bearing design bearing materials Selection of lubricants.

Rolling Contact Bearings: Types of rolling contact bearings selection of bearing type selection of bearing life Design for cyclic loads and speeds Static and dynamic loading of ball & roller bearings.

UNIT – II

Design of IC Engine Parts: Design of Connecting Rod; Thrust in connecting rod stress due to whipping action on connecting rod ends Pistons, Forces acting on piston Construction, Design and proportions of piston, Cylinder, Cylinder liners.

UNIT – III

Design of Belt and Rope Drives: Transmission of power by Belt and Rope drives, Transmission efficiencies, Flat and VBelts

Helical Springs: Design of springs, Stress in springs, Deflection of Springs in series, parallel conditions, composite springs

UNIT – IV

Design of Spur Gear Drives: Spur gears Load concentration factor Dynamic load factor, Surface compressive strength Bending strength Design analysis of Spur gears check for plastic deformation, Check for dynamic and wear considerations.

UNIT – V

Design of Helical Gear Drives: Helical gears Load concentration factor Dynamic load factor, Surface compressive strength Bending strength Design analysis of Helical gears check for plastic deformation, Check for dynamic and wear considerations.

Text Book:

1. Machine Design, V.Bhandari, TMH Publishers

Reference Books:

1. Machine Design, Pandya& Shah, Charotar Publishing House Pvt. Ltd.
2. Machine Design, R.L.Norton, McGraw Hill
3. Mechanical Engineering Design, Bahi and Goel, Standard Publications.
4. Shigley's Mechanical Engineering Design, Richard G. Budynas, J. Keith Nisbett, Mc Graw Hill.

HEAT TRANSFER

B. Tech. III Year II Semester -MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the basic modes of heat transfer, steady and unsteady periodic heat transfer.
2. Solve 1-D problems of steady state and transient conduction heat transfer.
3. Appreciate concepts of convective heat transfer process and evaluate heat transfer coefficient for free and forced convection over exterior and interior surfaces with proper boundary conditions.
4. Applying the boiling and condensation principles in the heat transfer equipment design.
5. Analyze the performance of heat exchangers by LMTD and NTU methods. Appreciate radiation heat transfer scenarios.

UNIT – I

Introduction: Modes and mechanisms of heat transfer Basic laws of heat transfer General discussion about applications of heat transfer.

Conduction Heat Transfer: Fourier's law of conduction General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates. Simplification and forms of the field equation-steady, unsteady and periodic heat transfer- initial and boundary conditions.

One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders and spheres overall heat transfer coefficient electrical analogy Critical radius of insulation.

UNIT – II

One Dimensional Steady State Conduction Heat Transfer: Variable thermal conductivity systems with heat sources or Heat generation, extended surface (Fins) Heat Transfer Long Fin, Fin with insulated tip and short Fin, Application to error measurement of temperature.

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance Significance of Biot and Fourier Numbers Chart solutions of transient conduction systems Concept of Functional body.

UNIT – III

Convective Heat Transfer: Classification of systems based on causation of flow, condition of flow, medium of flow – Dimensional analysis as a tool for experimental investigation Buckingham Pi Theorem and method , application for developing semi empirical non dimensional correlation for convection heat transfer Significance of non-dimensional numbers Concepts of Continuity, Momentum and Energy equations.

Forced Convection: External Flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer - Flat plates and cylinders.

Internal Flows: Concepts of hydrodynamic and thermal entry lengths – Division of internal flow based on this – Use of empirical relations for horizontal pipe flow and annulus flow.

UNIT – IV

Free Convection: Development of hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for vertical plates and pipes

Boiling and Condensation: Pool boiling – Regimes Calculations on Nucleate boiling, Critical Heat flux and Film boiling. Film wise and Drop wise condensation on vertical and horizontal cylinders using empirical correlations.

UNIT – V

Heat Exchangers: Classification of heat exchangers overall heat transfer Coefficient and fouling factor LMTD and NTU methods Concepts and Problems

Radiation Heat Transfer: Emission characteristics and laws of black-body radiation irradiation total and monochromatic quantities laws of Planck, Wien, Kirchoff, Lambert, Stefen and Boltzmann heat exchange between two black body's concepts of shape factor Emissivity heat exchange between grey bodies radiation shields electrical analogy for radiation networks.

Text Book:

1. Heat and Mass Transfer, R.K.Rajput, S.Chand Publications

Reference Books:

1. Heat Transfer A Practical Approach Yunus Cengel, Boles, Mc GrawHill.
2. Heat Transfer ,P.K.Nag , TMH
3. Fundamentals of Engg. Heat and Mass Transfer, R.C.Sachdeva, New Age International.
4. Heat and Mass Transfer, D. S Kumar ,S.K.Kataria& Sons

FINITE ELEMENT METHOD

B. Tech. III Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the basics of FEM, stress-strain relations and gain knowledge of Weighted Residual Methods and Variational Methods.
2. Solve 1-D problems by applying the pertinent boundary conditions.
3. Analyze and formulate finite element equations for 1-D planar truss element and beam element.
4. Solve 2-D problems using CST element and integration using Numerical Integration method.
5. Analyze and solve 1-D and 2-D heat transfer problems using FEM. Formulate Finite element equations for a stepped bar and a beam using dynamic analysis.

UNIT – I

Introduction To FEM: Basic concepts, historical background, Steps in FEM, applications of FEM, comparison of FEM with other methods, Basic equations of elasticity, Stress Strain and strain displacement relations, Rayleigh Ritz method, Galarkin's method, Problems.

UNIT – II

One Dimensional Problems: Shape functions,Stiffness matrix for a axial bar element, Assembly of Global stiffness matrix, properties of stiffness matrix, Finite element analysis of stepped and tapered bars subjected to mechanical and thermal loads, Quadratic shape functions, Problems.

UNIT – III

Analysis of Trusses: Finite Element Analysis of Trusses, Stiffness matrix of truss element, load vector, Problems.

Analysis of Beams: Analysis of 2-noded beam element with 2-DOF at each node, Hermite shape functions, stiffness matrix, load vector, problems with point load and uniformly distributed load.

UNIT – IV

2-D Structural Problems: CST element, Stiffness matrix and load vector for CST element, Introduction to LST element, Problems.

Isoparametricelement representation, Shape functions, Convergence requirements,two dimensional four-nodedisoparametric elements, Numerical integration, Problems.

UNIT – V

Analysis of Heat Transfer Problems: 1-D Heat conduction with lateral and edge convection, fin and composite wall analysis, 2-D heat transfer analysis, Problems.

Dynamic Analysis: Dynamic equations, Lumped and consistent mass matrices, Eigen Values and Eigen Vectors, mode shapes, Problems on stepped bars and beams.

