Department
of
Mechanical Engineering

I B.Tech I SEM & II SEM
Course Structure & Syllabus
(ACE-R22 Regulations)

ACE
Engineering College
Ankushapur(V), Ghatkesar(M), Medchal Dist - 501 301

(An Autonomous Institution, Affiliated to JNTUH ,Hyderabad)

Department of Mechanical Engineering
B.Tech. in Mechanical Engineering
COURSE STRUCTURE & SYLLABUS (ACE-R22 Regulations)
Applicable from AY 2022-23 Batch

I Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1.	MA101BS	Matrices and Calculus	3	1	0	4
2.	PH102BS	Applied Physics	3	1	0	4
3.	ME103ES	C Programming and Data Structures	3	0	0	3
4.	ME104ES	Engineering Workshop	0	1	3	2.5
5.	EN105HS	English for Skill Enhancement	2	0	0	2
6.	ME106ES	Elements of Mechanical Engineering	0	0	2	1
7.	PH107BS	Applied Physics Laboratory	0	0	3	1.5
8.	EN109HS	English Language and Communication Skills Laboratory	0	0	2	1
9.	CS109ES	C Programming and Data Structures Laboratory	0	0	2	1
10.	*MC110	Environmental Science	3	0	0	0
11.		Induction Programme				
		Total	**14**	**3**	**12**	**20**

I Year II Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1.	MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2.	CH202BS	Engineering Chemistry	3	1	0	4
3.	ME203ES	Computer Aided Engineering Graphics	1	0	4	3
4.	ME204ES	Engineering Mechanics	3	0	0	3
5.	ME205PC	Engineering Materials	2	0	0	2
6.	ME206ES	Python Programming Laboratory	0	1	2	2
7.	CH207BS	Engineering Chemistry Laboratory	0	0	2	1
8.	ME208PC	Fuels & Lubricants Laboratory	0	0	2	1
		Total	**12**	**3**	**10**	**20**

II Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1.	MA305BS	Probability, Statistics & Complex Variables	3	1	0	4
2.	ME302PC	Mechanics of Solids	3	0	0	3
3.	ME303PC	Metallurgy & Material Science	3	0	0	3
4.	ME304PC	Production Technology	3	0	0	3
5.	ME305PC	Thermodynamics	3	1	0	4
6.	ME306PC	Production Technology Laboratory	0	0	2	1
7.	ME307PC	Material Science & Mechanics of Solids Laboratory	0	0	2	1
8.	ME308PC	Computer Aided Machine Drawing	0	0	2	1
9.	*MC309	Constitution of India	3	0	0	0
		Total	**18**	**2**	**6**	**20**

II Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1.	EE401ES	Elements of Electrical and Electronics Engineering	3	0	0	3
2.	ME402PC	Kinematics of Machinery	3	0	0	3
3.	ME403PC	Fluid Mechanics & Hydraulic Machines	3	0	0	3
4.	ME404PC	IC Engines & Gas Turbines	3	0	0	3
5.	ME405PC	Instrumentation and Control Systems	3	0	0	3
6.	ME406ES	Elements of Electrical and Electronics Engineering Laboratory	0	0	2	1
7.	ME407PC	Fluid Mechanics & Hydraulic Machines Laboratory	0	0	2	1
8.	ME408PC	Instrumentation and Control Systems Laboratory	0	0	2	1
9.	ME409PC	Real-time Research Project/ Field-Based Project	0	0	4	2
10.	*MC410	Gender Sensitization Lab	0	0	2	0
		Total	**15**	**0**	**12**	**20**

MATRICES AND CALCULUS

B. Tech. I Year I Sem. **L T P C**

3 1 0 4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn

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

Course Outcomes: After learning the contents of this paper the student must be able to

- **CO1:** Write the matrix representation of a set of linear equations and to analyse the solution of thesystem of equations
- **CO2:** Find the Eigen values and Eigen vectors. Reduce the quadratic form to canonical form using orthogonal transformations.
- **CO3:** Solve the applications on the mean value theorems and evaluate the improper integrals using Beta and Gamma functions
- **CO4:** Find the extreme values of functions of two variables with/ without constraints.
- **CO5:** Evaluate the multiple integrals and apply the concept to find areas, volumes

UNIT-I: Matrices **10 L**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss- Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors **10 L**

Linear Transformation and Orthogonal Transformation: Eigen values, Eigenvectors and theirproperties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: Calculus **10 L**

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-IV: Multivariable Calculus (Partial Differentiation and applications) 10 L

Definitions of Limit and continuity. Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration) **10L**

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,5th Editon, 2016.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint,2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and CompanyLimited, New Delhi.

