VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

(Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)

DEPARTMENT OF HUMANITIES & SCIENCES

ACADEMIC REGULATIONS & SYLLABI (R-22)

B.Tech

Mechanical Engineering

w.e.f. the Academic Year 2022-2023

Vidya Jyothi Institute of Technology

(An Autonomous Institution)

(Accredited by NAAC A+ Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)

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

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF MECHANICAL ENGINEERING

R22 COURSE STRUCTURE

B. TECH I YEAR I SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	A221001	Mathematics-I(Linear Algebra & Calculus)	3	1	0	4.0
2	A221002	Applied Physics	3	1	0	4.0
3	A221081	Applied Physics Lab	0	0	3	1.5
4	A221501	C-Programming for Engineers	3	0	0	3.0
5	A221581	C-Programming for Engineers Lab	0	0	2	1.0
6	A221003	English for Skill Enhancement	2	0	0	2.0
7	A221082	English Language & Communication Skills Lab	0	0	2	1.0
8	A221301	Elements of Mechanical Engineering	0	0	2	1.0
9	A221381	Engineering Workshop	0	1	3	2.5
10		Induction Programme				
		Total	11	3	12	20

B. TECH I YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	A222005	Mathematics– II (Ordinary Differential Equations & Vector Calculus)	3	1	0	4.0
2	A222006	Engineering Chemistry	3	1	0	4.0
3	A222084	Engineering Chemistry Lab	0	0	2	1.0
4	A222304	Engineering Mechanics	3	0	0	3.0
5	A222305	Engineering Materials	2	0	0	2.0
6	A222303	Engineering Graphics & Modelling	1	0	4	3.0
7	A222583	Python Programming Lab	0	2	2	3.0
		Total	11	4	10	20

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B.Tech in MECHANICAL ENGINEERING

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	A223009	Probability &Statistics	3	1	0	4
2.	A223306	Mechanics of Solids	3	0	0	3
3.	A223307	Metallurgy & Material Science	3	0	0	3
4.	A223308	Production Technology	3	0	0	3
5.	A223309	Thermodynamics	3	1	0	4
6.	A223383	Production Technology Laboratory	0	0	2	1
7.	A223384	Material Science & Mechanics of Solids Laboratory	0	0	2	1
8.	A223385	Computer Aided Machine Drawing	0	0	2	1
9.	A223012	Professional Communications	2	0	0	0
Total Credits			**17**	**2**	**6**	**20**

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	A224310	Basic Electrical and Engineering	3	0	0	3
2.	A224311	Kinematics of Machinery	3	0	0	3
3.	A224312	Fluid Mechanics & Hydraulic Machines	3	0	0	3
4.	A224313	IC Engines & Gas Turbines	3	0	0	3
5.	A224314	Instrumentation and Control Systems	3	0	0	3
6.	A224287	Basic Electrical EngineeringLaboratory	0	0	2	1
7.	A224386	Fluid Mechanics & Hydraulic Machines Laboratory	0	0	2	1
8.	A224387	Instrumentation Laboratory	0	0	2	1
9.	A224315	Real-time Research Project/ Field-Based Project	0	0	4	2
10.	A224013	Quantitative Methods & Logical Reasoning	2	0	0	0
Total Credits			**17**	**0**	**10**	**20**

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Department of Mechanical Engineering
R22 COURSE STRUCTURE

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	A225316	Dynamics of Machinery	3	0	0	3
2.	A225317	Metrology & Machine Tools	3	0	0	3
3.	A225318	Steam Power & Jet Propulsion	3	0	0	3
4.	A225319	CAD/CAM	2	0	0	2
5.	A225320	Design of Machine Elements	3	0	0	3
6.	A225321 A225322	**Open Elective-I:** Basic Mechanical Engineering Product Engineering	3	0	0	3
7.	A225388	Thermal Engineering Laboratory	0	0	2	1
8.	A225389	Metrology & Machine Tools Laboratory	0	0	2	1
9.	A225390	CAD/CAM Laboratory	0	0	2	1
10.	A225016	Environmental Science	3	0	0	0
Total Credits			**20**	**0**	**8**	**20**

III YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1.	A226323	Machine Design	3	0	0	3
2.	A226324	Heat Transfer	3	0	0	3
3.	A226018	Business Economics & Financial Analysis	3	0	0	3
4.	A226325 A226326 A226327 A226328	**Professional Elective – I:** Finite Element Method Additive Manufacturing Composite Materials Microprocessors in Automation	3	0	0	3
5.	A226329 A226330	**Open Elective – II:** Materials & Applications Industrial Engineering	3	0	0	3
6.	A226392	Heat Transfer Lab	0	0	2	1
7.	A226393	Computer Aided Engineering Laboratory	0	0	2	1
8.	A225087	Advanced English Communication Skills Laboratory	0	0	2	1
9.	A2263P1	Industry Oriented Mini Project/ Internship	0	0	4	2
10.	A226019	Gender Sensitization	3	0	0	0
Total Credits			**18**	**0**	**10**	**20**

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
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Department of Mechanical Engineering
R22 COURSE STRUCTURE

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	A227331	Industrial Management	2	0	0	2
2.	A227332	Refrigeration & Air Conditioning	3	0	0	3
3.	 A227333 A227334 A227335 A227336	**Professional Elective – II:** Artificial Intelligence in Mechanical Engineering Industry 4.0 Industrial Robotics Production Planning & Control	3	0	0	3
4.	 A227337 A227338 A227339 A227340	**Professional Elective – III:** Operations Research Computational Fluid Dynamics Total Quality Management Solar Energy Technology	3	0	0	3
5.	 A227341 A227342 A227343 A227344	**Professional Elective – IV:** Re-Engineering Non-Conventional Energy Sources Automobile Engineering Electric and Hybrid Vehicles	3	0	0	3
6.	 A227345 A227346	**Open Elective – III:** Basic Automobile Engineering Maintenance and Safety Engineering	3	0	0	3
7.	A2273PS1	Project Stage - I	0	0	6	3
Total Credits			**17**	**0**	**6**	**20**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	A228347	Unconventional Machining Process	3	0	0	3
2.	A228348	Plant Layout & Material Handling	3	0	0	3
3.	A228349	Power Plant Engineering	3	0	0	3
4.	A2283PS2	Project Stage – II including seminar	0	0	22	9+2
Total Credits			**9**	**0**	**22**	**20**

MATHEMATICS-I (LINEAR ALGEBRA AND CALCULUS)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221001	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives:

To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

Course Outcomes:

After learning the contents of this course, the students must able to:

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.

Syllabus

UNIT-I Matrices and Linear System of Equations :

Introduction of Matrices, Rank - Echelon form, Normal form. Solution of Linear Systems – Gauss Elimination and 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: Nature, Index and Signature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

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: Improper Integrals and Mean Value Theorems:

Improper Integrals: Gamma and Beta Functions-Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Generalized Mean Value theorem (Taylor's and MacLaurin's Series all theorems without proof) – Geometrical interpretation of Mean value theorems.

UNIT-V: Functions of several variables:

Partial Differentiation: Total derivative, Functional dependence, Jacobian Determinant- Maxima and Minima of functions of two variables with constraints and without constraints, Method of Lagrange Multipliers.

Textbooks:

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

Reference Books:

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

APPLIED PHYSICS

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221002	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B.Tech I Year I Semester

Course Outcomes:

At the end of the course the student will be able to

1. Understand various optical phenomena of light
2. Apply the basic principles of quantum mechanics to classify solids based on the band theory
3. Elucidate the characteristics of semiconductors and semiconductor devices
4. Apply the knowledge of nanotechnology for societal applications
5. Explain the working principle of lasers and optical fibers

Unit – I Wave Optics

Principle of superposition, coherence. Interference - Interference in thin films by reflection, Newton's rings. Diffraction – Fresnel and Fraunhofer diffraction, Fraunhofer 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 Introduction to Quantum Physics and Band theory of solids

Introduction to quantum physics: Planck's Law (qualitative treatment), wave-particle duality, de-Broglie hypothesis of matter waves, properties of matter waves, time independent Schrodinger equation, Born interpretation of wave function, particle in one dimensional potential box, Fermi-Dirac distribution.

Classical free electron Theory (Qualitative treatment)- merits and demerits, Bloch theorem, Kronig-Penny model (qualitative treatment), E-k diagram, effective mass of electron, Energy bands in solids, classification of materials into metals, semiconductors and insulators.

UNIT-III Semiconductors and Semiconductor devices

Intrinsic and extrinsic semiconductors- energy band diagram and position of fermi level (qualitative treatment).

Direct and indirect band-gap semiconductors, Formation of PN junction, energy level diagram of PN junction, I-V characteristics of PN junction diode; construction, working and characteristics of Photo diode, solar cell and light emitting diode, Hall effect and its applications

UNIT-IV Nanotechnology

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods-top-down fabrication: Ball milling, physical vapor deposition (PVD), chemical vapor deposition (CVD), characterization techniques – basic principles of XRD, SEM, TEM; applications of nanomaterials.

UNIT-V Lasers and Fiber Optics

Introduction to interaction of radiation with matter: Absorption, spontaneous emission and stimulated emission, Einstein coefficients and their relations, 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 and semiconductor laser, applications of lasers.

Introduction to optical fibers, total internal reflection, construction of optical fiber, acceptance angle and numerical aperture, step and graded index fibers, block diagram of optical fiber communication system, applications of optical fibers.

Text books:

1. A Text book of Engineering Physics by P K Palanisamy: Scietech publication.
2. Engineering Physics by V Rajendran, McGraw Hill Education.

Reference books:

1. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd dition,2022.
2. Essentials of Nanoscience & Nanotechnology by Narsimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.
3. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications.

APPLIED PHYSICS LAB

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221081	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B. Tech I Year I Semester

Course Outcomes:

At the end of the course, the student will be able to

1. Apply optical phenomena to characterize optical sources and components.
2. Characterize semiconductors and semiconductor devices.
3. Study transient response of RC circuit and resonance mechanisms in mechanical and electrical systems.
4. Collect data and evaluate the outcomes of an experiment quantitatively and qualitatively.
5. Carry out experimental data analysis.

LIST OF EXPERIMENTS

1. Newton's rings: Determination of the radius of curvature of a given plano-convex lens by forming Newton's rings.
2. Diffraction grating: Determination of wavelength of a given monochromatic source using a plane diffraction grating.
3. Dispersive power: Determination of dispersive power of given prism.
4. Single Slit Diffraction using Laser- Determination of wavelength of given 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. Solar cell: Study of V-I characteristics of solar cell.
9. LCR Circuit: Determination of the resonance frequency of forced electrical oscillator in series and parallel.
10. RC- Circuit: Determination of the time constant of RC-circuit.
11. Optical fiber: a) Determination of the acceptance angle and numerical aperture of optical fiber.
    b) Estimation of attenuation in optical fiber
12. Method of least squares-Torsional pendulum.

    Note: Any 10 experiments are to be performed.

Reference books:

1. Engineering Physics Theory and Practical, C. K. Pandey, A. K. Katiyar.
2. Engineering Physics Lab Manual, C. V. Madhusudan Rao.