Text Book:

1. Introduction to Finite Elements in Engineering, Tirupathi K. Chandrupatla and Ashok D. Belagundu, Pearson .

Reference Books:

1. The Finite Element Methods in Engineering, S.S.Rao, Elsevier, Pergamon
2. Finite Element Methods, Alavala, TMH
3. An Introduction to Finite Element Methods, J.N. Reddy, Mc Grawhill
4. Concepts and Applications of Finite Element Analysis – Robert Cook – Wiley

REFRIGERATION AND AIR CONDITIONING
(Professional Elective – 2)

B. Tech. III Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the basic concepts of refrigeration and thermodynamically analyze air refrigeration systems.
2. Appreciate the working principle and thermodynamically analyze vapor compression refrigeration system.
3. Understand the working principles of vapor absorption and steam jet refrigeration systems.
4. Estimate the air conditioning load for comfort and industrial applications by applying the principles of psychrometry and design conditions.
5. Appraise Air Conditioning Systems and calculate the Cooling Load.

UNIT – I

Introduction to Refrigeration: Necessity and applications Unit of refrigeration and C.O.P. Mechanical Refrigeration, Ideal cycle of refrigeration.

Air Refrigeration: Bell Coleman cycle - Brayton Cycle - Open and Dense air refrigeration cycleAir craft cooling systems.

UNIT – II

Vapour Compression Refrigeration: Introduction working of simple VCR cycle - Representation of cycle on T-S and p-h charts Effect of sub cooling and super heating Actual VCR cycle Problems.

System Components: Compressors General classification working principles **Condensers** classification Working Principles, **Evaporators** classification Working Principles, **Expansion Devices -**Types Working Principles.

Refrigerants: Classification - Desirable properties commonly used refrigerants - Nomenclature.

UNIT III:

Vapor Absorption System: Introduction Description and working of NH_3-Water system, Calculation of Maximum COP Water - Li-Br absorption system Triple Fluid absorption system.

Steam Jet Refrigeration System: Introduction Working Advantages and Disadvantages.

UNIT IV:

Psychometric: Introduction Psychometric terms Psychometric processes.

Inside and Outside Design Conditions: Introduction Selection of inside design conditions Selection of outside design conditions.

UNIT – V:

Psychrometry of Air Conditioning Systems: Introduction- Summer Air

conditioning system Winter Air conditioning system- All year air conditioning system.
Unitary refrigerant based systems.
Cooling Load Calculations: Introduction- Estimation of required cooling capacity.

Text Book:

1. A Course in Refrigeration and Air conditioning, SC Arora &Domkundwar, Dhanpatrai

Reference Books:

1. Principles of Refrigeration, Dossat, Pearson Education.
2. Refrigeration and Air Conditioning, CP Arora, TMH.
3. Refrigeration and Air Conditioning , RS Khurmi and JK Gupta, S.CHAND Publication
4. Refrigeration and Air Conditioning, Manohar Prasad, New Age.

INDUSTRIAL MANAGEMENT
(Professional Elective – 2)

B. Tech. III Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understanding the principles of management.
2. Compare various organizational structures for effective management
3. Apply the concepts of production management concepts
4. Evaluate the project in terms of time and method of execution for better quality
5. Applying the modern management concepts with scheduling techniques

UNIT - I

Introduction to Management: Entrepreneurship and organization – Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management

UNIT - II

Designing Organizational Structures: Departmentalization and Decentralization, Types of Organization structures – Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

UNIT - III

Operations Management: Objectives- product design process- Process selection-Types of production system (Job, batch and Mass Production), Plant location-factors- Urban-Rural sites comparison- Types of Plant Layouts- Design of product layout- Line balancing (RPW method) Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram

UNIT - IV

Work Study: Introduction — definition — objectives — steps in work study — Method study — definition, objectives — steps of method study. Work Measurement — purpose — types of study — stop watch methods — steps — key rating — allowances — standard time calculations — work sampling. Statistical Quality Control: variables-attributes, Shewart control charts for variables- chart, R chart, – Attributes- Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling- Double sampling plans-OC curves.

UNIT - V

Job Evaluation: Methods of job evaluation — simple routing objective systems — classification method factor comparison method, point method, benefits of job evaluation and limitations. Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

Text Book:

1 Industrial Engineering and Management/O.P. Khanna/Khanna Publishers

Reference Books:

1. Industrial Engineering and Management Science/T.R. Banga and S.C. Sarma/Khanna Publishers.
2. Motion and Time Study by Ralph M Barnes! John Willey & Sons Work Study by lLO.
3. Human factors in Engineering & Design/Ernest J McCormick /TMH.
4. Production & Operation Management /Paneer Selvam/PHI

AUTOMATION IN MANUFACTURING
(Professional Elective – 2)

B. Tech. III Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Summarize the facets of automation in a manufacturing activity.
2. Applying various elements like sensors, pneumatics, and hydraulics to append in manufacturing automation.
3. Design the assembly lines by considering the on line process analysis.
4. Evaluate the automation elements for low cost automation investment.
5. Applying the automation concepts in automobile and manufacturing sectors

UNIT-I

Introduction to Automation: Automation in Production Systems-Automated Manufacturing Systems, Computerized Manufacturing Support Systems, Reasons for Automation, Automation Principles and Strategies. Manufacturing operations, Production Concepts and Mathematical Models. Costs of Manufacturing Operations, Basic Elements of an Automated Systems, Advanced Automation Functions, Levels of automation.

UNIT-II

Introduction to Material Handling: Overview of Material Handling Equipment, Considerations in Material Handling System Design, Principles of Material Handling. Material Transport Systems, Automated Guided Vehicle Systems, Monorails and other Rail Guided Vehicles, Conveyor Systems, Analysis of Material Transport Systems. Storage Systems, Storage System Performance, Storage Location Strategies, Conventional Storage Methods and Equipment, Automated Storage Systems, Engineering Analysis of Storage Systems. Automatic data capture-overview of Automatic identification methods, bar code technology, other ADC technologies.

UNIT -III

Manual Assembly Lines: Fundamentals of Manual Assembly Lines, Alternative Assembly Systems, Design for Assembly, Analysis of Single Model Assembly Lines, Line balancing problem, largest candidate rule, Kilbridge and Wester method, and Ranked Positional Weights Method, Mixed Model Assembly Lines, Considerations in assembly line design.

UNIT-IV

Transfer Lines: Fundamentals of Automated Production Lines, Storage Buffers, and Applications of Automated Production Lines. Analysis of Transfer Lines with no Internal Storage, Analysis of Transfer lines with Storage Buffers.

UNIT-V

Automated Assembly Systems, Fundamentals of Automated Assembly Systems, Design for Automated Assembly, and Quantitative Analysis of Assembly Systems - Parts Delivery System at Work Stations, Multi- Station Assembly Machines, Single Station Assembly Machines, Partial Automation.

Text Book:

1. Automation, Production systems and computer integrated manufacturing, Mikel P. Groover, Pearson Education.

Reference Books:

1. Industrial Automation, W.P.David, John Wiley and Sons.
2. CAD / CAM/ CIM, Radhakrishnan,New Age International.
3. Automation, Buckinghsm W, Haper& Row Publishers, New York, 1961
4. CAD CAM: Principles, Practice and Manufacturing Management, Chris Mc Mohan, Jimmie Browne,Pearson edu. (LPE).