APPLIED PHYSICS

B.Tech. I Year I Sem.

L	T	P	C
3	1	0	4

Pre-requisites: 10 + 2 Physics

Course Objectives: The objectives of this course for the student are to:

- Understand the basic principles of quantum physics and band theory of solids.
- Understand the underlying mechanism involved in construction and working principles ofvarious semiconductor devices.
- Study the fundamental concepts related to the dielectric, magnetic and energy materials.
- Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
- Study the characteristics of lasers and optical fibres.

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

- **CO1:** Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
- **CO2:** Identify the role of semiconductor devices in science and engineering Applications.
- **CO3:** Explore the fundamental properties of dielectric, magnetic materials and energy for theirapplications.
- **CO4:** Appreciate the features and applications of Nanomaterials.
- **CO5:** Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT - I: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, Blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - Photoelectric effect Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – Time independent Schrodinger wave equation - Particle in one dimensional potential box- Rectangular Potential barrier Free electron theory (Drude & Lorentz, Sommerfeld) - Bloch's theorem -Kronig-Penney model – E-K diagram- Effective mass of electron-origin of energy bands- classification of solids.

UNIT - II: SEMICONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors – Hall effect-Direct and indirect bandgap semiconductors - Construction, principle of operation and characteristics of P-N Junction diode, Zener diode and Bipolar Junction Transistor (BJT)–LED, PIN diode and Solar cells, their structure, materials, working principle and characteristics.

UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

Dielectric Materials: Basic definitions- types of polarizations (qualitative) - Ferroelectric, Piezoelectric, and Pyroelectric materials – Applications

Magnetic Materials: Hysteresis - Soft and hard magnetic materials - Magnetostriction, Magnetoresistance - Applications - Bubble memory devices, Magnetic field sensors and Multiferroics.

Energy Materials: Conductivity of liquid and solid electrolytes- Superionic conductors - Materials and electrolytes for super capacitors - Rechargeable ion batteries.

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 - XRD, SEM &TEM - applications of nanomaterials.

UNIT - V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations-lasing action - pumping methods- ruby laser, He-Ne laser, Nd: YAG laser-Semiconductor laser-Applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection-Construction of optical fiber - acceptance angle - numerical aperture-classification of optical fibers-Losses in optical fiber - optical fiber for communication system - Applications.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"-
   S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill,4thEdition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical CreativesNANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition,2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1st Edition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion andStorage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.
8. Solid State Physics- R.L. Singhal- KNRN Publications

C PROGRAMMING AND DATA STRUCTURES

B.Tech. I Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives: Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

Course Outcomes:

- Understand the various steps in Program development.
- Explore the basic concepts in C Programming Language.
- Develop modular and readable C Programs
- Understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Data structures.
- Apply data structures such as stacks, queues in problem solving
- To understand and analyze various searching and sorting algorithms.

UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages,Creating and running programs, Software Development

Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types,Variables, Constants, Input / Output

Structure of a C Program – Operators, Bit-wise operators, Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Statements.

UNIT - II

Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loopexamples, other statements related to looping – break, continue, go to, Recursion.

Designing Structured Programs- Functions, basics, user defined functions, inter functioncommunication, standard functions.

Arrays – Concepts, using arrays in C, inter function communication, array applications, two –dimensional arrays, multidimensional arrays.

UNIT - III

Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility, **Pointer Applications –** Passing an array to a function, Memory allocation functions, array of pointers **Strings –** Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulationfunctions, string / data conversion.

UNIT - IV

Derived types – The Typedef, enumerated types, Structures – Declaration, definition and initializationof structures, accessing structures, operations on structures, complex structures. Unions – Referencing unions, initializers, unions and structures.

Input and Output – Text vs Binary streams, standard library functions for files, converting file types, File programs – copy, merge files.

UNIT – V

Sorting- selection sort, bubble sort, insertion sort,

Searching-linear and binary search methods.

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

TEXT BOOKS:

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, CengageLearning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition,Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie PHI/PearsonEducation

REFERENCE BOOKS:

1. C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3 Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
4. C for Engineers and Scientists, H. Cheng, McGraw-Hill International Edition
5. Data Structures using C – A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, PearsonEducation / PHI
6. C Programming & Data Structures, E. Balagurusamy, TMH.
7. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
8. C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand & Co.