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C-PROGRAMMING FOR ENGINEERS

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221501	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B.Tech. I Year I Semester

Course Outcomes:

At the end of this course, the student would be able to

1. Design Algorithms and Flowcharts for real world applications.
2. Know various operators and decision statements for Program development.
3 Design programs involving iteration statements and code reusability using Functions.
4. Develop programs using arrays and identify various string handling functions.
5. Analyze various searching and sorting techniques.

UNIT - I:

Introduction: Introduction to Computers, Number Systems & Conversions, Algorithms, Flowcharts.
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 Associatively with suitable illustrative "C" Programs.
Conditional/Decision Statements: if, if-else, Nested if-else, else-if ladder, and Switch-Statement with suitable illustrative "C" Programs.

UNIT - III:

Loop Control Statements: while, do-while and for with suitable illustrative "C" Programs, break, continue.
Pointers: Defining pointers, increment & decrement operations, Pointer to Pointers.
Functions: Introduction to Functions, benefits of functions, types of functions, Function calls, return Statement, Parameter Passing mechanism: Call-by-Value, Call-by-reference Recursion, Storage Classes.

UNIT - IV:

Arrays: Introduction to Arrays, One-Dimensional Arrays, Two-Dimensional Arrays, Arrays and Functions, Pointers and Arrays.
Strings: Introduction to Strings, String I/O, String Manipulation Functions (strlen( ), strcmp( ), strcat( ),strcpy( ) , strrev( ), toupper(), tolower()).

UNIT - V:

Structures: Definition and Initialization of Structures, Accessing structure members, Unions, typedef.
Searching and Sorting: Linear Search, Binary Search, Bubble Sort, Insertion Sort.
Data Structures: Introduction, Stacks, Queues.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

C-PROGRAMMING FOR ENGINEERS LAB

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221581	L	T	P	C	CIE	SEE	Total
	0	0	2	1.0	40	60	100

B.Tech. I Year I Semester

Course Outcomes:

At the end of this course, the student would be able to

1. Apply the specification of syntax rules for numerical constants, variables and data types.
2. Know the usage of various operators and design programs on decision Statements.
3. Design programs on loop control statements, pointers and code reusability using functions.
4. Develop programs on array and strings.
5. Implement programs on structures and various searching and sorting techniques.

Week 1

Ubuntu and Linux Commands.

Week 2

Designing of flowcharts and algorithms

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.
9. Program to find the roots of quadratic equation.

Week 3

Programs on operators.(min 9 programs)

Programs on precedence and Associativity & Type conversions.

Programs on Conditional Statements or Decision Statements.(12)

Week 4,5,6

Programs on Loop Control Statements.(12)

Programs on Pointers, pointer arithmetic, pointer to pointer (6).

Programs on Functions, Recursion& Storage classes.(8)

Week 7,8

Programs on One Dimensional Arrays. (3)

Programs on Two Dimensional Arrays. (2)

Programs on Arrays and Functions, Pointer to Array.

Programs on Strings with string built-in or manipulation Functions.(8)

Week 9,10,11

Programs on Accessing Structures.(4)

Programs on Unions, typedef(4)

Implementation of Linear Search and Binary Search.

Implementation of Bubble Sort and Insertion Sort

ENGLISH FOR SKILL ENHANCEMENT

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221003	L	T	P	C	CIE	SEE	Total
	2	0	0	2	40	60	100

B. Tech I Year I Semester

Course Objectives:

This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

Course Outcomes:

Students will be able to:

Understand the importance of vocabulary and sentence structures.

1. Choose appropriate vocabulary and sentence structures for oral and written communication.
2. Demonstrate understanding of the rules of functional grammar.
3. Develop comprehension skills from the known and unknown passages through effective reading strategies.
4. Construct paragraphs, letters, essays, abstracts, précis and reports in various contexts thereby improving proficiency in writing modules of English.

UNIT - I

Chapter entitled '***Toasted English***' **by R.K.Narayan** from ***"English: Language, Context and Culture"*** published by Orient Black Swan, Hyderabad.

Vocabulary: The Concept of Word Formation - The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

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

Writing: Sentence Structures - Use of Phrases and Clauses in Sentences - Importance of Proper Punctuation - Techniques for Writing precisely – Paragraph Writing -Types, Structures and Features of a Paragraph - Creating Coherence - Organizing Principles of Paragraphs in Documents.

UNIT - II

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture" published*** by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-Verb Agreement.
Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice
Writing: Nature and Style of Writing - Defining/Describing People, Objects, Places and Events – Classifying - Providing Examples or Evidence.

UNIT - III

Chapter entitled **'Lessons from Online Learning' by F. Haider Alvi, Deborah Hurst et al** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.
Writing: Format of a Formal Letter - Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice
Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion – Précis Writing.

UNIT - V

Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Technical Vocabulary and their Usage
Grammar: Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)
Reading: Reading Comprehension-Exercises for Practice
Writing: Technical Reports - Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

TEXTBOOK:

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
3. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
4. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221082	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech I Year I Semester

Course Objectives:

1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. To improve the fluency of students in spoken English and neutralize the impact of dialects.
5. To train students to use language appropriately for public speaking, group discussions and interviews

Course Outcomes:

Students will be able to:

1. Reproduce speech sounds and improve language
2. Develop accent and pronunciation in various situations
3. Understand variants in pronunciation by differentiating between British and American accents
4. Identify the diverse purposes of listening and speaking
5. Exhibit critical thinking, problem-solving and decision-making skills through Group Discussions

Exercise I

CALL Lab:

Understand: Listening Skill- its importance-Purpose-Process-Types-Barriers-Effective Listening.

Practice: Introduction to Phonetics- Speech Sounds- Vowels and Consonants- Minimal Pairs - Consonant Clusters - Past Tense Marker and Plural Marker - *Testing Exercises*

ICS Lab:

Understand: Spoken vs. Written language - Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise II

CALL Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress patternin sentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise III

CALL Lab:

Understand: Errors in Pronunciation-Neutralizing Mother Tongue Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation - *Testing Exercises*

ICS Lab:

Understand: Descriptions – Narrations - Giving Directions and Guidelines – Blog Writing

Practice: 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:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests - *Testing Exercises*

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication - Presentation Skills.

Practice: Making a Short Speech – Extempore - Making a Presentation.

Exercise V

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:

Understand: Group Discussion

Practice: Group Discussion

REFERENCE BOOKS:

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* CambridgeUniversity Press
3. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.*Orient Black Swan Pvt. Ltd.

ELEMENTS OF MECHANICAL ENGINEERING

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221301	L	T	P	C	CIE	SEE	Total
	0	0	2	1	50	-	50

B.Tech. I Year I Semester

Course Outcomes:

At the end of the course, students will be able to:

1. Understand the operation, usage and applications of different measuring instruments and tools.
2. Prepare simple composite components and joining different materials using soldering process.
3. Identify tools & learn practically the process of turning, milling, grinding on mild steel pieces.

LIST OF EXPERIMENTS

Perform any ten experiments from the following

1. Study of measurement units.
2. Measurement of length, height, diameter by vernier calipers.
3. To measure diameter of a given wire and sphere, thickness of a given sheet and volume of an irregular lamina using micrometer screw gauge.
4. Use of straight edge and sprit level in finding the flatness of surface plate.
5. Determination of flash and fire point of a given fuel
6. Metal joining process–soldering of metal alloys to any PCB board
7. A simple composite geometry preparation by hand layup method.
8. Grouping of dry cells for a specified voltage and current and its measurement using ammeters and voltmeters etc.
9. Drop point and penetration apparatus for grease.
10. Determination of viscosity of liquid lubricants and fuels.
11. Demonstration of lathe, milling, drilling, grinding machine operations.
12. Study of constructional features of a metallurgical microscope.
13. Study of 3D printing of different components.
14. Assembly /disassembly of engines.
15. Study of boilers.

ENGINEERING WORKSHOP

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221381	L	T	P	C	CIE	SEE	Total
	0	1	3	2.5	40	60	100

B. Tech. I Year I Semester

Course Outcomes:

At the end of the course, the student will be able to

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.

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

1. Carpentry – T-Lap Joint, Dovetail Joint & Tenon Joint.
2. Fitting – V-Fit, Step Cutting & Flat Filling.
3. Tin-Smithy – Open Scoop, Rectangular Tray & Conical Funnel.
4. Foundry – Preparation of Green Sand Mould using Single Piece and Split Pattern.
5. Welding Practice – Arc Welding – Lap Joint & Butt Joint.
6. House-wiring – Parallel Connection, Series Connection & Two-way Switch.

2.TRADES FOR DEMONSTRATION & EXPOSURE

Plumbing, Machine Shop, Power tools in construction and Wood Working

TEXT BOOKS:

1. Manufacturing Engineering and Technology, Kalpakjian S. and Steven S. Schmid, 4th edition, Pearson Education India Edition, 2002.
2. 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.

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

MATHEMATICS II (ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS)

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222005	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B.Tech I Year II Semester

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives:

To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions

The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course Outcomes:

After learning the contents of this course the students must be able to:

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:

Introduction to ODE, 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) $= e^{ax}, \sin ax, \cos ax$ *and* $x^k, e^{ax}V(x), x^kV(x)$. Method of variation of parameters, Equations reducible to Linear ODE with constant coefficients: Cauchy-Euler Equation and Legendre's Equations.

Applications: Electric Circuits.

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 by B.S. Grewal, Khanna Publishers, 36th Edition, 2010
2. Advanced Engineering Mathematics by Jain &Iyengar, Narosa Publications.

Reference Books:

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

ENGINEERING CHEMISTRY

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222006	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B.Tech I Year II Semester

Course Objectives :

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion - it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

Course Outcomes:

The students will able to

1. understand the basic properties of water and its usage in domestic and industrial purposes.
2. acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
3. learn the fundamentals and general properties of polymers and other engineering materials.
4. acquire knowledge of various energy sources.
5. apply the knowledge of engineering materials in daily life.

UNIT - I: Water and its treatment: (10)

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation - Determination of F^- ion by ion- selective electrode method.

Boiler Troubles - Introduction. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange process. Desalination of Brackish water - Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion: (11)

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of Zn-air and Lithium-ion battery. Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode & impressed current methods and Electroless plating.

UNIT - III: Polymeric materials: (9)

Definition – Classification of polymers with examples – Types of polymerizations – addition and condensation polymerization with examples – Nylon 6:6, Terylene **Plastics:** Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC, Bakelite and Teflon.

Rubbers: Natural rubber and its vulcanization.

Synthetic Rubbers- Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages – Poly lactic acid and poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources: (9)

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula, Numerical problems. Classification- Solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Trans esterification and advantages.

UNIT - V: Engineering Materials: (9)

Cement: Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermo response materials- Poly acryl amides and Poly vinyl amides

Lubricants: Classification of lubricants with examples-characteristics of a good lubricant - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpat rai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.

REFERENCE BOOKS:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

ENGINEERING CHEMISTRY LABORATORY

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222084	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B.Tech I Year II Semester

Course Objectives:

The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

1. Estimation of hardness and chloride content of water to check its suitability for drinking purpose.
2. To perform estimation of acids and bases using conductometry, potentiometry and pH metry methods.
3. To prepare polymers such as Thiokol rubber and Nylon-6 in the laboratory.
4. Skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course Outcomes:

The experiments will make the student gain skills on:

1. Determination of parameters like hardness and Chloride content of water.
2. Determination of rate of corrosion of mild steel in various conditions.
3. To perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
4. To prepare polymers like Thiokol rubber and Nylon-6.
5. Estimation of Saponification value, Viscosity and Surface tension of lubricant oils.