HEAT TRANSFER LAB

B. Tech. III Year II Semester - MECH

L	T	P	C
0	0	2	1

Course Outcomes:

1. Understand the structural features of heat transfer equipment and their mode of working.
2. Analyze the output responses by comparing with the heat transfer governing equations.
3. Evaluate the process parameters for designing the heat transfer devices.

LIST OF EXPERIMENTS

1. Composite Slab Apparatus Overall heat transfer co-efficient.
2. Heat Transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere.
4. Thermal Conductivity of given metal rod.
5. Heat Transfer in pin-fin.
6. Experiment on transient heat conduction.
7. Heat Transfer in forced convection apparatus.
8. Heat Transfer in natural convection.
9. Parallel and counter flow heat exchanger.
10. Emissive apparatus.
11. Stefan Boltzman Apparatus.
12. Critical Heat flux apparatus.
13. Study of heat pipe and its demonstration.
14. Study of Two Phase flow.

Reference Book:

1. Fundamentals of Heat Transfer & Mass Transfer, Incropera& Dewitt, John Wiley Pub.

COMPUTER AIDED ENGINEERING LAB

B. Tech. III Year II Semester - MECH

L	T	P	C
0	0	2	1

Course Outcomes:

1. Build FE models of mechanical components under various loading conditions.
2. Understand conductive and convective heat transfer analysis of 1-D & 2-D components.
3. Evaluate Modal analysis of beams, plates and shells for natural frequencies and mode shapes with different elements

List of Experiments

1. Introduction to modeling in ANSYS workbench.
2. Analysis of bar problems to determine nodal displacements and stresses.
3. Analysis of Plane Truss to determine member forces, member strains & stresses, joint deflections under static, thermal and combined loading.
4. Analysis of Spatial Truss to determine member forces, member strains & stresses, joint deflections under static, thermal and combined loading.
5. Analysis of Beam to determine the shear force and bending moment when subjected to a point load.
6. Analysis of Beam to determine the shear force and bending moment when subjected to a UDL.
7. Determine the nodal stresses for a given axi-symmetric problem.
8. Analyzing the temperature distribution in a 2-D problem subjected to conduction & convection.
9. Determining the Natural frequencies and different modes for a bar problem.
10. Analyzing the stresses for a given 3D component.

INSTRUMENTATION AND CONTROL SYSTEMS

B. Tech. IV Year I Semester - MECH

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

Course Outcomes:

1. Define basic terms related to measurements, understand displacement measurement techniques.
2. Understand working principles of pressure and temperature measuring instruments.
3. Appraise the working of various flow, level, and speed measurement instruments.
4. Model and analyze acceleration, vibration, stress, strain, force, torque and power measuring methods.
5. Understand control systems and their applications.

UNIT – I

Definition Basic principles of measurement systems, instrument-classifications, generalized configuration and functional descriptions of measuring instruments examples. Static and Dynamic performance characteristics input and output configuration of measuring instruments, calibration, sources of error, classification and elimination of error.

Measurement of Displacement: Theory and construction of various transducers to measure displacement Piezo electric, inductive capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

UNIT – II

Measurement of Temperature: Classification ranges various principles of measurement Expansion, pressure thermometers, Electrical thermometers, Thermistors Thermocouples-laws of thermocouples Pyrometers.

Measurement of Pressure: Units classification different principles used. Manometers, Bourdon pressure gauges, Bellows pressure gauges Diaphragm gauges, Dead weight tester.

Low Pressure Measurement: Thermal conductivity gauges ionization pressure gauges, McLeod pressure gauges.

UNIT – III

Measurement of Level: Direct method indirect methods capacitive, ultrasonic, magnetic, cryogenic fuel level indicators Bubbler level indicators.

Flow Measurement: Rota meter, magnetic, ultrasonic, Turbine flow meters, hot wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed: Mechanical tachometers Electrical tachometers Stroboscope, Non-contact type of tachometers.

UNIT – IV

Measurement of Acceleration and Vibration: Different simple instruments Principles of seismic instruments Vibrometer and accelerometer using this principle

Stress Strain Measurements: Various types of stress and strain measurements electrical strain gauges gauge factor method of usage of resistance strain gauge for bending compressive and tensile strains usage for measuring torque, strain gauge Rosettes, temperature compensation in strain gauges.

UNIT – V

Control Systems:

Open and closed loop translation and rotational elements of a mechanical system, Pneumatic control systems, Hydraulic control systems. Representation of Control Components and Systems, Mechanical Accelerometer.

Text Book:

1. Mechanical Measurements & Control by D.S.Kumar, Metropolitan Book Co. (P) Ltd.

Reference Books:

1. Mechanical Measurement and Instrumentation by A.K.Sawhney&Dhanpat Rai Publications
2. Instrumentation & Mechanical Measurements by A.K.Tayal, Galotia Publications.
3. Measurement Systems: Applications & Design, E.O.Doebelin, Mc Graw Hill
4. Instrumentation, Measurement & Analysis by B.C.Nakra&K.K.Choudhary, TMH

CAD/CAM

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Appreciate CAD/CAM principles and know the various input and output peripherals of computers. Understand concepts of computer graphics.
2. Develop mathematical models to represent curves, surfaces and solids.
3. Understand numerical control systems and develop CNC part programs. Appraise the rudiments of Group Technology.
4. Understand Computer Aided Quality Control and Computer Integrated Manufacturing Systems.
5. Applying FMS concepts for production of engineering components.

UNIT – I

Introduction: Computers in industrial manufacturing, Product cycle, CAD/CAM hardware basic structure, CPU, memory types, input devices, display devices, hard copy devices, storage devices.

Computer Graphics: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 2D and 3D transformations, viewing transformation, mathematics of projections, windowing and clipping, hidden surface removal.

UNIT – II

Geometric Modeling: Requirements, Geometric models, Curve representation methods, Surface representation methods, modeling facilities desired.

CAD Standards- Graphical kernel system, standards for exchange images, open graphics library, data exchange standards- IGES, STEP, and CALS etc.

UNIT – III

Numerical Control: NC, NC modes, NC machine tools structure of CNC machine tools, features of machining center, turning center, CNC part programming: Fundamentals, manual part programming methods, computer aided part programming.

Group Technology: Part family, coding and classification, production flow analysis, advantages and limitations, computer aided processes panning, retrieval type and generative type.

UNIT – IV

Computer Aided Quality Control: Terminology in quality control, computer applications, contact inspection methods, noncontact inspection methods Optical, Noncontact, and inspection methods non optical, Computer aided testing, integration of CAQC with CAD/CAM.

Computer Integrated Manufacturing Systems: Types of manufacturing systems, Machine tools and related equipment, computer control systems, human labour in the manufacturing systems, CIMS benefits.

UNIT – V

Flexible Manufacturing Systems: Introduction, Main Objectives, FMS Equipment, Tool Management system, System layouts, FMS control

Text Book:

1. CAD/CAM Principles and Applications, P.N. Rao, Mc Graw Hill.

Reference Books:

1. CAD/CAM: Computer- Aided Design and Manufacturing, Mikell P.Groover, Emory. W.Zimmers, Pearson Education India, 1984.
2. CAD/CAM: Theory and Practice, Ibrahim Zeid, R Sivasubramanian, Mc Graw-Hill.
3. Automation, Production Systems & Computer Integrated Manufacturing", P. Groover, Pearson Education, 2016
4. Computer Numerical Control Concepts and Programming, Warren S. Seames, Vengage Learning, 2007.