ENGINEERING WORKSHOP

B.Tech. I Year I Sem.

L	T	P	C
0	1	3	2.5

Pre-requisites: Practical skill

Course Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products. Develop a right attitude, team working, precision and safety at work place.
- To provide hands on experience about use of different engineering materials, tools,equipments and processes those are common in the engineering field.
- It explains the construction, function, use and application of different working tools, equipment,and machines.
- To have practical exposure to various welding and joining processes. And to study commonly used carpentry joints. Identify and use marking out tools, hand tools, measuring equipment and to work toprescribed tolerances.

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

- **CO1**: Study and practice on machine tools and their operations
- **CO2**: Practice on manufacturing of components using workshop trades including pluming,fitting, carpentry, and foundry, house wiring and welding.
- **CO3**: Identify and apply suitable tools for different trades of Engineering processes includingdrilling, material removing, measuring, chiseling.
- **CO4**: Apply basic electrical engineering knowledge for house wiring practice.
- **CO5**: Identify the different types of welding, moulding, metal cutting methods.

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
V. Welding Practice – (Arc Welding & Gas Welding)
VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and WoodWorking

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

1. Workshop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP
3. Dictionary of Mechanical Engineering – G.H.F. Nayler, Jaico Publishing House.

ENGLISH FOR SKILL ENHANCEMENT

B.Tech. I Year I Sem. **L T P C**
2 0 0 2

Course Objectives: This course will enable the students to:

- Improve the language proficiency of students in English with an emphasis on Vocabulary,Grammar, Reading and Writing skills.
- Develop study skills and communication skills in various professional situations.
- 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.
- Choose appropriate vocabulary and sentence structures for their oral and written communication.
- Demonstrate their understanding of the rules of functional grammar.
- Develop comprehension skills from the known and unknown passages.
- Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
- Acquire basic proficiency in reading and writing modules of English.

UNIT - I

Chapter entitled '***Toasted English***' **by R.K.Narayan** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, 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 ofProper 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 Agreementand 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 andEvents – 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 forPractice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter ofRequisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context andCulture"*** 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 andCulture"*** 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 notcovered 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.

Note: ***Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum arecovered in the syllabus of ELCS Lab Course.***

- **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended,*** besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

- **Note**: **2**.Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXT BOOK:

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. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language,Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for EngineeringStudents. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

ELEMENTS OF MECHANICAL ENGINEERING

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives: The objectives of this course are to

- Make the student to experimentally measure the common geometric properties like length,diameter, flatness, curvature, volume and moment of inertia etc.
- Give a practical knowledge to evaluate the friction between surfaces and also to evaluate thenatural frequency of the system.
- Correlate between theory and experimental results, directly observe the proof of principlesand theories through practical knowledge
- Introduce students to the basic concepts of manufacturing through the demonstration ofvarious processes.
- Understand the commonly used mechanical components like gear box, working of boilers andIC engine etc.

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

- **CO1**: Understand the operation, usage and applications of different measuring instrumentsand tools.
- **CO2**: Examine the different characteristics of instruments like accuracy, precision etc
- **CO3**: Prepare simple composite components and joining different materials using solderingprocess.
- **CO4**: Identify tools & learn practically the process of turning, milling, grinding on mild steelpieces.
- **CO5**: Understand the basic components of IC engine, Gear box and boiler

List of Experiments to be performed:

1. Measurement of length, height, diameter by vernier calipers.
2. To measure diameter of a given wire and sphere, thickness of a given sheet and volume of an irregular lamina using micrometer screw gauge.
3. Use of straight edge and sprit level in finding the flatness of surface plate.
4. Determination of time period and natural frequency of simple pendulum.
5. Determination of time period and natural frequency of compound pendulum.
6. To measure the coefficients of static and kinetic friction between a block and a plane using various combination of materials.
7. To determine the radius of curvature of a given spherical surface.
8. The experimental determination of the Moment of Inertia of regular and irregular solids.
9. Metal joining process–soldering of metal alloys to any PCB board
10. A simple composite geometry preparation by hand layup method.
11. Grouping of Dry cells for a specified voltage and current and its measurement using ammeters and voltmeters etc.
12. Study of transmission system –gear box

***Note:** Perform any 10 out of the 12 Exercises.

REFERENCE BOOKS:

1. Dictionary of Mechanical Engineering – G.H.F. Nayler, Jaico Publishing House.
2. Principles of Engineering Metrology/ Rega Rajendra/ Jaico Publishers.
3. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
4. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.
5. Principles of Machine Tools, Bhattacharyya A and Sen.G.C / New Central Book Agency.
6. Khurmi R.S, Khurmi N., Engineering Mechanics, S. Chand, 2020.
7. A Text Book of Automobile Engineering by R K Rajput. Laxmi Publications.