Choice of 8-10 Experiments from the following:

1. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.
2. **Corrosion:** Determination of rate of corrosion of mild steel in various conditions.
3. **Conductometry:**
   a. **1.**Estimation of the concentration of an acid by Conductometry.
   b. **2.**Estimation of the concentration of Mixture of acids by conductometry
4. **Potentiometry:**
   a. Estimation of the Concentration of an acid by potentiometry
   b. Estimation of the amount of Fe^{+2} by Potentiometry
5. **pH Metry:** Determination of an acid concentration using pH meter.
6. **Argentometry:** Estimation of Chloride content of water by argentometry
7. **Preparations:**
   a. Preparation of Thiokol rubber.
   b. Preparation Nylon – 6.

8. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.
3. Estimation of Surface tension of lubricant oil using Stalagmometer.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publication

ENGINEERING MECHANICS

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222304	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B.Tech I Year II Semester

Course Outcomes:

At the end of the course, the student will be able to

1. Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
2. Solve problem of bodies subjected to friction.
3. Find the location of centroid and centre of gravity of the composite sections.
4. Compute moment of inertia of various sections
5. Analyze the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.

UNIT- I

INTRODUCTION TO ENGINEERING MECHANICS - Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D; 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.

UNIT- II

FRICTION: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.

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

UNTI- IV

AREA MOMENT OF INERTIA: Definition, Moment of inertia of plane sections from first principles, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem.

MASS MOMENT OF INERTIA: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

UNIT- V

REVIEW OF PARTICLE DYNAMICS: Rectilinear motion, Plane curvilinear motion, Work-kinetic energy, power, Impulse-momentum.

KINETICS OF RIGID BODIES: Basic terms, general principles in dynamics, Types of motion, centre of rotation in plane motion; D' Alembert's principle and its applications in plane motion and connected bodies; Kinetics of rigid body rotation.

TEXT BOOKS:

1. Shames and Rao, Engineering Mechanics, Pearson Education
2. Reddy Vijay Kumar K. and J. Suresh Kumar, Singer's Engineering Mechanics –Statics & Dynamics

REFERENCE BOOKS:

1. Beer F.P & Johnston E.R Jr., Vector Mechanics for Engineers – Statics and Dynamics, Mc Graw Hill.
2. Hibbeler R.C, Engineering Mechanics, Pearson.
3. Khurmi R.S, Khurmi N., Engineering Mechanics, S. Chand.
4. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University

ENGINEERING MATERIALS

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222305	L	T	P	C	CIE	SEE	Total
	2	0	0	2	40	60	100

B.Tech I Year II Semester

Course Outcomes:

At the end of the course, the student will be able to

1. Classify the various materials that will be essential for the mechanical engineering applications and testing for their mechanical properties
2. Understanding the composition and properties of Ferrous and Non-Ferrous Alloys
3. Analyze the manufacturing methods of composite materials for their overall feasibility
4. Evaluate the properties of ceramics and polymers employed in engineering components
5. Understanding the features of nano materials and high entropy alloys for engineering applications

UNIT- I:

INTRODUCTION: Classification of engineering materials, mechanical properties of metals and their testing equipment/procedures, ASTM standards for testing of materials.

UNIT- II:

METALS AND METAL ALLOYS: Classification, composition, properties and usage. Ferrous alloys-steel, cast iron.
NON-FERROUS MATERIALS: Aluminum, Titanium, Copper and their alloys.

UNIT – III:

COMPOSITES: Classification of composites, Types of reinforcements, Properties of composites in comparison with standard materials
MANUFACTURING METHODS: Hand and spray lay - up, injection molding, resin injection, filament winding

UNIT- IV:

CERAMICS: Classification of ceramic materials, Crystal Structure, Properties of Ceramics and applications, Ceramic fabrication techniques.
POLYMERS: Classification, Thermoplastic and Thermosetting Polymers, Characteristics and Applications

UNIT-V:

MATERIALS IN NANO TECHNOLOGY: Applications, Metal nano particles (Iron and copper).
HIGH ENTROPY ALLOYS: High entropy alloys and oxides, Applications

TEXT BOOKS:

1. William. D. Callister, David G. Rethwisch, Materials Science and Engineering: An Introduction, John Wiley & Sons.
2. Donald R Askland and Pradeep P Phule, Essentials of Materials Science and Engineering, by Pradeep P. Fulay, Donald R. Askeland.

REFERENCE BOOKS:

1. George Murray, Charles V. White, Wolfgang Weise, Introduction to Engineering Materials, CRC Press.
2. Myer Kutz, Mechanical Engineers' Handbook, John Wiley & Sons.
3. M.A. Shah, K.A.Shah, Nano technology, the science of Small, WILEY, Second Edition.
4. E. Paul De Garmo, J.T. Black, R.A. Kohler. Materials and Processes in Manufacturing, John Wiley and Sons, Inc., NY, 11th Edition.

ENGINEERING GRAPHICS & MODELLING

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222303	L	T	P	C	CIE	SEE	Total
	1	0	4	3	40	60	100

B.Tech I Year II Semester

Course Outcomes:

1. Comprehend the concepts of engineering drawing and CAD software.
2. Conceptualize and draw the projections of points and straight lines.
3. Visualize and project different views of a planes and solids.
4. Evaluate the surfaces of solids developed for further processing in the engineering applications.
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.

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 Surfaces of Right Regular Solids: Prism, Pyramid, Cylinder and Cone.

Implementation In CAD: 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 orthographic views to isometric views.

Orthographic Projections: conversion of isometric views to orthographic views.

Implementation In Cad: Drawing isometric views from giving orthographic views and vice-versa using a CAD package.

TEXT BOOKS:

3. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R., Charotar Publishing House.

REFERENCE BOOKS:

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

PYTHON PROGRAMMING LAB

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222583	L	T	P	C	CIE	SEE	Total
	0	2	2	3	40	60	100

B. Tech I Year II Semester

Course Outcomes:

After completion of the course, the student should be able to

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Implement programs using modular approach, file I/O, Python standard library

Week -1 (Installation & Simple Applications)

1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.

Week - 2: (Mathematical Expressions & I/O Operations)

1. i) Write a program to calculate compound interest when principal, rate and number of periods are given.
   ii) Given coordinates (x1, y1), (x2, y2), find the distance between these two points.
2. Read name, address, email and phone number of a person through keyboard and print the details.

Week – 3 (Conditional statements)

1. Write a Program to find the given number is even or odd.
2. Write a program to find the maximum of three numbers (use 'if-elif-else' ladder).

Week – 4 (Loop Statements)

1. Write a program to Print the Fibonacci sequence using while loop.
2. Write a program to Print the below triangle using for loop:

   5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1
3. Write a program to print all prime numbers in a given interval (using break statement).

Week – 5 (List, Tuple, Dictionary)

1. i) Write a program to illustrate operations of List & Tuple
   ii) Write a program to find common values between two lists.
2. Write a program to perform addition of two matrices.
3. Write a program to read dictionary values from the user and find an element using given key.

Week – 6 (Functions & Modules)

1. Write a function called is_sorted that takes a list as a parameter and return True if the list is sortedin ascending order and False otherwise.
2. Write a function called GCD that takes parameters **a** and **b** and return their greatest common divisor.
3. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.

Week –7(Strings)

1. Write a program to add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
2. Write a program to remove the given word in all the places in a string?
3. Write a function that takes a sentence as an input parameter and replaces the first letter of everyword with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

Week–8 (Classes & objects)

1. Write a program to add two complex numbers using classes and objects
2. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draw a representation of the Rectangle on the Canvas.

Week– 9 (Inheritance)

1. Write a program to demonstrate the various types of Inheritances.

Week– 10(File Concepts)

1. Write a program to merge two given file contents into a third file.
2. Write a program to Read text from a text file, find the word with most number of occurrences
3. Write a program that reads a file *file1* and displays the number of words, number of vowels, and blank spaces.

Week – 11(Packages)

1. a) Install NumPy package with pip and explore it.
   b) Illustrate 1-D and 2-D vector processing and slicing.

2. Explore matplotlib with plotpy and visualize the data.

TEXT BOOKS:

1. "Python Programming- Using Problem Solving Approach", Reema Thareja, Oxford
2. "Python Programming-Problem Solving, Packages and Libraries", Anurag Gupta, G.P. Biswas, Mc Graw Hill

MECHANICS OF SOLIDS

Department of Mechanical Engineering					II B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Pre-requisites: Mathematical Knowledge at pre-university level

Course Outcomes:

At the end of the course, students will be able to:

6. Understand the internal forces, moments, stresses, strains, and deformations in structures madeof various materials acted on by a variety of loads.
7. Appreciate the concepts of shear force and bending moments. Generate shear force and bending moment diagrams for any given beam problem.
8. Develop the bending formula and apply to the design of beams.
9. Applying the theories of elastic failure for structure under consideration and evaluating principal stresses and strains.
10. Analyzing the failure of shafts under the torsional forces.

Syllabus

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 moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience

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 single overhanging beams subjected to point loads, UDL, 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, sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular sections.

UNIT-IV: Principal Stresses and Strains:

Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions

Theories of Failure: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

UNIT-V: Torsion of Circular Shafts:

Theory of pure torsion – Derivation of Torsion equations: $T/J = \tau/r = G\theta/L$– Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts

Columns and Struts: Euler's Theory, Limitations of Euler's theory, Equivalent Length, Rankine's Formula.

Textbooks:

1. S. S. Rattan, "Strength of Materials", Second Edition Tata McGraw Hill Education Pvt. Ltd,New Delhi,2011

Reference Books:

1. Barry J. Goodno and James M. Gere, "Mechanics of Materials" Ninth Edition, Cengage Learning, 2018.
2. U. C. Jindal, "Strength of Materials", Pearson Education India,2012
3. Egor P. Popov, Toader A. Balan, "Engineering Mechanics of Solids", PHI Learning 2010
4. G. H. Ryder, "Strength of Materials", Macmillan Long Man Publications, 1961
5. W. A. Nash and M. C. Potter, "Strength of Materials", Fifth Edition, Schaum's Outline Series, 2011

METALLURGY & MATERIAL SCIENCE

Department of Mechanical Engineering					II B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Course Outcomes:

At the end of the course, student will be able to

1. Understand the types of Crystal structures and their defects.
2. Comprehend the basic concepts of phase transformation during solidification employing phase diagrams.
3. Demonstrate importance of critical understanding of heat treatment in achieving requiredproperties.
4. Apply the knowledge of heat treatment to enhance surface properties.
5. Analyze the properties and micro structure of ferrous and non-ferrous alloys.

UNIT - I: Structure of Metals:

Crystal structures- BCC, FCC, HCP. Imperfection in solids: Point, line,surface and volume defects.

Mechanical behavior of Materials: Strengthening mechanisms, slip systems, critical resolved shear stress.

UNIT – II Phase diagrams:

Necessity of alloying, Hume – Rothery rules, substitutional and interstitial solid solutions. Interpretation of binary phase diagrams, eutectic, peritectic, eutectiod, peritectoid and monotectic reactions.