ROBOTICS
(Professional Elective – 3)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

After completion of the course, student will be able to:

1. Understand the basic concepts of robotics and know the components of industrial robots.
2. Derive forward and inverse kinematic models for robots.
3. Decide upon the selection of actuators and sensors for robots.
4. Appreciate different programming techniques and languages for robots.
5. Comprehend industrial applications and work cell design of robots.

UNIT – I

Introduction: Automation and Robotics, Overview of Robotics, Classification of robots by coordinate system and control systems, Components of industrial robots, Advantages, disadvantages of and applications of robots.

End Effectors: Classification of end effectors, Types and working principles of grippers, General considerations of gripper selection and design, Different tools used as end effectors.

UNIT – II

Motion Analysis: Basic translation and rotation matrices, Transformations, Composite transformations, Homogeneous transformation, Problems.

Manipulator Kinematics: Joint coordinates and world coordinates, forward and inverse kinematics of position and orientation, Problems.

UNIT – III

Robot Actuators: Introduction, Working principles, applications, advantages and limitations of Pneumatic, Hydraulic and Electric Actuators.

Robot Sensors: Classification of sensors, working principles of different types of sensors like position, velocity, tactile, proximity sensors etc.

UNIT – IV

Robot Programming: Methods of Robot Programming, Leadthrough Programming Methods, Motion Interpolation, Wait, Signal, and Delay Commands, Branching, Capabilities and Limitations of Leadthrough Methods.

Robot Languages: The Textual Robot Languages, Generations of Robot Programming Languages, Robot Language Structure, Robot Language Elements and Functions.

UNIT – V

Industrial Applications of Robots: Robot Applications in Manufacturing: Material handling, Processing, Assembly & Inspection.

Robot Cell Design: Robot workcells, robot-centered cell, in-line robot cell & mobile robot cell, multiple robots and machine interference, considerations in workcell design.

Text Book:

1. Industrial Robotics (Technology, Programming and Applications), Mikell P. Groover, Tata McGraw Hill Education Private Limited.

Reference Books:

1. Introduction to Robotics: Analysis, Control and Applications, Saeed Benjamin Niku, John Wiley & Sons.
2. Robotics and Control, R.K. Mittal & I.J. Nagrath, Tata McGraw Hill Publishing Company Limited.
3. Introduction to Robotics: Mechanics and Control, John J. Craig, Pearson Education International.
4. Robotics: Control, Sensing, Vision and Intelligence, K.S.Fu, R.C.Gonzalez & C.S.G.Lee, McGraw Hill Education.

GAS DYNAMICS
(Professional Elective – 3)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understanding the features of different flows.
2. Comparing the flow in different cross sectional arcos.
3. Apply gas dynamics principles to Jet propulsion system.
4. Evaluate the effects with and without shocks during flow.
5. Designing the aviation components using gas dynamics principles

UNIT-I

Introduction: Concept of continuum and control volume, continuity equation, momentum equation, streamline, steady, one dimensional dynamic equation of a fluid flow with and without friction, energy equation. Basic concepts of compressible flow. Properties of atmosphere, Standard atmosphere, Relative pressure, use of air and gas tables. Condition for neglecting compressibility. Compressible flow, acoustic velocity, Mach number, Mach cone, Mach angle.

UNIT-II

Isentropic Flow: Stagnation enthalpy, density, pressure and temperature, local acoustic speed, maximum speed, variation of Compressibility with mach number.

UNIT-III

Variable Area Flow: Criteria for acceleration and deceleration, critical condition, nozzle discharge co-efficient, nozzle efficiency, operation of nozzles under varying back pressures.

Flow in Constant Area Duct: Adiabatic and isothermal-flow calculation of pressure, temperature, density, Mach number relationships, Limiting length of duct for adiabatic and isothermal flow, Fanno line, Diabatic flow, Flow of perfect gases in constant area duct with heat exchange, density temperature, pressure and mach number relationships, Limiting conditions, Rayleigh line.

UNIT-IV

Wave Phenomenon: Pressure disturbances in compressible fluid, type of shock waves normal, shock pressure density-velocity-temperature and Mach number relations for a plane normal shock-Shock tube-mach reflection- thin area prandtl theory.**UNIT-V**

Shock: Shock intensity-Rayleigh-Pilot and Prandtl-Pitot equation for normal shock, introduction to oblique shockwaves and hypersonic flow- fenno flow.

Text Book:

1. Fundamentals of Compressible flow, S.M. Yahya, New Age International.

Reference Books:

1. Gas Dynamics, E.Radha Krishnan, P.H.I Publication.
2. Gas Dynamics for engineers, P.Balachandran, PHI, Easterr Economy Edition.
3. Gas Dynamics and Jet propulsion, S L Somasundaram, New age International Publishers.
4. Gas Dynamics, H.W.Lipman and A.Rashkho, John Wiley.

PRODUCTION AND OPERATIONS MANAGEMENT

(Professional Elective – 3)

B. Tech. IV Year I Semester – MECH

L	T	P	C

3	0	0	3

Course Outcomes:

1. Understand the importance of production and operations management for getting the competitive edge.
2. Analyze the factors effecting plant location and the volume of production to be made.
3. Apply the value engineering and work study method to standardize the manufacturing activity.
4. Evaluate the project management techniques to improve overall productivity.
5. Designing the production systems with the effective PPC principles

UNIT-I:

Overview of Production & Operations Management (POM): Introduction-Definition Importance-Historical Development of POM-POM scenario today

Product & Process Design: Role of product development- Product development process-Tools for efficient product development- Determination of process characteristics- Types of processes and operations systems-Continuous Intermittent-Technology issues in process design- Flexible Manufacturing Systems- Automated Material Handling Systems

UNIT –II:

Value Analysis: Definition-Objectives-Types of Values-PhasesTools -FAST diagram-Steps-Advantages-Matrix method-Steps.

Plant Location& Plant Layout: Factors affecting locations decisions-Location planning methods-Location factor rating -Centre of Gravity method-Load distance method. Plant layout- Definition-Objectives-Types of layouts-Design of product layout-Line balance-Terminology-RPW method.

UNIT- III:

Aggregate Planning: Definition- Objectives-Basic strategies for aggregate production planning-Aggregate production planning method-Transportation model- Master Production Scheduling. Material Requirement Planning: Terminology-Logic-Lot sizing methods-Advantages & Limitations

UNIT – IV:

Work Study: Work study: method study definition-objectives-steps-Charts used Work measurement-Time study- Definition-steps- Determination of standard time- Performance rating- Allowances. Work sampling- steps-comparison with time study.

Quality Management: Economics of quality assurance-Control charts for variables and for attributes Acceptance sampling plans-Total Quality Management-ISO 9000 series standards-Six sigma

UNIT – V:

Scheduling: Need-basis for scheduling- Scheduling rules- Flow shop & Job shop scheduling. Line of Balance.