APPLIED PHYSICS LABORATORY

B.Tech. I Year I Sem **L T P C**
0 0 3 1.5

Course Objectives: The objectives of this course for the student to

- Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
- Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
- Able to measure the characteristics of dielectric constant of a given material.
- Study the behavior of B-H curve of ferromagnetic materials.
- Understanding the method of least squares fitting.

Course Outcomes: The students will be able to:

- **CO1:** Know the determination of the Planck's constant using Photo electric effect and identify thematerial whether it is n-type or p-type by Hall experiment.
- **CO2:** Appreciate quantum physics in semiconductor devices and optoelectronics.
- **CO3:** Gain the knowledge of applications of dielectric constant.
- **CO4:** Understand the variation of magnetic field and behavior of hysteresis curve.
- **CO5:** Carried out data analysis.

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)
   b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a) Determination of the beam divergence of the given LASER beam

b) Determination of Acceptance Angle and Numerical Apertureof an optical fiber.

12. Understanding the method of least squares – torsional pendulum as an example.

Note: **(Any eight experiments to be mandatorily performed by the student)**

TEXTBOOKS

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

REFERENCE BOOKS

1. C.L. Arora, "Practical Physics", S. Chand & Co., New Delhi, 3rd Edition, 2012.
2. Vijay Kumar, Dr. T. Radhakrishna, "Practical Physics for Engineering Students", S M Enterprises, 2nd Edition, 2014
3 Y. Aparna, K. Venkateswarao, "Engineering Physics Lab Manual", VGS Book links 2010.

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

B.Tech. I Year I Sem. **L T P C**
0 0 2 1

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

- To facilitate computer-assisted multi-media instruction enabling individualized andindependent language learning
- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation ofEnglish by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize the impact ofdialects.
- To train students to use language appropriately for public speaking, groupZ

Course Outcomes: Students will be able to:

- **CO1:** Understand the nuances of English language through audio- visual experience and groupactivities
- **CO2:** Neutralise their accent for intelligibility
- **CO3:** Speak with clarity and confidence which in turn enhances their employability skills

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

Listening Skills:

Objectives

1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab**.

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 insentences – 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-Neutralising 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: Introduction to Group Discussion

Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration
ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab :

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

Source of Material (Master Copy):

- *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge UniversityPress.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

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.* Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press

C PROGRAMMING AND DATA STRUCTURES LABORATORY

B.Tech. I Year I Sem. **L T P C**
0 0 2 1

Course Objectives: Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

Course Outcomes:

- **CO1:** Develop modular and readable C Programs
- **CO2:** Solve problems using strings, functions
- **CO3:** Handle data in files
- **CO4:** Implement stacks, queues using arrays, linked lists.
- **CO5:** To understand and analyze various searching and sorting algorithms

List of Experiments:

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Writea C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.
5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and useSwitch Statement)
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
    i) Addition of Two Matrices
    ii) Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins,or – 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.
15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program that uses functions to perform the following operations:
    i) Reading a complex number
    ii) Writing a complex number
    iii) Addition of two complex numbers
    iv) Multiplication of two complex numbers
    (Note: represent complex number using a structure.)
18.
    i. Write a C program which copies one file to another.
    ii. Write a C program to reverse the first n characters in a file.
    (Note: The file name and n are specified on the command line.)

19.
   i. Write a C program to display the contents of a file.
   ii. Write a C program to merge two files into a third file (i.e., the contents of the first filefollowed by those of the second are put in the third file)

20. Write a C program that uses functions to perform the following operations on singly linkedlist.:
    i) Creation ii) Insertion iii) Deletion iv) Traversal

21. Write C programs that implement stack (its operations) using
    i) Arrays ii) Pointers

22. Write C programs that implement Queue (its operations) using
    i) Arrays ii) Pointers

23. Write a C program that implements the following sorting methods to sort a given list ofintegers in ascending order i) Bubble sort ii) Selection sortiii)Insertion sort

24. Write C programs that use both recursive and non recursive functions to perform the followingsearching operations for a Key value in a given list of integers:
    i) Linear search ii) Binary search

TEXT BOOKS:

1. C Programming & Data Structures, B.A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
2. Let us C, Yeswanth Kanitkar C Programming, Balaguruswamy.