Iron Iron-carbide phase diagram: Detailed study of Iron Iron-carbide phase diagram and microstructural aspects of austenite, ledeburite, pearlite, ferrite and cementite.

UNIT - III Heat treatment of steels:

Isothermal transformation diagrams for Fe-C alloys and microstructures development. Martensite, Bainite. Annealing, Normalizing, Hardening, Tempering.

UNIT - IV: Continuous cooling curves:

Continuous cooling curves and interpretation of final microstructures and properties-Thermo mechanical treatments like austempering, martempering.

Surface hardening methods: case hardening, carburizing, nitriding, carbo-nitriding, flame and induction hardening,

UNIT - V: Ferrous Alloys:

Alloy steels, properties and applications of stainless steels and tool steels, maraging steels- Types of cast irons (grey, white, malleable and spheroidal graphite cast irons).

Non-Ferrous Alloys: Copper and its alloys (Brass and bronze)- Aluminium and its alloys (Al-Cu Alloys).

TEXT BOOKS:

1. Sidney H Avner, Introduction to Physical Metallurgy, McGraw Hill,2017

REFERENCE BOOKS:

1. V. Raghavan, "Material Science and Engineering', Prentice Hall of India Private Limited, Fifth Edition.
2. William. D. Callister, David G. Rethwisch, "Materials Science and Engineering: An Introduction", John Wiley & Sons, 2018.
3. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 9th Edition, Indian Reprint, 2009.
4. U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011.

PRODUCTION TECHNOLOGY

Department of Mechanical Engineering					II B.Tech I Semester		
Course Code	**Hours/Week**			**Credits**	**Marks**		
	L	**T**	**P**	**C**	CIE	SEE	Total
	3	**0**	**0**	**3**	**40**	**60**	**100**

Course Outcomes:

Student will be able to:

1. Understand the basic concepts of casting processes to make different engineering components of industrial applications.
2. Identify the importance of permanent joining and principle behind different welding processes.
3. Evaluating the welded components for their defects using destructive and non-destructive testing methods.
4. Distinguish the hot working and cold working processes and recognize the processes of various rolling operations.
5. Elaborates the uniqueness of extrusion and forging processes in metal working.

UNIT - I: Casting:

Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances; Properties of moulding methods. Methods of Melting - Crucible melting and cupola operation – Defects in castings.

UNIT – II Welding:

Classification – Types of welds and welded joints and their characteristics, Welding Positions - Gas welding - Types, Arc welding, Shielded metal arc welding, submerged arc welding, Resistance welding,

UNIT - III

Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non-destructive testing of welds.

UNIT - IV:

Hot working, cold working, recovery, recrystallisation and grain growth. Sheet metal Operations: Stamping, Blanking and piercing, Coining, Hot and cold spinning. Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements. Drawing and its types – wire drawing and Tube drawing.

UNIT - V: Extrusion of Metals:

Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion, Hydrostatic extrusion. Forces in extrusion.

Forging Processes: Forging methods – Smith forging, Drop Forging, Rotary forging – forging defects.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao/ Vol.1 / Mc Graw Hill Education/ 5th Edition, 2018.

REFERENCE BOOKS:

1. Manufacturing Engineering & Technology / Serope Kalpakjian / Steven R. Schmid / Pearson,7th Edition,2014
2. Production Technology Vol.: 1, WILEY, sreeramulu M, 2018
3. A Text book of Production Technology (Manufacturing Processes)/ Dr.P.C. Sharma / S. Chand Publications /1st Edition, 2006.
4. Manufacturing processes H. S. Shan, Second Edition, Cambridge University Press, 2017.
5. Production Technology: Manufacturing Processes, Technology and Automation / R. K. Jain/Vol.1/Khanna Publishers /19th Edition, 2009.
6. Elements of Workshop Technology/ S.K. Hajra Choudhury, A.K. Hajra Choudhury, Nirjhar Roy/Vol.1/ Media Publishers & Promoters Pvt. Ltd./1st Edition,2008.

THERMODYNAMICS

Department of Mechanical Engineering					II B.Tech I Semester		
Course Code	**Hours/Week**			**Credits**	**Marks**		
	L	**T**	**P**	**C**	CIE	SEE	Total
	3	**1**	**0**	**3**	**40**	**60**	**100**

Course Outcomes:

At the end of the course, students will be the able to

1. Understand the basics of Thermodynamics
2. Apply first and second laws of thermodynamics to different systems
3. Appreciate the concepts of phase transformation of pure substance.
4. Analyze mixtures of perfect gases and understanding the concepts of perfect gas laws.
5. Evaluate the performance of power cycles

UNIT- I Introduction

Basic Concepts: System, Control Volume Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT- II First Law of Thermodynamics:

PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.

Second Law of Thermodynamics: Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, 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.

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.

UNTI- 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

Mixtures of perfect Gases – Mole Fraction, Mass friction 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 const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour.

UNIT- V Power Cycles:

Otto, Diesel, Dual Combustion cycles, 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 BOOKS:

1. Engineering Thermodynamics / PK Nag / Mc Graw Hill

REFERENCE BOOKS:

1. Thermodynamics – An Engineering Approach by Yunus A. Cengel & Michael A. Boles, TMH
2. Fundamentals of Classical Thermodynamics by G. Van Wylan & R.E. Sonntag, John WileyPub
3. Engineering Thermodynamics by Jones & Dugan, PHI, 2007.
4. Thermodynamics by M. Achutan, PHI, 2nd Edition, 2013.
5. Thermodynamics & Heat Engines by R. Yadav, Central Book Depot, Allahabad.
6. Thermodynamics by S.C. Gupta, Pearson Publications.

PRODUCTION TECHNOLOGY LABORATORY

Department of Mechanical Engineering					II B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Course Outcomes:

At the end of the course, students will be the able to

1. Evaluate the performance of Electrical Circuits and Electrical Machines. Understand the operating methods of moulding, casting, welding and mechanical press tools.
2. Measuring the properties of moulding sand.
3. Evaluate the quality of welded joints and products made by mechanical press.

List of experiments/demonstrations:

Minimum of 10 Exercises need to be performed

I. **Metal Casting Lab:**

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing for strengths.
3. Sand properties testing for permeability
4. Moulding of solid pattern and subsequent casting using molten aluminum.
5. Moulding of split-piece pattern by designing the elements of gating system.

II. Welding Lab:

1. Spot Welding
2. Brazing
3. Gas welding

III. Mechanical Press Working:

1. Blanking & Piercing operation and study of compound die press tool.
2. Bending and other operations

IV. Processing of Plastics

1. Injection Moulding

.

REFERENCE BOOKS:

Dictionary of Mechanical Engineering – G.H.F. Nayler, Jaico Publishing House

MATERIAL SCIENCE & MECHANICS OF SOLIDS LABORATORY

Department of Mechanical Engineering					II B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Course Outcomes:

At the end of the course, students will be the able to

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. Evaluate the hardness and mechanical properties of treated and untreated steels.

MATERIAL SCIENCE LAB

List of Experiments:

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.

MECHANICS OF SOLIDS LAB:

List of Experiments:

1. Direct tension test
2. Bending test on Simple supported beam
3. Bending test on Cantilever beam
4. Torsion test
5. Brinell hardness test/ Rockwell hardness test
6. Test on springs
7. Izod Impact test/ Charpy Impact test

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REFERENCE BOOKS:

1. William. D. Callister, David G. Rethwisch, “Materials Science and Engineering: AnIntroduction”, John Wiley & Sons, 2018.
2. S. S. Rattan, “Strength of Materials”, Second Edition Tata McGraw Hill Education Pvt. Ltd,New Delhi,2011

COMPUTER AIDED MACHINE DRAWING

Department of Mechanical Engineering				II B.Tech I Semester		
Course Code	**Hours/Week**		**Credits**	**Marks**		
	L	**T**	**P**	**C**	CIE	SEE	Total
	1	**0**	**2**	**1**	**40**	**60**	**100**

Course Outcomes:

At the end of the course, students will be the able to

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

Drawing of Machine Elements and simple parts

1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cottered joints and knuckle joint.
3. Rivetted joints
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and foot step bearings.

Drawing of Machine Elements: Using Computer aided drafting in addition to manual drawing

Assembly Drawings:

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

1. Machine tool parts: Tail stock, Tool Post, Machine Vices.
2. Other machine parts - Screw jack, Connecting rod, Plumber block.
3. Valves - Steam stop valve, spring loaded safety valve.
4. Miscellaneous: Eccentric, Stuffing Box

Assembly Drawings: Using Computer aided drafting in addition to manual drawing

NOTE: 1. First angle projection to be adopted.

TEXT BOOKS:

1. Machine Drawing / N.D. Bhatt / Charotar

.

REFERENCE BOOKS:

1. Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson
2. Machine Drawing by / Bhattacharyya / Oxford
3. Machine Drawing / Ajeet Singh / Mc Graw Hill

KINEMATICS OF MACHINERY

Department of Mechanical Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Course Outcomes:

At the end of the course, students will be able to:

1. Understand working principles of different lower and higher pairs, mechanisms and their inversions.
2. Draw the velocity and acceleration polygons to compute their magnitude.
3. Understanding various steering gear mechanisms and Hooke's joint.
4. Appreciate different cams and followers used in mechanical systems.
5. Evaluating the number of teeth and velocity ratio required in gearing systems.

UNIT- I:

Mechanisms: Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematics pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully and incompletely constrained.

Mechanism and Machines – Mobility of Mechanisms: Grubler's criterion, classification of machines –kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains.

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 line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.

Analysis of Mechanisms: Analysis of slider crank chain for displacement- velocity and acceleration of slider – Acceleration diagram for a given mechanism.

UNIT – III:

Straight-line motion mechanisms: Tchebicheff's and Robert Mechanism - Pantographs
Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman'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 3 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 – Types – Simple – compound and reverted gear trains – 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 BOOKS:

1. Rattan, S.S, “Theory of Machines”, 4th Edition, Tata McGraw-Hill, 2014.

REFERENCE BOOKS:

1. Uicker, J.J., Pennock G.R and Shigley, J.E., “Theory of Machines and Mechanisms”, 4 thEdition, Oxford University Press, 2014.
2. Sadhu Sigh, “Theory of Machines”, Third Edition, Pearson Education, 2012.
3. Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors, 2005.
4. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.
5. Rao. J.S. and Dukkipati. R.V. "Mechanisms and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

FLUID MECHANICS & HYDRAULIC MACHINES

Department of Mechanical Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A221503	L	T	P	C	CIE	SEE	Total
	3	0	0	2	40	60	100

Course Outcomes:

1. Understand fluid properties and fluid statics.
2. Identify type of fluid flow patterns, measuring fluid pressure and describe continuity equation.
3. Evaluate the flow losses in pipes and evaluating the forces on different vanes.
4. Analyze the performance of various turbines.
5. Appreciate the working principles of pumps and their applications.

UNIT – I

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity, and surface tension - vapour pressure and their influence on fluid motion- atmospheric, gauge and vacuum pressures – **Measurement of pressure**- Piezometer, U-tube and differential manometers.

UNIT – II

Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows- steady & unsteady, uniform & non-uniform, laminar & turbulent, rotational & irrotational flows- equationof continuity for one dimensional flow and three-dimensional flows.

Fluid dynamics: Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend. Measurement of flow: Pitot tube, venturi meter, and orifice meter.