Project Management: PERT- Critical path determination- Probability of completing project in a given time- CPM- Types of floats- Critical path determination- Crashing of simple networks- Optimum project schedule.

Text Book:

1. Operations Management: Theory and Practice, B.Mahadevan, Pearson.

Reference Books:

1. Modern Production and Operations Management, Buffa, Wiley
2. Theory and Problems in Production and Operations Management, SN Chary, TMH.
3. Industrial Engineering and Management, Dr.Ravi Shankar, Galgotia Publications.
4. Operations Management 8e Process and Value Chains, Lee Krajewskiet, Pearson

OPERATIONS RESEARCH
(Professional Elective – 4)

B. Tech. IV Year I Semester - MECH

L	T	P	C

3	0	0	3

Course Outcomes:

1. Model the real life situations with mathematical models. Understand the concept of linear programming.
2. Solve transportation and assignment problems.
3. Understand the various waiting lines and replacement concepts.
4. Identify and apply game theory and inventory models.
5. Apply Sequencing shop floor problems and network scheduling models.

UNIT – I

Development Definition, historic developments of operation research, Characteristics and Phases Types of models Operations Research models applications.

Allocation: Linear Programming Problem Formulation Graphical solution Simplex method Artificial variables techniques: Two phase method, Big-M method; Duality Principle.

UNIT – II

Transportation Problem: Formulation Optimal solution, unbalanced transportation problem Degeneracy.

Assignment Problem: Formulation Optimal solution Variants of Assignment Problem; Traveling Salesman problem.

UNIT – III

Replacement: Introduction Replacement of items that deteriorate with time when money value is not counted and counted Replacement of items that fail completely- Group Replacement.

Waiting Lines: Introduction Terminology-Single Channel Poisson arrivals and Exponential Service times with infinite population and finite population models.

UNIT – IV

Theory of Games: Introduction Terminology Solution of games with saddle points and without saddle points- 2 x 2 games m x 2 & 2 x n games graphical method m x n games dominance principle.

Inventory: Introduction Single item, Deterministic models Types Purchase inventory models with one price break and multiple price breaks stochastic models demand discrete variable or continuous variable Single Period model with no setup cost.

UNIT – V

Sequencing: Introduction Flow Shop sequencing n jobs through two machines n jobs through three machines two jobs through ‘m’ machines

Network Scheduling: Critical path method, Programme evaluation and review technique, crashing of networks, resource leveling.

Text Book:

1. Operations Research, S.D.Sharma, Kedarnath

Reference Books:

1. Operations Research, A.M. Natarajan, P. Balasubramaniam, A. Tamilarasi, Pearson.
2. Operations Research, Wagner, PHI Publications
3. Operations Research: Methods and Problems, Maurice Saseini, ArhurYaspan and Lawrence Friedman, Literary Licensing Publishers
4. Operations Research, ACS Kumar, Yesdee Publications

ENERGY CONSERVATION AND MANAGEMENT
(Professional Elective – 4)

B. Tech. IV Year I Semester - MECH

L	T	P	C

3	0	0	3

Course Outcomes:

1. Understand the energy data to carry out audit.
2. Identifying the electrical, thermal and other systems with their energy consumption.
3. Perform energy audit of consumption of industries.
4. Evaluate the energy consumption of units by the economic concepts.
5. Designing the mechanical systems employing energy conservation principles

UNIT -I

Introduction

Energy Power Past & Present scenario of World; National Energy consumption Data

Environmental aspects associated with energy utilization Energy Auditin g: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT- II

Electrical Systems

Components of EB billing HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors Motor Efficiency Computation, Energy Efficient Motors, Illumination Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT- III

Thermal Systems

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters Efficiency computation and encon measures. Steam: Distribution & U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories

UNIT- IV

Energy Conservation in Major Utilities

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems Cooling Towers D.G. sets

UNIT-V
Economics

Energy Economics Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, LifeCycle Costing ESCO concept

Text Book:

1. Industrial Energy Management and Utilisation, Witte. L.C., P.S. Schmidt, D.R. Brown, Hemisphere Publ, Washington, 1988.

Reference Books:

1. The Efficient Use of Energy, Dryden. I.G.C., Butterworths, London, 1982
2. Energy Management Hand book, Turner. W.C., Wiley, New York, 1982.
3. Design and Management for Energy Conservation, Callaghn, P.W, Pergamon Press, Oxford, 1981.
4. Energy Management, Murphy. W.R. and G. Mc KAY, Butterworths, London 1987.

FLUID POWER SYSTEMS
(Professional Elective – 4)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the properties fluid and fluid power systems.
2. Apply accessories and valves in the systems for effective functioning.
3. Design and analyze typical hydraulic circuits.
4. Evaluate the systems with different control units.
5. Designing the modern fluid power systems with the hydraulic principles

UNIT-I

Introduction to Oil Hydraulics and Pneumatics: Structure, advantages and limitations. ISO symbols, energy losses in hydraulic systems. Applications, Basic types and constructions of Hydraulic pumps and motors. Pump and motor analysis. Performance curves and parameters.

UNIT-II

Hydraulic Actuators: Types and constructional details, lever systems, control elements direction, pressure and flow control valves. Valve configurations, General valve analysis, valve lap, flow forces and lateral forces on spool valves. Series and parallel pressure compensation flow control valves. Flapper valve Analysis and Design.

UNIT-III

Control Valves and Servo Valves: Nonlinearities in control systems (backlash, hysteresis, dead band and friction nonlinearities). Design and analysis of typical hydraulic circuits. Regenerative circuits, high low circuits, Synchronization circuits, and accumulator sizing.

UNIT-IV

Meter-in & Meter-out Circuits: Bleed-off circuits; Fail Safe and Counter balancing circuits, accessories used in fluid power system, Filtration systems and maintenance of system. Components of pneumatic systems; Direction, flow and pressure control valves in pneumatic systems. Development of single and multiple actuator circuits. Valves for logic functions; Time delay valve; Exhaust and supply air throttling;

UNIT-V

Control Systems: Examples of typical circuits using Displacement Time and Travel-Step diagrams. Will-dependent control, Travel-dependent control and Time-dependent control, combined control, Program Control, Electro-pneumatic control and air-hydraulic control, Ladder diagrams. Applications in Assembly, Feeding, Metalworking, materials handling and plastics working.

Text Book:

1. Fundamentals of Fluid Power Control, John Watton, 1st Ed. Cambridge University Press,

Reference Books:

1. Hydraulic Operation and Control of Machine Tools, Ian Mencal, Ronald Press.
2. Hydraulic and Pneumatic Power for Production, Sterwart, Industrial Press.
3. Fluid Power with Applications, Anthony Esposito, Pearson Education.
4. Fundamentals of Pneumatics/Electro Pneumatics ,Hasebrink J.P., and Kobler R., FESTO
5. Didactic publication No. 7301, Esslingen Germany, 1979.