ENVIRONMENTAL SCIENCE

B.Tech. I Year I Sem. **L T P C**
3 0 0 0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Learn about water, mineral and energy resources. Environmental impacts associated with the natural resources.
- Understand the importance of biodiversity, levels of biodiversity and their values.
- Understanding the environmental policies and regulations.

Course Outcomes:

- **CO1:** Students will examine and learn how organisms modify their environments to sustain their needs.
- **CO2:** Students will be able to understand about renewable and non-renewable resources.
- **CO3:** Students will understand about the threats to biodiversity.
- **CO4:** Students will learn about types of pollution and their control technologies.
- **CO5:** Students will understand the environmental policies and regulations.

UNIT - I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In- Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards.

Water pollution: Sources and types of pollution, drinking water quality standards.

Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation.

Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha forUniversity Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHLLearning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHILearning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BSPublications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

B.Tech. I Year II Sem.

L	T	P	C
3	1	0	4

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 andvolume integrals

Course outcomes: After learning the contents of this paper the student must be able to

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real worldproblems.
- Use the Laplace transforms techniques for solving ODE's.
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I: First Order ODE **8 L**

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order **10L**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sin ax , cos ax, polynomials in x, $e^{ax}V(x)$ and x $V(x)$, method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits

UNIT-III: Laplace transforms **10 L**

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation **10 L**

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration **10 L**

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and theirapplications.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and CompanyLimited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.

ENGINEERING CHEMISTRY

B.Tech. I Year II Sem.

L	T	P	C
3	1	0	4

Course Objectives:

- To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- To know the importance of water and its treatment in domestic and industrial usage.
- To acquire fundamental aspects of battery chemistry, significance of corrosion its control to protect the structures.
- To gain knowledge in the preparation and engineering applications of materials like polymers, cement, smart materials, Lubricants etc.,
- To acquire required knowledge the basic concepts of petroleum and its products.

Course Outcomes:

- **CO1:** They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.
- **CO2:** The students are able to understand the basic importance of water and its usage in domestic and industrial purposes.
- **CO3:** Students will acquire the basic knowledge of battery technology and electrochemical procedures related to corrosion and its control.
- **CO4:** They can learn the fundamentals and general properties of polymers and other engineering materials.
- **CO5:** Students will be able to understand the mechanism of combustion for solving problems related to combustion.

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: Sludge, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion [10]

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 and impressed current methods. Electroplating of Cu.

UNIT - III: Polymeric materials: [10]

Definition – Classification of polymers with examples – Types of polymerization – addition (free radical 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 and Bakelite, Teflon, Fiber reinforced plastics (FRP).

Rubbers: Natural rubber, Processing and its vulcanization.

Elastomers: 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 - Polylactic acid and poly vinyl alcohol and their applications.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources: [10]

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula and Numericals 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 – Transesterification, advantages. Combustion –Calculation of air quantities (Numericals).

UNIT - V: **Engineering Materials: [8]**

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

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermo response materials- Polyacryl amides, Poly vinyl amides

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - 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, Dhanpatrai 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.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

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)

COMPUTER AIDED ENGINEERING GRAPHICS

B.Tech. I Year II Sem

L	T	P	C
1	0	4	3

Course Objectives:

- To develop the ability of visualization of different objects through technical drawings.
- To acquire computer drafting skill for communication of concepts, ideas in the design ofengineering products.
- Apply the knowledge of interpretation of projection in different quadrants.
- Create intricate details of components through sections and develop its surfaces.
- Convert the pictorial views into orthographic view and vice versa.

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

- **CO1:** Apply computer aided drafting tools to create 2D and 3D objects
- **CO2:** Sketch conics and different types of solids
- **CO3:** Appreciate the need of Sectional views of solids and Development of surfaces of solids
- **CO4:** Read and interpret engineering drawings
- **CO5:** Conversion of orthographic projection into isometric view and vice versa manually and byusing computer aided drafting

UNIT – I:

Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

UNIT- II:

Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines, and planes

UNIT – III:

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids –Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views

UNIT – IV:

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Developmentof surfaces using computer aided drafting

UNIT – V:

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversionof Isometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S.Chand and company Ltd.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers
6. John, K.C. Engineering Graphics, Prentice Hall India Publishers.