UNIT – III

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

UNIT – IV

Hydraulic Turbines: Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory- functions and efficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities.

UNIT – V

Centrifugal pumps: Classification, working, work done – barometric head- losses and efficiencies specific speed.

Reciprocating pumps: Working, Discharge, slip.

TEXT BOOK:

1. Fluid Mechanics and Hydraulic Machines by Er. R. K. Bansal, Laxmi publication.

REFERENCE BOOKS:

1. Hydraulics, Fluid mechanics and Hydraulic Machinery - MODI and SETH, 21st Edition,standard Book House.
2. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K. Kataria & Sons,2018
3. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International publishers
4. Hydraulic Machines by T.R.Banga & S.C. Sharma, 7th Edition, Khanna Publishers

IC ENGINES & GAS TURBINES

Department of Mechanical Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A221502	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Course Outcomes:

At the end of this course, the student would be able to

1. Understand the concepts of IC Engine systems and its classification.
2. Analyze the combustion phenomenon in SI and CI engines.
3. Evaluate the testing and performance parameters of IC engines.
4. Evaluate the working principles of compressors in industrial applications.
5. Computation of performance characteristics of gas turbines.

UNIT - I:

I.C. Engines: Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling andLubrication system, Fuel properties and Combustion Stoichiometry.

UNIT - II:

Combustion in SI engines: Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effectof engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types of SI engines.

Combustion in CI engines: Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating

UNIT - III:

Testing and Performance: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart

Compressors: Classification of compressors – Fans, blowers and compressors – positive displacement and dynamictypes – reciprocating and rotary types.

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.

UNIT - IV:

Rotary Compressor (Positive displacement type): Roots Blower, vane sealed compressor, mechanical details and principle of working – efficiency considerations.

Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

UNIT - V:

Gas Turbines: Simple Gas Turbine Plant – Ideal Cycle – Closed Cycle and Open Cycle for Gast Turbines, Constant Pressure Cycle, Constant Volume Cycle, Efficiency – Work Ratio and Optimum Pressure Ration for Simple Gas Turbine Cycle. Parameters of Performance, Actual Cycle.

TEXT BOOKS:

1. I.C. Engines, V. Ganesan, 4th Edition, Mc Graw Hill

REFERENCE BOOKS:

1. Thermal Engineering, Mahesh M Rathore, Tata Mc Graw Hill, 2010
2. Applied Thermodynamics for Engineering Technologists, Eastop & McConkey, Pearson
3. Fundamentals of Classical Thermodynamics, Vanwylen G.J., Sonntag R.E., Wiley Eastern
4. Internal Combustion Engines Fundamentals, John B. Heywood, McGraw Hill Ed.

INSTRUMENTATION AND CONTROL SYSTEMS

Department of Mechanical Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A221502	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Course Outcomes:

At the end of this course, the student would be able to

1. Understand the basic terms related to measurements and errors.
2. Appraise the displacement and Temperature measuring instruments.
3. Evaluate the working of various physical variable Level and pressure measuring instruments.
4. Comprehend the measuring of stress-strain developed in engineering components.
5. Comprehend the concept of control system and Force, Torque and Power measuring instruments.

UNIT - I:

Basic principles of measurement – Measurement systems, generalized configuration and functional description of measuring instruments – examples. Static and Dynamic performance characteristics– sources of errors, Classification and elimination of errors.

UNIT - II:

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Using Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers.

Measurement of Temperature: Various Principles of measurement-Classification: Expansion Type: Bimetallic Strip- Liquid in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer

UNIT - III:

Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge Tester (Piston gauge), Bourdon pressure gauges, Bellows, Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges, ionization pressure gauges, McLeod pressure gauge.

Measurement of Level: Direct methods – Indirect methods – Capacitive, Ultrasonic,Magnetic, Cryogenic Fuel level indicators –Bubbler level indicators.

UNIT - IV:

Flow measurement: Rotameter, magnetic, Ultrasonic, Turbine flowmeter, Hot – wire anemometer,Laser Doppler Anemometer (LDA).

Stress-Strain measurements: Various types of stress and strain measurements –Selection and installation of metallic strain gauges; electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending, compressive and tensile strains – Temperature compensation techniques, Use of strain gauges for measuring torque, Strain gauge Rosettes.

UNIT - V:

Measurement of Force, Torque and Power: Elastic force meters, load cells, Torsion meters, Dynamometers.

Elements of Control Systems: Introduction, Importance – Classification – Open and closed systems- Servomechanisms – Examples with block diagrams.

TEXT BOOKS:

1 Principles of Industrial Instrumentation & Control Systems/Chennakesava R alaavala, -Cengage Learning/1st Edition, 2009.

REFERENCE BOOKS:

1. Basic Principles – Measurements (Instrumentation) & Control Systems /S. Bhaskar/ Anuradha Publications
2. Measurement Systems: Applications & design, E. O. Doebelin, TMH, Tata Mcgraw Hill/6th Edition, 2017.
3. Instrumentation, Measurement & Analysis, B.C. Nakra & K.K. Choudhary, TMH, 4th Edition, 2016.
4. Experimental Methods for Engineers / Holman
5. Mechanical and Industrial Measurements / R. K. Jain/ Khanna Publishers.
6. Mechanical Measurements / Sirohi and Radhakrishna / New Age International, 3rd Edition,2013.

FLUID MECHANICS & HYDRAULIC MACHINES LABORATORY

Department of Mechanical Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A221582	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Course Outcomes:

At the end of this course, the student would be able to

1. Test for the performance of different turbines and pumps.
2. analyze a variety of practical fluid flow and measuring devices
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.

REFERENCES:

1) Fluid Mechanics and Hydraulic Machines by Er. R. K. Bansal, Laxmi publication

INSTRUMENTATION LABORATORY

Department of Mechanical Engineering					II B.Tech II Semester		
Course Code	**Hours/Week**			**Credits**	**Marks**		
A222005	**L**	**T**	**P**	**C**	CIE	SEE	Total
	0	**0**	**2**	**1**	**40**	**60**	**100**

Course Outcomes:

After learning the contents of this course the students must be able to:

1. Understanding the different devices for measuring mechanical parameters.
2. Calibrate the measuring devices and analyze the errors in measurement.
3. Evaluate the instruments in terms of accuracy and precision

List of Experiments:

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

Reference Books:

1. Principles of Industrial Instrumentation & Control Systems/Chennakesava R alaavala, - Cengage Learning/1st Edition, 2009.

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

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.

STEAM POWER & JET PROPULSION

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, Intercooling 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

CAD/CAM

B. Tech. III Year I Semester - MECH

L	T	P	C
2	0	0	2

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.

DESIGN OF MACHINE ELEMENTS

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.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
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BASIC MECHANICAL ENGINEERING
OPEN ELECTIVE-I

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

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PRODUCT ENGINEERING
OPEN ELECTIVE-I

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.

THERMAL ENGINEERING LABORATORY

B. Tech. III Year I Semester - MECH

L	T	P	C
0	0	2	1

Course Outcomes

CO1: Understand the assembly/disassembly and their working of IC engines for performance measurement.

CO2: Analyze the output responses of the IC engines by applying thermodynamic principles.

CO3: Evaluate performance parameters for consequent applications.

1. I.C. Engines Valve / Port Timing Diagrams.
2. I.C. Engines Performance test (4 – Stroke Diesel Engines)
3. Heat balance on single cylinder 4 stroke diesel engine
4. Evaluate of engine friction by conducting Morse test on 4 stroke Multi cylinder petrol engine.
5. Evaluate of engine friction by conducting motoring test on 4 stroke petrol engine.
6. Evaluation of Performance and Combustion Characteristics of Duel Fuel Automotive CRDI Engine
7. Determination of Economical speed test for fixed load on 4-stroke engine.
8. Disassembly / Assembly of engines.
9. Performance test on reciprocating air-compressor unit.
10. Study of boilers.

METROLOGY & MACHINE TOOLS LABORATORY

B. Tech. III Year I Semester - MECH

L	T	P	C
0	0	2	1

Course Outcomes

CO1: Understand the kinematic structure of machine tools and their mode of working.
CO2: Perform the machining operations and the measurement of samples using instruments.
CO3: Evaluate the responses for their accuracy and precision.

SECTION – A

1. Measurement of bores by internal micrometers and dial bore indicators.
2. Use of gear teeth, vernier calipers and checking the chordal addendum and choral height of spur gear.
3. Machine tool alignment test on the lathe.
4. Tool maker's microscope.
5. Angle and taper measurements by Bevel protractor & Sine bars.
6. Thread measurement by two wire / three wire method or Tool Makers' microscope.

SECTION – B

1. Step turning and Taper Turning on Lathe Machine.
2. Thread cutting and knurling on lathe machine.
3. Drilling and Tapping
4. Shaping and Planning
5. Slotting
6. Milling
7. Surface Grinding

CAD/CAM LABORATORY

B. Tech. III 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

MACHINE DESIGN

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

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FINITE ELEMENT METHOD
(PROFESSIONAL ELECTIVE – I)

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.

Isoparametric element representation, Shape functions, Convergence requirements, two dimensional four-node disoparametric 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

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ADDITIVE MANUFACTURING
(PROFESSIONAL ELECTIVE – I)

B. Tech. III Year II 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.

COMPOSITE MATERIALS
(PROFESSIONAL ELECTIVE – I)

B. Tech. III Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Knowledge of the crystal structures of a wide range of ceramic materials and glasses.
2. Able to explain how common fibers are produced and how the properties of the fibers are related to the internal structure.
3. Able to select matrices for composite materials in different applications.
4. Able to describe key processing methods for fabricating composites.
5. Evaluate the properties of composites.

UNIT - I

Introduction: Definition, Classification of Composite materials based on structure, based on matrix, Advantages of composites, Applications of composites, Functional requirements of reinforcement and matrix.

UNIT - II

Types of reinforcements and their properties: Fibers: Carbon, Boron, Glass, Aramid, Al2O3, SiC, Nature and manufacture of glass, carbon and aramid fibres, Comparison of fibres. Role of interfaces: Wettability and Bonding, The interface in Composites, Interactions and Types of bonding at the Interface, Tests for measuring Interfacial strength.

UNIT - III

Fabrication of Polymeric Matrix Composites, Structure and properties of Polymeric Matrix Composites, Interface in Polymeric Matrix Composites, Applications; Fabrication of Ceramic Matrix Composites, Properties of Ceramic Matrix Composites, Interface in Ceramic Matrix Composites, Toughness of Ceramic Matrix Composites Applications of Ceramic Matrix Composites.

UNIT - IV

Fabrication of Metal Matrix Composites: Solid state fabrication, Liquid state fabrication and In-situ fabrication techniques; Interface in Metal Matrix Composites: Mechanical bonding, Chemical bonding and Interfaces in In-situ Composites; Discontinuously reinforced Metal Matrix Composites, Properties and Applications. Fabrication of Carbon fiber composites, properties, interface and applications.

UNIT - V

Micromechanics of Composites: Density, Mechanical Properties: Prediction of Elastic constants, Micro mechanical approach, Halpin-Tsai equations, Transverse stresses; Thermal properties: Hydrothermal stresses and Mechanics of Load transfer from matrix to fiber.