CAD/CAM LAB

B. Tech. IV Year I Semester - MECH

L	T	P	C
0	0	2	1

Course Outcomes:

1. Understand the usage of relevant software and the syntax of CNC part program.
2. Develop the 2D, 3D models and conduct the analysis.
3. Evaluate the veracity between manual part program and the automated part program.

I. PART MODELLING

a) Generate a 3D Model using Solid Works (Extrude command) as per diagram
b) Generate a 3D Model using Solid Works (Revolve, sweep command) as per diagram.
c) Generate a Surface Model using Solid Works as per diagram.

II. ASSEMBLY MODELING

a) Generate an Assembly Model of Stuffing Box .
b) Generate an Assembly Model of Screw Jack .

III. MANUFACTURING

a) Introduction to CNC Simulation software.
b) Develop a part programme for CNC turning using simulating software as per the given diagram and manufacture on CNC Lathe.
c) Develop a part programme for CNC milling using simulating software as per the given diagram and manufacture on CNC Mill.

Software Packages: SOLIDWORKS, CAM Software

PRODUCTION DRAWING PRACTICE AND INSTRUMENTATION LAB

B. Tech. IV Year I Semester - MECH

L	T	P	C

0	0	2	1

Course Outcomes:

1. Understanding the symbols and their representation on drawings.
2. Calibrate the measuring devices and analyze the errors in measurement.
3. Evaluate the instruments in terms of accuracy and precision.

PRACTICE-I

Conventional representation of materials conventional representation of parts screw joints, Springs, Gears, Electrical, Hydraulic and Pneumatic circuits methods of indicating notes on drawings.

PRACTICE-II

Limits and fits: Types of fits, exercises involving selection/interpretation of fits and estimation of limits from tables.

PRACTICE-III

Form and positional Tolerances: introduction and indication of the tolerances of form and position on drawings, deformation of run out and total run out and their indication.

PRACTICE-IV

Surface roughness and its indication: Definitions, finishes obtainable from various manufacturing processes, recommended surface roughness on mechanical components.

PRACTICE-V

Heat treatment and surface treatment symbol used on drawings. Detailed and part drawings: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

INSTRUMENTATION LAB:

1. Calibration of pressure gauges
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for load measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotameter for flow measurement.
10. Study and use of a seismic pickup for the measurement of vibration amplitude of an
11. Engine bed at various loads.
12. Study and calibration of McLeod gauge for low pressure

Reference Books:

1. Measurement Systems: Applications & Design, E.O.Doebelin, Mc Graw Hill
2. Instrumentation, Measurement & Analysis by B.C.Nakra&K.K.Choudhary, TMH

INDUSTRY ORIENTED MINI PROJECT

B. Tech. IV Year I Semester - MECH

L	T	P	C
0	0	0	3

Course Outcomes:

1. Apply the engineering principles in the execution of a sub system under mechanical engineering domain.
2. Predict and solve the related issues of the sub system.
3. Evaluate the effectiveness of the sub systems the light of technical, ethical and other standards.

The students in a group of 4 to 5 works on an industry oriented topic approved by the head of the department and prepare a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

PRODUCTION PLANNING & CONTROL

B. Tech. IV Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the basic concepts of production planning and control.
2. Appreciate principles and importance of forecasting techniques.
3. Analysis of various inventory management and control systems. Plan the stock required based on various methods like MRP, ERP, LOB, JIT and other Japanese concepts.
4. Know the factors of routing and schedule. Apply standard scheduling methods and line balancing.
5. Appreciate dispatching procedure and application of computer in production planning and control.

UNIT-I

Introduction- Definitions, objectives of production planning and control-functions of production planning and control-elements of production control-types of production- organization of production planning and control, internal organizations department

UNIT-II

Forecasting - Importance of forecasting, types of forecasting, their uses- general principles of forecasting techniques- Qualitative methods and quantitative methods.

UNIT-III

Inventory Management- Functions inventory, Relevant inventory cost, ABC analysis, VED Analysis- EOQ model, Inventory control systems, P- Systems and Q-Systems Introduction to MRP and ERP, Line of balance , JIT inventory, Japanese concepts.

UNIT- IV

Routing – Definition, routing procedure, Route sheets, Bill of material, factors affecting routing procedure. Schedule: Definition, difference with loading. Scheduling polices, techniques, standard scheduling methods, job shop, flow shop. Line balancing, aggregate planning, methods for aggregate planning, Chase planning, expediting, control aspects.

UNIT-V

Dispatching: Activities of dispatcher, dispatching procedure, follow up, definition, reasons for existence of functions, types of follow up, applications of computer in production planning and control

Text Book:

1. Production Planning and Control: M.Mahajan, Dhanpatirai & Co.

Reference Books:

1. Operations Management(Theory and Practice), Dipak- Orient Blackswan
2. Production and Operations Management R.Panneer Selvam, PHI.
3. Production Planning and Control& Industrial Management: K.C Jain,L.N.Agarwal-Khanna.
4. Production Planning and Control- Text & cases-SK Mukhopadhyaya, PHI

UNCONVENTIONAL MACHINING AND PROCESSES

B. Tech. IV Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the need, importance and classification of various unconventional machining processes.
2. Appreciate basic principles and process parameters of ultrasonic, water jet and abrasive jet machining processes.
3. Appreciate thermal energy based machining processes with emphasis on surface finish and accuracy.
4. Appraise different chemical material removal processes.
5. Understand electron beam machining and plasma arc machining along with applications.

UNIT–I

Introduction: Need for non-conventional machining processes, Classification of non-conventional machining processes, considerations in process selection, materials, general characteristics and applications of non-conventional machining processes, Historical development.

UNIT–II

Mechanical Material Removal Processes: Ultrasonic machining, Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining: Basic principles, components, process variables, advantages and disadvantages, applications.

UNIT–III

Thermal Material Removal Processes: Electro Discharge Machining, Wire EDM, Laser Beam Machining, Electron Beam Machining, and Ion Beam Machining: Basic principles, components, process variables, advantages, limitations and applications.

UNIT–IV

Chemical Material Removal Processes: Electro Chemical Machining, Electro Chemical Grinding, Electro Chemical Honing, and Electro Chemical Deburring: Basic principles, components, process variables, advantages, limitations and applications.

UNIT-V

Electron Beam Machining: Generation and control, Theory of electron beam machining, Comparison of thermal and non-thermal processes. General principle and application of laser beam machining – Thermal features, Cutting speed and accuracy of cut.

Plasma Arc Machining: Application of plasma for machining, metal removal mechanism, Process parameters, Accuracy and surface finish and other applications of plasma in manufacturing industries.

Text Book:

1. Advanced Machining Processes, VK Jain, Allied publishers.

Reference Books:

1. Modern Machining Process, Pandey P.C. and Shah H.S., TMH
2. MEMS & Microsystems – Design and Manufacture by Tai-Ran Hsu, Tata McGrawHill
3. New Technology by Bhattacharya A, the Institution of Engineers, India 1984.
4. Non-Traditional Machining, P.K. Mishra, New Age.