Note: - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

ENGINEERING MECHANICS

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: The objectives of this course are to

- Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
- Perform analysis of bodies lying on rough surfaces.
- Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
- Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
- Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations

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

- **CO1:** Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
- **CO2:** Solve problem of bodies subjected to friction.
- **CO3:** Find the location of centroid and calculate moment of inertia of a given section.
- **CO4:** Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
- **CO5:** Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration.

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, Equilibriumof System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy; Principle of Virtual work.

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;

Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. – Theorem of Pappus

UNIT - III:

Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem. Polar Moment Of Inertia 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 - IV:

Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

UNIT - V:

Kinetics of Rigid Bodies -Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D' Alembert's principle and its applications in plane motion and connected bodies; Work Energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation

TEXT BOOKS:

1. Shames and Rao (2006), Engineering Mechanics, Pearson Education
2. Reddy Vijay Kumar K. and J. Suresh Kumar (2010), 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, 12th Edition.
2. Dumir P.C, Sengupta, Srinivas, Engineering Mechanics- Universities Press, 2020.
3. Hibbeler R.C, Engineering Mechanics, Pearson, 14th Edition.
4. Arshad Noor, Zahid & Goel, Engineering Mechanics, Cambridge University Press, 2018.
5. Khurmi R.S, Khurmi N., Engineering Mechanics, S. Chand, 2020.
6. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press
7. A. Nelson, "Engineering Mechanics: Statics and Dynamics", Tata McGraw Hill Education Private Limited, 2009.
8. S. Timoshenko, D.H. Young, J.V. Rao, "Engineering Mechanics", (In SI Units) (SIE) | 5th Edition.
9. Meriam J.L., Kraige L.G. Engineering Mechanics Statics. Solution Manual by Khalid Yousaf.

ENGINEERING MATERIALS

B.Tech. I Year II Sem. **L T P C**
2 0 0 2

Course Objectives: The objectives of this course are to

- Provide basic understanding of engineering materials, their structure, classification andusage.
- Introduce the testing methods for various material properties and ASTM standards used in testing.
- Understand the various materials used in mechanical engineering like metals, ceramics, polymers, composite materials and other new materials.
- Materials studied in detail include energy ceramics, ferrous metal systems, non-ferrous metal systems and polymers.
- Develop intuitive understanding of the subject to present a wealth of real world engineering examples to give students a feel of how material science is useful in engineering practices.

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

- **CO1:** Classify the various materials that will be essential for the mechanical engineering applications.
- **CO2:** Express the mechanical properties of metals and their testing procedures.
- **CO3:** Understand the application of materials and their processing
- **CO4:** Understand the requirement and need for the development of the new materials.
- **CO5:** concept of mechanical behavior of materials and calculations of same using appropriate equations

UNIT-I:

Classification of Engineering Materials, Ashby chart, Mechanical Properties of Metals and their testing equipment/procedures, ASTM standards for testing, Stress–Strain Behavior of various materials, Sources of Material Data

UNIT –II:

Metals and Metal Alloys, Classification of Metal Alloys, Classification, composition, properties and usage of Ferrous alloys, steel, HSS, grey cast iron, white cast iron; Classification, composition, properties and usage of Non-ferrous materials, Aluminum, Titanium, Zinc, Copper, Nickel, Cobalt and their alloys

UNIT –III:

Composites: Definitions, Reinforcements and matrices, Types of reinforcements, Types of matrices,Classification of composites, Overview of Micro Mechanics, Properties of composites in comparison with standard materials Manufacturing methods: Hand and spray lay - up, injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs.

UNIT – IV:

Ceramics, Classification of ceramic materials, Crystal Structure, Applications and Properties of Ceramics, Ceramic fabrication techniques, Carbon: Diamond and Graphite. Polymer Structures, Chemistry of Polymer Molecules, Classification scheme of polymer molecules, Thermoplastic and Thermosetting Polymers, Characteristics, Applications, and Processing of Polymers, Elastomers.

UNIT – V:

Materials in nano technology: Semiconductor Nanomaterials (Zinc oxide nano materials, titanium dioxide nanoparticles, Metal nanoparticles, ceramic nano materials metal nano particles (Silver, gold, iron and copper), applications, bio materials and other recent materials

TEXT BOOKS:

1. George Murray, Charles V. White, Wolfgang Weise, "Introduction to Engineering Materials",CRC Press, 2007.
2. William. D. Callister, David G. Rethwisch, "Materials Science and Engineering: An Introduction", John Wiley & Sons, 2018.