TEXTS BOOKS:

1. Composite Materials – Science & Engineering, K.K. Chawla, Springer-Verlag, New York, 1987.

REFERENCE BOOKS:

1. Composites, Engineered Materials Handbook, Vol. 1, ASM International, Ohio, 1988.
2. Structure and Properties of Composites, Materials Science and Technology, Vol. 13, VCH,Weinheim, Germany, 1993
3. Composite Materials: Engineering and Science, F.L. Matthews and R.D. Rawlings, Chapman & Hall, London, 1994

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

MICROPROCESSOR IN AUTOMATION
(PROFESSIONAL ELECTIVE – I)

B. Tech. III Year II Semester - MECH

L	T	P	C
3	0	0	3

COURSE OUTCOMES: At the end of this course, students would be able to:

1. Develop proficiency in understanding number systems, codes (BCD, Excess 3), and designing digital circuits using logic gates etc.
2. Attain a comprehensive understanding of 8085 microprocessor architecture, functional blocks, and timing/control signals.
3. Master 8085 assembly language programming and interfacing peripherals such as programmable interrupt controller (8255).
4. Acquire skills in interfacing analog-to-digital and digital-to-analog converters.
5. Understand the practical applications of microprocessors in diverse industries.

Unit I: Number Systems, codes: BCD, Excess 3, digital electronics: Logic Gates, combinational circuits design: Mux, Demux, Sequential logic circuits design: Flip-flops, Shift registers.

Unit II: Introduction to 8085 Functional Block Diagram, Registers, ALU, Bus systems, Timing and control signals. Machine cycles, instruction cycle and timing states, instruction timing diagrams, Memory interfacing.

Unit III: Assembly Language Programming: Addressing modes, Instruction set, simple programs in 8085; Concept of Interrupt, Need for Interrupts, Programmable interrupt controller; Interfacing peripherals: Programmable peripheral interface (8255).

Unit IV: Interfacing Analog to Digital Converter & Digital to Analog converter, Multiplexed seven segments LED display systems, Stepper Motor Control, Data Communication: Serial Data communication (8251), Programmable Timers (8253)

Unit V: Applications of microprocessors in various industries: Automobiles, Medical, Pharmaceuticals, Textiles and Robotics.

TEXT BOOKS:

1. Digital Electronics: An Introduction to Theory and Practice, William H. Gothmann, PHI Learning Private Limited
2. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh Gaonkar, PENRAM International Publishers.

REFERENCES:

1. Digital Computer Electronics: An Introduction to Microcomputers, Albert Paul Malvino, Tata McGraw-Hill Publishing Company Ltd.
2. Digital Control Systems, Benjamin C. Kuo, Oxford University Press (2/e, Indian Edition, 2007).
3. Microcomputer Experimentation with the Intel SDK-85, Lance A. Leventhal, Prentice Hall

MATERIALS & APPLICATIONS
(OPEN ELECTIVE-II)

B. Tech. III Year II Semester - MECH

L	T	P	C
3	0	0	3

COURSE OUTCOMES: At the end of the course, students will be able to

6. Classify the various materials that will be essential for the mechanical engineering applications and testing for their mechanical properties
7. Understanding the composition and properties of Ferrous and Non-Ferrous Alloys
8. Analyze the manufacturing methods of composite materials for their overall feasibility
9. Evaluate the properties of ceramics and polymers employed in engineering components
10. Understanding the features of nano materials and high entropy alloys for engineering applications

UNIT-I:

INTRODUCTION: Classification of engineering materials, mechanical properties of metals and their testing equipment/procedures, ASTM standards for testing of materials.

UNIT –II:

METALS AND METAL ALLOYS: Classification, composition, properties and usage. Ferrous alloys- steel, cast iron.

NON-FERROUS MATERIALS: Aluminum, Titanium, Copper and their alloys.

UNIT –III:

COMPOSITES: Classification of composites, Types of reinforcements, Properties of composites in comparison with standard materials

MANUFACTURING METHODS: Hand and spray lay - up, injection molding, resin injection, filament winding.

UNIT – IV:

CERAMICS: Classification of ceramic materials, Crystal Structure, Properties of Ceramics and applications, Ceramic fabrication techniques.

POLYMERS: Classification, Thermoplastic and Thermosetting Polymers, Characteristics and Applications

UNIT – V:

MATERIALS IN NANO TECHNOLOGY: Applications, Metal nano particles (Iron and copper).

HIGH ENTROPY ALLOYS: High entropy alloys and oxides, Applications

TEXT BOOKS:

1. William. D. Callister, David G. Rethwisch, Materials Science and Engineering: An Introduction, John Wiley & Sons.
2. Donald R Askland and Pradeep P Phule, Essentials of Materials Science and Engineering, by Pradeep P. Fulay, Donald R. Askeland.

REFERENCE BOOKS:

5. George Murray, Charles V. White, Wolfgang Weise, Introduction to Engineering Materials, CRC Press.
6. Myer Kutz, Mechanical Engineers' Handbook, John Wiley & Sons.
7. M.A. Shah, K.A.Shah, Nano technology, the science of Small, WILEY, Second Edition.
8. E. Paul De Garmo, J.T. Black, R.A. Kohler. Materials and Processes in Manufacturing, John Wiley and Sons, Inc., NY, 11th Edition.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

INDUSTRIAL ENGINEERING
(OPEN ELECTIVE-II)

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.

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 LABORATORY

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.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

INDUSTRY ORIENTED MINI PROJECT/INTERNSHIP

B. Tech. III Year II Semester - MECH

L	T	P	C
0	0	4	2

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.

INDUSTRIAL MANAGEMENT

B. Tech. IV Year I Semester - MECH

L	T	P	C
2	0	0	2

Course outcomes:

1. Understand the principles of management.
2. Able to design the organization structure.
3. Apply the techniques for plant location, design plant layout and value analysis.
4. Able to carry out work study and allied techniques.
5. Able to do job evaluation and human resource management effectively.

UNIT - I

Introduction to Management: Entrepreneurship and organization – Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory,, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Leadership Styles

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: 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

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.

Human Resource management: Recruitment, selection, training, performance appraisal, wages and incentives- time wage system, Taylor's differential piece rate system, bonus.

TEXT BOOKS

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

REFERENCE BOOKS

1. Motion and Time Study by Ralph M Barnes! John Willey & Sons Work Study by lLO.
2. Industrial Engineering and Management Science/T.R. Banga and S.C. Sarma/Khanna Publishers.
3. Production & Operation Management /Paneer Selvam/PHI.
4. Industrial Engineering Management/NVS Raju/Cengage Learning.

REFRIGERATION AND AIR CONDITIONING

B. Tech. IV Year I 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 cycle Air 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.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

ARTIFICIAL INTELLIGENCE IN MECHANICAL ENGINEERING
(PROFESSIONAL ELECTIVE – II)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

COURSE OUTCOMES: At the end of this course, students would be able to:

1. Understand the basics and the purpose of Artificial Intelligence
2. Illustrate the different applications of Machine learning
3. Apply the concept of AI in Robotics field
4. Evaluate the different applications of deep learning methods
5. Apply the concept of Artificial Intelligence in Mechanical and Manufacturing Industries

Unit-I: Introduction to Artificial Intelligence: Introduction to Al, Problem formulation, Problem Definition, Production systems, Control strategies, Search strategies, Problem characteristics, Production system characteristics, Specialized production systems, Problem solving methods, Problem graphs, Matching, Indexing and Heuristic functions, Hill Climbing, Depth first and Breath first, Constraints satisfaction — Related algorithms, Measure of performance and analysis of search algorithms.

Unit-II: Machine Learning and its Applications: Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation. Linear regression, Decision trees, over fitting. Instance based learning, Feature reduction, Collaborative filtering based recommendation. Probability and Bayes learning, Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM. Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning- case studies

Unit-III: Artificial Intelligence in Robotics: Reinforcement Learning- planning and search, localization, tracking, mapping and control- A* search algorithms- path smoothing algorithms - SLAM algorithm- Precision agriculture- Assistance robots-Robot Performance optimization-Case studies.

Unit-IV: Deep Learning and its Applications: Biological Motivation-Activation function-Cost function- Collaborative filtering-Vectorization-Back Propagation Algorithm with applications -Feed-Forward Neural Network Algorithm-Recurrent Neural Network Algorithm with applications -Convolution Neural Network with applications

Unit-V: Application of Artificial Intelligence in Mechanical Manufacturing Industries: Fault diagnosis- Quality inspection- Improving the safety of working places- Material modeling and smart materials-Automobile engineering- building self-driving cars and autonomous vehicles, Auto parking-Machine learning in Machine Tools and Manufacturing Industries.

TEXT BOOKS:

1. Mangey Ram, J. Paulo Davim, Soft Computing Techniques and Applications in Mechanical Engineering, IGI Global, USA, DOI: 10.4018/978-1-5225-30350,2022.ISBN13: 9781522530350

REFERENCES:

1. Kaushik Kumar, Divya Zindani, Paulo Davim, Artificial Intelligence in Mechanical and Industrial Engineering , ISBN 9781003011248, CRC Press, 2021.
2. Haykin Simon., Neural networks a comprehensive foundation, Pearson Education, 2nd Edition, ISBN-13: 978-0138958633, 1997.
3. E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2006.
4. Gebrail Bekda,Sinan Melih Nigdeli,Melda Yücel, “Artificial Intelligence and Machine Learning Applications in Civil, Mechanical, and Industrial Engineering (Advances in Computational Intelligence and Robotics)”, 2019.

INDUSTRY 4.0
(PROFESSIONAL ELECTIVE – II)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Explain Smart Business Perspective, Cyber security, Impacts of Industry 4.0.
2. Understand the basics of the Industrial Internet of Things.
3. Understand various key technologies.
4. Implement various sensors and actuators.
5. Understand different industrial transmission technologies and IIOT applications in real life

UNIT – I:

Industry 4.0 Basics: Industrial revolution: Phases, Evolution of Industry 4.0, Environmental impacts of industrial revolution, Applications, Design requirements, Drivers of Industry 4.0, Sustainability Assessment of industries, Smart Business Perspective, Cyber security, Impacts of Industry 4.0.

UNIT – II:

Industrial Internet of Things- Basics: IIoT and Industry 4.0, IIC, Industrial Internet Systems, Design of industrial internet systems, Impact of industrial internet, Benefits of industrial internet, Industrial sensing, Industrial Processes, Features of IIoT for industrial processes, Industrial plant–The future architecture, Digital Enterprise

Business Models and Reference Architecture of IIoT: Definition of a business model, Business models of IIoT, Industrial Internet Reference Architecture

UNIT –III:

Key Technologies: Off-site Technologies, Cloud Computing, Fog Computing

Key Technologies: On-site Technologies, Augmented Reality, Virtual Reality, Smart factories, Lean manufacturing system, Big Data and Advanced Analytics

UNIT –IV:

Sensors: Various sensor types and their underlying working principles, Characteristics of Sensors – Resolution, calibration, accuracy and others, Sensor Categories – Thermal, Mechanical, Electrical, Optical and Acoustic sensors.

Actuators: Thermal, Hydraulic, Pneumatic, Electro mechanical Actuator

UNIT – V:

Industrial Data Transmission and Acquisition: Architecture of various data transmission technologies like Foundation Fieldbus, Profibus, Highway Addressable Remote Transducer (HART), Interbus, Bitbus, Digital STROM, Controller Area Network, and other recent and upcoming Technologies. Distributed Control System, SCADA and PLC System.