TECHNICAL SEMINAR

B. Tech. IV Year II Semester - MECH

L	T	P	C

0	2	0	2

Course Outcomes:

1. Synthesizing information on any one specialized topic from text books, peer revised journals, hand books and other technical resources.
2. Generation a technical seminar report comprising of all relevant information with stipulated standards.
3. Judge the veracity of the topic with various time domains

METHOD OF EVALUATION:

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. Each student is expected to present atleast twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his/ her topic of seminar and marks are given based on the report. A Faculty guide is to be allotted and he/ she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

COMPREHENSIVE VIVA VOCE

B. Tech. IV Year II Semester - MECH

L	T	P	C

0	0	0	2

Course Outcomes:

1. Revise the mechanical engineering principles postulations and other technical information in order to apply in various conditions.
2. Explain the relevance of a technical note for a given application.
3. Collate and justify the design by the acquired comprehensive technical knowledge and skill.

Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department along with an external examiner. The Comprehensive Viva-Voce is intended to assess the student's understanding of the subjects he/she studied during the B. Tech. course of study. The Comprehensive VivaVoce is evaluated by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

MAJOR PROJECT

B. Tech. IV Year II Semester - MECH

L	T	P	C

0	**0**	**20**	**10**

Course Outcomes:

1. Develop a model comprising of real time application in the industry.
2. Design a system under the domain of mechanical engineering.
3. Evaluate for simulation design, analysis and manufacturing facts of the system.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

OPEN ELECTIVES (R21

ELEMENTS OF MECHANICAL ENGINEERING

B. Tech. III Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the basic concepts of mechanical engineering.
2. Apply principles of engineering mechanics in mechanism and machines
3. Develop manufacturing methods to produce engineering components.
4. Evaluate alternative designs for the engineering components
5. Select a suitable type of automation applicable for any industry.

UNIT-I

Thermal Engineering Basic Concepts: Zeroth Law of Thermodynamics First law of Thermodynamics- Second Law of Thermodynamics Boyles Law Charles Law Thermodynamic processes Otto cycle Diesel cycle- Four stroke petrol and diesel engines. Brake Power, Indicated Power, Mechanical efficiency, Air Refrigeration, Vapour Compression Refrigeration.

UNIT-II

Theory of Machines : Types of Gears and Geartrains Transmission of power by Belts, Ropes and Chain drives Cams and Followers. Free Vibration of mass attached to vertical spring Oscillation of pendulums Transverse loads.

UNIT-III

Production Technology : Metal Casting Sand Casting, Molten metal Pouring, Welding Arc Welding, Gas Welding, Brazing, Soldering. Metal Forming Forging, Drawing, Extrustion. Metal Cutting Lathe, Drilling, Milling operations.

UNIT-IV

Introduction To Design: Elasticity and plasticity, Types of stresses and strains, Hooke's law stress strain diagram for mild steel, Working stress Factor of Safety, Lateral Strain, Poisson's ratio and volumetric strain Temperature stresses.

UNIT-V

Automation and Robotics : Introduction to Automation in Manufacturing, CIM, CAD, CAM, CNC, Robots in industry, Robot Anatomy, Robot Configurations, Advantages, Disadvantages and Applications of robots.

Text Books:

1. Fundamentals of Mechanical Engineering, Pravin Kumar, Pearson, second edition.

Reference Books:

1. Elements of Mechanical Engineering, V. M. Manglik, PHI
2. Theory of Machines, Rattan .S.S, TMH, 2009 Edition.
3. Elements of Mechanical Engineering, Mathur M.L. & F.S. Mehta & Tewari, Jain Brothers Publishers.
4. Elements of Mechanical Engineering, Mathur M.L. & F.S. Mehta & Tewari, Jain Brothers Publishers

PRODUCT ENGINEERING

B. Tech. III Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Illustrate creativity and study the techniques of innovation
2. Assess the evaluation techniques for screening ideas
3. Differentiate the IPR-Patents, Design patents, copy right and trade mark and their laws.
4. Describe the interaction between design, manufacture, quality and testing
5. Establish the machining time in various cutting operations; value engineering; GT and concepts of concurrent engineering.

UNIT – I: Product Design and Process Design functions. Selection of right product. Systematic procedure of product innovation. Factors contributing to successful technological innovation – need for creativity and innovation. Techniques of innovation like brain storming and Delphi techniques.

UNIT – II: Project selection and evaluation: Function of design – Design with Human Machine Interaction (HMI), Collection of ideas and purpose of project. Selection criteria – screening ideas for new products using evaluation techniques. Principles of ergonomics.

UNIT – III: New Product Development: Research and new product development. Patents, definitions, patent search, patent laws, international code for patents – Intellectual Property Rights (IPR).

UNIT – IV: New Product Planning: Interaction between the functions of design, manufacture, quality, testing, and marketing. Steps for introducing new products after evaluation.

UNIT – V: Process Planning: Process planning, process sheets, Selection of manufacturing process, estimation of machining time in various cutting operations – estimation of costs for manufacture. Value engineering in product design, group technology, concepts of concurrent engineering.

Text Book:

1. Chitale AK & Gupta R.C, Product Design & Manufacturing, – Prentice Hall of India, 1997.

Reference Books:

1. Niebel BW & Draper AB, Production Design & Process Engg., Mc Graw Hill Kogakusha, 1974.
2. Harry Nystrom, Creativity and Innovation, Jhon Wiley & Sons, 1979.
3. Brain Twiss, Managing Technological Innovation, Pittman Publ. 1992.
4. Harry, B. Waton, New Product Planning, Prentice Hall Inc., 1992.

INDUSTRIAL ENGINEERING

B. Tech. III Year II Semester - MECH

L	T	P	C

3	0	0	3

Course Outcomes:

1. Understanding the concepts of industrial engineering inorder to improve overall productivity of a given system
2. Analysing various layout factors with a view to reduce the cost per unit of production at different prospective layout
3. Designing the production plan with a high throughput at a given point of time
4. Reducing the inventory by evaluating various costs
5. Creating a quality system by following principles

UNIT – I

CONCEPTS OF INDUSTRIAL ENGINEERING: Productivity, Production, Productivity Improvement. Work Study: Method Study and Time Study. Flow Process Chart, multiple activity chart, Standard time computation, work sampling.

UNIT – II

PLANT LOCATION FACTORS: Quantitative and qualitative methods; types of production - Mass, batch, job. Types of plant layout - product, process and fixed position layouts, cellular layouts, Group Technology – Flexible Manufacturing systems.

UNIT – III

PRODUCTION PLANNING AND CONTROL: Production plan, loading, scheduling, Production planning by line of Controls. Materials Requirement Planning (MRP), Manufacturing Resource Planning (MRP II) Network scheduling – CPM and PERT.

UNIT – IV

INVENTORY CONTROL: ABC analysis, FSN analysis, VED Analysis, P System, Q System. Economic ordering quantity, Lead time, Buffer Stock, ASRS, Stores management.

UNIT – V

QUALITY ENGINEERING: X, R, p, C charts, Acceptance Sampling, Kaizen, JIT, ISO-9000, Deming, Juran, Philip Crosby Concepts, Taguchi Quality loss function.