IOT Applications: IoT Applications on Industrial automation, Factories and Assembly line, Plant Security and Safety, Transportation, Agriculture, Healthcare, Home Automation, Oil, Chemical and Pharmaceutical Industry and others.

TEXT BOOK:

1. Introduction to Industrial Internet of Things and Industry 4.0 by Sudip Misra, Chandana Roy, Anandarup Mukherjee, CRC Press

REFERENCES:

1. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
2. Vijay Madisetti, Arshdeep Bahga, İnternet of Things, "A Hands on Approach", University Press.
3. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: Apractical Approach", ETI Labs
4. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media

INDUSTRIAL ROBOTICS
(PROFESSIONAL ELECTIVE – II)

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.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

PRODUCTION PLANNING AND CONTROL
(PROFESSIONAL ELECTIVE – II)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand production systems and their characteristics.
2. Evaluate MRP and JIT systems against traditional inventory control systems.
3. Understand basics of variability and its role in the performance of a production system.
4. Analyze aggregate planning strategies. Apply scheduling techniques to production systems.
5. Understand theory of constraints for effective management of production systems.

UNIT – I

Introduction: Definition – Objectives of Production Planning and Control – Functions of production planning and control - Types of production systems - Organization of production planning and control department.

Forecasting – Definition- uses of forecast- factors affecting the forecast- types of forecasting- their uses - general principle of forecasting. Forecasting techniques- quantitative and qualitative techniques. Measures of forecasting errors.

UNIT – II

Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – Basic EOQ model- Inventory control systems –continuous review systems and periodic review systems, MRP I, MRP II, ERP, JIT Systems - Basic Treatment only.

Aggregate planning –

Definition – aggregate-planning strategies – aggregate planning methods – transportation model.

UNIT – III

Line Balancing: Terminology, Methods of Line Balancing, RPW method, Largest Candidate method and Heuristic method.

Routing – Definition – Routing procedure – Factors affecting routing procedure, Route Sheet.

UNIT – IV

Scheduling –Definition – Scheduling Policies – types of scheduling methods – differences with loading – flow shop scheduling **–** job shop scheduling, line of balance (LOB) – objectives - steps involved.

UNIT – V

Dispatching: Definition – activities of dispatcher – dispatching procedures – various forms used in dispatching.
Follow up: definition – types of follow up – expediting – definition – expediting procedures- Applications of computers in planning and control.

TEXT BOOKS:
1. Operations management – Heizer- Pearson.

REFERENCE BOOKS:
1. Production Planning and Control- Text & cases/ SK Mukhopadhyaya /PHI.
2. Production Planning and Control- Jain & Jain – Khanna publications
3. Production and Operations Management / Ajay K Garg / Mc Graw Hill.

OPERATIONS RESEARCH
(PROFESSIONAL ELECTIVE – III)

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

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

COMPUTATIONAL FLUID DYNAMICS
(PROFESSIONAL ELECTIVE – III)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand different types of Partial Differential Equations and to know and understand appropriate numerical techniques.
2. Solve the simple heat transfer and fluid flow problems using different numerical techniques, viz., FDM.
3. Understand and to appreciate the need for validation of numerical solution.
4. Apply finite difference solution to unsteady inviscid flow to long cylinder and sphere
5. Evaluation of fluid flow problems employing finite difference method

UNIT - I:

Basic Aspects of the Governing Equations – Physical Boundary Conditions – Methods of solutions of Physical Problems – Need for Computational Fluid Dynamics – Different numerical/CFD techniques –FDM, FEM, FVM etc., - Main working principle - CFD as a research and design tool – Applications in
various branches of Engineering Mathematical behavior of Partial Differential Equations (Governing Equations): Classification of linear/quasi linear PDE – Examples - Physical Processes: Wave Equations and Equations of Heat Transfer
and Fluid Flow – Mathematical Behavior - General characteristics – Its significance in understanding the physical and numerical aspects of the PDE – One way and Two Way variables – Well posed problems – Initial and Boundary Conditions Solution of Simultaneous Algebraic Equations: Direct Method – Gauss Elimination – LU Decomposition – Pivoting – Treatment of Banded Matrices – Thomas Algorithm Iterative Method: Gauss Seidel and Jordan Methods - Stability Criterion

UNIT - II:

Finite Difference Method: Basic aspects of Discretization – Finite Difference formulae for first order and second order terms – Solution of physical problems with Elliptic type of Governing Equations for different boundary conditions - Numerical treatment of 1D and 2D problems in heat conduction, beams
etc., - Solutions –Treatment of Curvelinear coordinates – Singularities – Finite Difference Discretization – Solution of 1D heat conduction problems in Heat conduction in curve linear coordinates

UNIT - III:

FDM: Solution of physical problems with Parabolic type of Governing Equations – Initial Condition –Explicit, implicit and semi implicit methods – Types of errors – Stability and Consistency – Von Neumann Stability criterion– Solution of simple physical problems in 1D and 2D – Transient Heat conduction problems- ADI scheme - Simple Hyperbolic type PDE -

First order and Second order wave equations – Discretization using Explicit method - Stability criterion – Courant Number – CFL Condition – Its significance - Treatment of simple problems

UNIT - IV:

Finite Difference Solution of Unsteady Inviscid Flows: Lax – Wendroff Technique – Disadvantages –Maccormack's Technique Fluid Flow Equations – Finite Difference Solutions of 2D Viscous Incompressible flow problems –

Vorticity and Stream Function Formulation – Finite Difference treatment of Lid Driven Cavity Problem -Application to Cylindrical Coordinates with example of flow over infinitely long cylinder and sphere –Obtaining Elliptic Equations

UNIT - V:

Finite Difference Applications in Fluid flow problems: Fundamentals of fluid Flow modeling using Burger's Equation – Discretization using FTCS method with respect to Upwind Scheme and Transport Property – Upwind Scheme and Artificial Viscosity Solutions of Navier Stokes Equations for Incompressible Fluid Flows: Staggered Grid – Marker and Cell (MAC) Formulation – Numerical Stability Considerations – Pressure correction method - SIMPLE

Algorithm

TEXT BOOKS:

1. Computational Fluid Dynamics: The basics with applications/ John D Anderson/McGraw Hill Publications

REFERENCE BOOKS:

1. Computational Fluid Flow and Heat Transfer / K Muralidharan and T Sudarajan/ Narosa Publishers.
2. Computational Methods for Fluid Dynamics / Firziger & Peric/ Springer
3. Numerical Heat Transfer and Fluid Flow/ S.V. Patankar/ Mc Graw Hill

TOTAL QUALITY MANAGEMENT
(PROFESSIONAL ELECTIVE – III)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understanding the concepts of TQM
2. Setting bench marks for quality levels
3. Implementing TQM employing various tools
4. Evaluating the cost of quality of the products and processes
5. Design for achieving quality at ISO standards

UNIT-I Introduction, The concept of TQM, Quality and Business performance, attitude, and involvement of top management, communication, culture and management systems. Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

UNIT-II Customer Focus and Satisfaction: Process vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships. Bench Marking: Evolution of Bench Marking, meaning of bench marking, benefits of bench marketing, the bench marking procedure, pitfalls of bench marketing.

UNIT-III Organizing for TQM: The systems approach, organizing for quality implementation, making the transition from a traditional to a TQM organization, Quality Circles, seven Tools of TQM: Stratification, check sheet, Scatter diagram, lshikawa diagram, paneto diagram, Kepner &Tregoe Methodology.

UNIT-IV The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

UNIT-V ISO 9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQC Q- 90. Series Standards, benefits of ISO 9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

TEXT BOOKS:

1. Total Quality Management / Joel E. Ross/Taylor and Francis Limited

REFERENCE BOOKS:

1. Beyond TQM / Robert L. Flood.
2. Total Quality Management/P. N. Mukherjee/PHI
3. Statistical Quality Control / E. L. Grant.
4. Total Quality Management: A Practical Approach/H. Lal.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

SOLAR ENERGY TECHNOLOGY
(PROFESSIONAL ELECTIVE – III)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

1. Gain expertise in analyzing solar angles, employing Sun path diagrams, and evaluating the thermal performance of various solar collectors.
2. Acquire a deep understanding of the operation of solar heating/cooling systems, thermal energy storage.
3. Develop proficiency in semiconductor physics, comprehend solar cell properties, and analyze efficiency limits.
4. Factors such as shadow analysis, reliability, autonomy, and economic aspects of solar photovoltaic systems.
5. Attain expertise in passive heating and cooling concepts and understanding bioclimatic classifications

UNIT- I Solar Radiation and Collectors: Solar angles – Sun path diagrams – Radiation - extraterrestrial characteristics - measurement and estimation on horizontal and tilted surfaces - flat plate collector thermal analysis - testing methods evacuated tubular collectors - concentrator collectors – classification - design and performance parameters - tracking systems - compound parabolic concentrators - parabolic trough concentrators -concentrators with point focus - Heliostats – performance of the collectors.

UNIT – II Solar Thermal Technologies: Principle of working, types, design and operation of - Solar heating and cooling systems - Thermal Energy storage systems – Solar Desalination – Solar cooker : domestic, community – Solar pond –Solar drying

UNIT - III Solar PV Fundamentals: Semiconductor – properties - energy levels - basic equations of semiconductor devices physics. Solar cells - p-n junction: homo and hetro junctions – metal-semiconductor interface - dark and illumination characteristics - figure of merits of solar cell - efficiency limits - variation of efficiency with band-gap and temperature - efficiency measurements - high efficiency cells – Solar thermophotovoltaic's.

UNIT- IV SPV System Design and Applications: Solar cell array system analysis and performance prediction- Shadow analysis: reliability - solar cell array design concepts - PV system design - design process and optimization - detailed array design -storage autonomy - voltage regulation - maximum tracking - centralized and decentralized SPV systems - stand alone - hybrid and grid connected system - System installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems.

UNIT - V SOLAR PASSIVE ARCHITECTURE: Thermal comfort - bioclimatic classification – passive heating concepts: direct heat gain - indirect heat gain - isolated gain and sunspaces - passive cooling concepts: evaporative cooling - Radiative cooling - application of wind, water and earth for cooling; shading - paints and cavity walls for cooling - roof radiation traps - earth air-tunnel. – energy efficient landscape design - thermal comfort.

TEXT BOOKS:

1. Goswami, D.Y., Kreider, J. F. and & Francis., Principles of Solar Engineering, Taylor and Francis,2000

REFERENCES:

1. Chetan Singh Solanki, Solar Photovoltatics – Fundamentals, Technologies and Applications, PHI Learning Private limited, 2011
2. Sukhatme S P, J K Nayak, Solar Energy – Principle of Thermal Storage and collection, McGraw Hill, 2008.
3. Solar Energy International, Photovoltaic – Design and Installation Manual – New Society Publishers, 2006 5. Roger Messenger and Jerry Vnetre, Photovoltaic Systems Engineering, CRC Press, 2010.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
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RE- ENGINEERING
(PROFESSIONAL ELECTIVE – IV)
B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

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

1. Familiarize with the process of reverse engineering and its applications.
2. Understand the methodologies and techniques for Reverse Engineering.
3. Learn various data collection techniques and the data processing chain.
4. Select a proper system to generate geometric representations of physical objects.
5. Integrate Reverse Engineering and Rapid Prototyping.