TEXT BOOKS:

1. Industrial Engineering and Management/ Banga and Sharma

REFERENCE BOOKS:

1. Industrial Engineering & Management/ SK Hajra Choudhury, Nirjhar Roy, AK Hajra Choudhury
2. PERT and CPM Principles and Applications /L S Srinath
3. Industrial Management/K.K.Ahuja
4. Production Systems - Planning Analysis And Control/ Riggs.

MAINTENANCE AND SAFETY ENGINEERING

B. Tech. III Year II Semester- MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the need for maintenance in an industry and know about Maintenance Management and Control.
2. Appreciate and implement various types of maintenance.
3. Know the concept of inventory control in maintenance.
4. Evaluate the quality and cost of safety and maintenance.
5. Appraise the concepts of reliability and maintainability with reference to the maintenance of equipment.

UNIT – I

Introduction: Need for Maintenance, Facts and Figures, Modern Maintenance, Problem and Maintenance strategy for the 21st Century Engineering Maintenance Objectives and Maintenance in Equipment Life cycle, Terms and Definitions.

Maintenance Management and Control: Maintenance Manual Maintenance, Facility Evaluation Functions of Effective Maintenance Management, Maintenance Project Control Methods, Maintenance Management Control indices.

UNIT – II

Types of Maintenance: Preventive Maintenance, Elements of Preventive, Maintenance Program, Establishing Preventive Maintenance Program, PM Program Evaluation and improvement, PM Measures, PM Models, Corrective Maintenance, Corrective Maintenance Types, Corrective Maintenance Steps and Downtime Components, Corrective Maintenance Measures, Corrective Maintenance Models.

UNIT – III

Inventory Control in Maintenance: Inventory Control Objectives and Basic inventory Decisions, ABC inventory Control Models Two Bin inventory Control and Safety Stock, spares Determination Factors spares calculation methods.

UNIT – IV

Quality and Safety in Maintenance: Needs for Quality Maintenance Processes, Maintenance Work Quality, Use of Quality Control Charts in Maintenance Work Sampling, Post Maintenance Testing, Reasons for Safety Problems in Maintenance, Guidelines to improve Safety in Maintenance Work, Safety Officer's Role in Maintenance Work, Protection of Maintenance Workers.

Maintenance Costing: Reasons for Maintenance Costing, Maintenance Budget Preparation Methods and steps, Maintenance Labor Cost Estimation, Material Cost Estimation, Equipment Life Cycle Maintenance Cost Estimation, Maintenance Cost Estimation Models.

UNIT – V

Reliability, Reliability Centered Maintenance, RCM: Goals and Principles, RCM Process and Associated Questions, RCM Program Components Effectiveness Measurement indicators, RCM Benefits and Reasons for its Failures, Reliability Versus Maintenance and Reliability Measures and Formulas, Reliability Networks, Reliability Analysis Techniques.

Maintainability: Maintainability importance and Objective, Maintainability in Systems Life Cycle, Maintainability Design Characteristics, Maintainability Functions and Measures, Common Maintainability Design Errors.

Text Book:

1. Engineering Maintenance a modern approach, B. S. Dhallon, C.R.R Publishers

Reference Books:

1. Reliability, Maintenance and Safety Engineering, Dr. A.K Guptha, Laxmi Publications.
2. Reliability Engineering, Elsayed, Pearson
3. Industrial Safety Engineering, Garg, Danpathrai Publishers
4. Industrial Safety Management, L.M.Deshmukh, TMH

BASIC AUTOMOBILE ENGINEERING

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understanding the basic structure of an automobile.
2. Evaluating different cooling and lubrication systems of an automobile

3. Analyzing the electrical systems in tandem with ignition systems
4. Understand various transmission and suspension systems.
5. Appraise steering and braking systems. Understand emission norms of automobiles.

UNIT-I

Introduction: Types of automobile engines.

S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump, filters, carburetor, types, air filters, petrol injection. M.P.F.I system

C.I. engines: Requirements of diesel injection systems, types of injection systems, Common Rail Diesel injection- fuel pump, nozzle, spray formation, injection timing.

UNIT-II

Engine Lubrication System: Splash and pressure lubrication systems.

Cooling System: Cooling requirements, Air cooling, liquid cooling, Thermo, Water and forced lubrication system, Radiators: Types, Cooling fans.

UNIT-III

Ignition System: Battery ignition system, Magneto coil ignition system, electronic ignition system. Battery, Contact breakers, Spark plugs.

Electrical System: Charging circuit, generator, current, voltage regulator, starting system, bendix drive mechanism solenoid switch, lighting system, Horn, Wiper, fuel gauge.

UNIT-IV

Transmission System: Clutches, types-cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches – gear boxes, types. Propeller shaft, Hotch- Kiss drive, Torque tube drive.

Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, independent suspension system.

UNIT-V

Steering System: Steering geometry, camber, castor, King pin rake, combined angle toe-in, center point steering.

Braking System: Mechanical brake system, Hydraulic brake system, Disc and Drum type Brakes.

Emission from Automobiles: Pollution standards National and international, Pollution control Techniques. Noise pollution and controls.

Text Book:

1. Automobile Engineering ,Vol. 1 & Vol. 2,Kirpal Singh,Standard Publishers Distributors Delhi

Reference Books:

1. Automotive Mechanics,G.B.S.Narang, Khanna Publishers.
2. Automotive Mechanics,J.Heitner, CBS Publications.
3. Automobile Engineering , Vol. 1 & Vol. 2 , K.M Gupta, Umesh publication
4. Automobile Engineering, William Crouse, TMHILL Publishers.

MATERIAL SCIENCE AND ENGINEERING

B. Tech. IV Year I Semester - MECH

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Course Outcomes:

1. Understand structure of metals and constitution of alloys.
2. Appraise equilibrium diagrams of various alloys.

3. Classify steels, cast irons and their alloys.
4. Appreciate different heat treatment processes and their influence on properties of metals and alloys. Know different Non-ferrous Metals and Alloys.
5. Apply the knowledge of composite and ceramic materials to replace metals and alloys wherever applicable.

UNIT – I

Structure of Metals: Bonds in Solids Metallic bond crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal/ alloys determination of grain size. Constitution of Alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT –II

Equilibrium of Diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn and Fe-Fe_3C.

UNIT –III

Cast Irons and Steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plan carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – IV

Heat Treatment of Alloys: Effect of alloying elements on Fe-Fe_3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – V

Ceramic Materials: Crystalline ceramics, glasses, cermets, abrasive materials, Nanomaterials definition, properties and applications of the above.

Composite Materials: Classification of composites, various methods of component manufacture of composites, particle reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal matrix composites and C C composites.

Text Book:

1. Foundations of Materials Science and Engineering, Smith, 4th Edition, McGraw Hill, 2009.

Reference Books:

1. Introduction to Physical Metallurgy, Sidney H. Avener, Mc Graw Hill
2. Material Science & Engineering, V. Rahghavan, PHI
3. Science of Engineering Materials, Agarwal
4. An Introduction To Material Science, W.G.vinas & HL Mancini, Princeton University Press