UNIT - I Introduction to Reverse Engineering: Reverse Engineering –The Generic Process Reverse Engineering in Automotive, Aerospace, Medical sectors: Legal Aspects of Reverse Engineering: Copyright Law, Reverse Engineering, Recent Case Law, Barriers to Adopting Reverse Engineering. A discussion on a few benchmark case studies

UNIT –II Methodologies and Techniques for Reverse Engineering: The Potential for Automation with 3-D Laser Scanners, What Is Not Reverse Engineering, What is Computer-aided (Forward) Engineering, What Is Computer-aided Reverse Engineering, Computer Vision and Reverse Engineering, Structured light Range Imaging, Scanner Pipeline

UNIT – III Reverse Engineering–Hardware and Software: Contact Methods Noncontact Methods, Destructive Method. Reverse Engineering Software Classification, Fundamental Reverse Engineering Operations, Reverse Engineering Phases

UNIT - IV Selecting a Reverse Engineering System: The Selection Process, Some Additional Complexities, Point Capture Devices, Triangulation Approaches, "Time-of-flight" or Ranging Systems, Structured-light and Stereoscopic Imaging Systems, issues with Light-based Approaches, Tracking Systems, Internal Measurement Systems, X-ray Tomography, Destructive Systems, Some Comments on Accuracy, Positioning the Probe, Post processing the Captured Data, Handling Data Points, Curve and Surface Creation, Inspection Applications, Manufacturing Approaches.

UNIT – V: Integration between Reverse Engineering and Rapid Prototyping: Modeling Cloud Data in Reverse Engineering, Data Processing for Rapid Prototyping, Integration of RE and RP for Layer-based Model Generation, Adaptive Slicing Approach for Cloud Data Modeling, Planar Polygon Curve Construction for a Layer, Determination of Adaptive Layer Thickness.

TEXT BOOK:

1. Reverse Engineering: An Industrial Perspective by Vinesh Raja and Kiran J. Fernandes, Springer-Verlag London Limited 2008

REFERENCE BOOKS:

1. K. Otto and K. Wood, Product Design: Techniques in Reverse Engineering and New Product Development, Prentice Hall, 2001.
2. Anupam Saxena, Birendra Sahay, Computer Aided Engineering Design, Springer, 2005.
3. Ali K. Kamrani and Emad Abouel Nasr, Engineering Design and Rapid Prototyping, Springer, 2010.

NON-CONVENTIONAL ENERGY SOURCES
(PROFESSIONAL ELECTIVE – IV)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understanding Non-conventional energy sources
2. Knowledge of working principle of various energy systems
3. Capability to carry out basic design of Non-conventional energy systems.
4. Design the biogas systems and plants by understanding the properties
5. Build the ocean energy based power plants to harness green energy

UNIT-I Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy- concept of Hybrid systems.

UNIT-II Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

UNIT-III Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Wind mill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

UNIT-IV Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.

UNIT-V Ocean Energy: Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion (OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.

1. **Small hydro Power Plant:** Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.
2. **Geothermal Energy:** Geothermal power plants, various types, hot springs and steam ejection.

TEXT BOOKS:

1. Renewable Energy Sources / Twidell, J.W. and Weir, A./ EFN Spon Ltd., 1986.

REFERENCE BOOKS:

1. Kishore VVN, Renewable Energy Engineering and Technology, Teri Press, New Delhi, 2012
2. Non-Conventional Energy Sources / G.D Rai/ Khanna Publishers
3. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K, 1996.

AUTOMOBILE ENGINEERING
(PROFESSIONAL ELECTIVE – IV)

B. Tech. IV 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.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
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ELECTRIC AND HYBRID VEHICLES
(PROFESSIONAL ELECTIVE – IV)

B. Tech. IV Year I Semester - MECH

L	T	P	C
3	0	0	3

COURSE OUTCOMES: At the end of this course, students would be able to:

1. Get a good understanding of the basic functioning of both Electric and Hybrid vehicles and their performance
2. Develop a good concept of the electrical vehicle modeling and its power plant characteristics.
3. To understand the fundamentals of chargers related to both electric & hybrid vehicle operation & energy management.
4. Have a detailed understanding of electric propulsion systems, types of motors and the other important subsystems in Electric vehicles.
5. Have clear concepts of the different possible energy storage systems for both electric and hybrid vehicles.

UNIT-I: INTRODUCTION TO EV: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, Classification of EV. ARCHITECTURE OF HEV: Series HEV, Parallel HEV and Series-Parallel HEV, Power flow control inhybrid drive train topologies: Series hybrid drive train, Parallel hybrid drive train and Series-Parallel hybrid drive train

UNIT-II: FUNDAMENTALS OF ELECTRIC VEHICLES: General description of vehicle movement, Vehicle resistance: Rolling Resistance, Aerodynamic drag, Grading résistance, Dynamic Equation, Vehicle Transmission Characteristics: Manual gear transmission and Hydro dynamic transmission, Vehicle performance: Maximum Cruising Speed, Grade ability, Acceleration performance.

UNIT-III: PLUG-IN HYBRID ELECTRIC VEHICLES: Introduction, Functions and Benefits of PHEV, Operating Principles of Plug- in Hybrid Vehicle: Charge-Depleting Mode, Charge-Sustaining Mode, AER Mode, Engine-Maintenance Mode, Control Strategy of PHEV, PHEV-Related Technologies and Challenges FUNDAMENTALS OF CHARGERS: Charger Classification and Standards, Charger Requirements, Topology Selection for Level 1 and 2 AC Chargers: Front-End AC–DC Converter Topologies, Isolated DC–DC Converter Topologies, Wireless Chargers.

UNIT-IV: ELECTRIC PROPULSION SYSTEMS: Introduction to electric components used in HEV's, DC Motor drives: Combined armature and Field Control method, Chopper

control DC drives, Multi quadrant control of Chopper fed DC drive. PERMANENT MAGNET BLDC & SRM MOTOR DRIVES: Closed loop Torque control of BLDC motor drive and Sensor-less Control of BLDC Motor drive using Back EMF method, Switch Reluctance Motor drives: Basic Magnetic structure, Modes of operation, different Inverter topologies of SRM drives.

UNIT-IV: ENERGY STORAGE: Introduction to Energy Storage Requirements in Electric Vehicles, Battery Parameters, Battery based energy storage: Lead acid battery, Lithium Ion Battery and Metal Air batteries, Super Capacitor based energy storage, Fuel Cell based energy storage, Hybridization of different energy storage device.

TEXT BOOKS:

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.

REFERENCE BOOKS:

1. T. Denton, "Electric and Hybrid Vehicles", Routledge,2016.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies",Springer, 2015.
3. Ali Emadi, "Advanced Electrical Hybrid Vehicles" CRC Press, 2015, Taylor & FrancisGroup.
4. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

BASIC AUTOMOBILE ENGINEERING
(OPEN ELECTIVE-III)

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.

MAINTENANCE AND SAFETY ENGINEERING

B. Tech. IV Year I 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

PROJECT STAGE-I

B. Tech. IV Year I Semester - MECH

L	T	P	C
0	0	6	3

Course Outcomes:

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation, and design engineering solutions.
3. Formulate the methodology of the proposed project and acquire necessary Materials, testing methods and evaluation procedures

The students in a group of 3 to 4 approved by the head of the department under the guidance of a faculty member shall carry out literature survey/ visit industries to finalize the topic of the Project. Subsequently, the students shall collect the material required for the selected project, prepare synopsis and narrate the methodology to carry out the project work. Each student, under the guidance of a Faculty, is required to present the seminar on the selected project orally and/or through power point slides before a departmental project review committee. Answer the queries and involve in debate/discussion. Submit two hard copies as per the department guidelines. The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

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.

PLANT LAYOUT AND MATERIAL HANDLING

B. Tech. IV Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes

1. Understand different plant layouts, selection and comparison of process and product layouts.
2. Understand heuristics for plant layouts like ALDEP, CORELAP and CRAFT.
3. Get an overview of material handling systems and relationship between material handling and plant layout.
4. Appreciate various methods of material handling like path and function oriented systems.
5. Minimize cost of material handling with safety perquisites.

UNIT-I

Introduction to plant layout

Classification of Layout, Advantages and Limitations of different layouts, Layout design procedures, Overview of the plant layout. Process layout & Product layout: Selection, specification, Implementation and follow up, comparison of product and process layout.

UNIT-II

Heuristics for Plant layout

ALDEP, CORELAP, CRAFT, Group Layout, Fixed position layout- Quadratic assignment model. Branch and bound method,

UNIT-III

Introduction to Material Handling

Material Handling systems, Material Handling principles, Classification of Material Handling Equipment, Relationship of material handling to plant layout.

UNIT-IV

Basic Material Handling systems

Selection, Material Handling method- path, Equipment, function oriented systems.

UNIT-V

Methods to minimize cost of material handling- Maintenance of Material Handling Equipments, Safety in handling Ergonomics of Material Handling equipment. Design, Miscellaneous equipments.

TEXT BOOKS

1. Operations Management: PB Mahapatra/PHI-2010.

REFERENCES

1. Facility Layout & Location an analytical approach: RL Francis, LF Mc Linnis Jr, White-PHI Second edition-1991.
2. Plant Layout and Material Handling: RB Chowdary- Khanna Publishers Second Edition-1986.
3. Plant Layout and Materials Handling/James M. Apple/ John Wiley & Sons; Third Edition-1978
4. Aspects of Material handling: Dr. KC Arora & Shinde/ Lakshmi Publications-2007.

POWER PLANT ENGINEERING

B. Tech. IV Year II Semester - MECH

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the layout of steam power plant and know different handling systems. Appreciate the working principles of various components responsible for combustion.
2. Comprehend the layout of diesel power plant with detailed emphasis on its auxiliaries.
3. Know the working of hydroelectric power plants and characteristics of hydrographs.
4. Identify the advantages, disadvantages & applications of nuclear power plants.
5. Analyze and estimate different power plant economic factors and environmental considerations.

UNIT – I

Introduction to the Sources of Energy – Resources and Development of Power in India.

Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

Combustion Process: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat
rejection. Corrosion and feed water treatment.

UNIT – II

Internal Combustion Engine Plant: Diesel Power Plant: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.

UNIT – III

Hydro Electric Power Plant: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways.

Hydro Projects and Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

UNIT – IV

Nuclear Power Station: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation. **Types of Reactors:** Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

UNIT – V

Power Plant Economics and Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve.
Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

TEXT BOOKS:

1. Power Plant Engineering/ P. K. Nag / Mc Graw Hill

REFERENCES BOOKS:

1. Power Plant Engineering / Hegde / Pearson.
2. Power Plant Engineering / Gupta / PHI
3. Power Plant Engineering / A K Raja / New age

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

PROJECT STAGE-II including seminar

B. Tech. IV Year II Semester - MECH

L	T	P	C
0	0	22	9+2

Course Outcomes:

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

Each student of the project batch shall involve in carrying out the project work jointly under the guidance of a faculty member and prepare the project report after completing the work to the satisfaction of the internal guide. Each student, under the guidance of a Faculty, is required to present the seminar on the selected project orally and/or through power point slides. The progress of the project is evaluated by a departmental review committee. 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.