REFERENCE BOOKS:

1. Myer Kutz, "Mechanical Engineers' Handbook", John Wiley & Sons, 2015.
2. M.A. Shah, K.A.Shah, Nano technology, the science of Small, WILEY, Second Edition, 2019.
3. E. Paul De Garmo, J.T. Black, R.A. Kohler. Materials and Processes in Manufacturing, JohnWiley and Sons, Inc., NY, 11 th Edition, 2012.
4. R.J. Crawford, plastics engineering, Pergamon Presss, 2013.
5. Donald R Askland and Pradeep P Phule "Essentials of Materials Science and Engineering",by Pradeep P. Fulay (Author), Donald R. Askeland, 2013.
6. K. K. Chawala, Cermic Matrix composite Materials, Kluwer Academic Publishers, 2002.

PYTHON PROGRAMMING LABORATORY

B.Tech. I Year II Sem.

L	T	P	C
0	1	2	2

Course Objectives:

- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

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
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples

Week -1:

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.
3.
   i) Write a program to calculate compound interest when principal, rate and number of periods aregiven.
   ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points
4. Read name, address, email and phone number of a person through keyboard and print the details.

Week - 2:

1. Print the below triangle using for loop.5

4 4
3 3 3
2 2 2 2
1 1 1 1 1

2. Write a program to check whether the given input is digit or lowercase character or uppercasecharacter or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval (use break)

Week - 3:

1. i) Write a program to convert a list and tuple into arrays.

ii) Write a program to find common values between two arrays.

2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.

3. Write a function called palindrome that takes a string argument and returnsTrue if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week - 4:

1. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.

2. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
   i). Write a function called remove_duplicates that takes a list and returns a new list with only theunique elements from the original. Hint: they don't have to be in the same order.
   ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add"I", "a", and the empty string.
   iii). Write a python code to read dictionary values from the user. Construct a function to invert itscontent. i.e., keys should be values and values should be keys.
3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
   ii) Remove the given word in all the places in a string?
   iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word 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?
4. Writes a recursive function that generates all binary strings of n-bit length

Week - 5:

1. i) Write a python program that defines a matrix and prints
   ii) Write a python program to perform addition of two square matrices
   iii) Write a python program to perform multiplication of two square matrices
2. 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.
3. Use the structure of exception handling all general purpose exceptions.

Week-6:

1. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
   b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that ituses the color attribute as the fill color.
   c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.
   d. Define a new class called Circle with appropriate attributes and instantiate a few Circleobjects. Write a function called draw_circle that draws circles on the canvas.
2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiplelevels of Inheritances.
3. Write a python code to read a phone number and email-id from the user and validate it forcorrectness.

Week- 7

1. Write a Python code to merge two given file contents into a third file.
2. Write a Python code to open a given file and construct a function to check for given words presentin it and display on found.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences
4. Write a function that reads a file *file1* and displays the number of words, number of vowels, blankspaces, lower case letters and uppercase letters.

Week - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. a) Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder
5. Write a GUI program to create a window wizard having two text labels, two text fields and twobuttons as Submit and Reset.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
4. Think Python, Allen Downey, Green Tea Press
5. Core Python Programming, W. Chun, Pearson

Introduction to Python, Kenneth A. Lambert, Cengage

ENGINEERING CHEMISTRY LABORATORY

B.Tech. I Year II Sem

L	T	P	C
0	0	2	1

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

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
- Students will learn to prepare polymers such as Thiokol rubber and nylon-6 in the laboratory.
- Students will learn skills related to the lubricant properties such as viscosity of oils.
- Students will learn the extent of corrosion in metals like mild steel.

Course Outcomes: The experiments will make the student gain skills on:

- Determination of parameters like hardness of water in various conditions.
- Able to know parameters of rate of corrosion of mild steel in various conditions.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like Thiokol rubber and nylon-6.

Estimations viscosity of lubricant oils.

List of Experiments:

I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.

II. **Conductometry:** Estimation of the concentration of an acid by Conductometry.

III. **Potentiometry:** Estimation of the amount of Fe^{+2} by Potentiomentry.

IV. **pH Metry:** Determination of an acid concentration using pH meter.

V. **Preparations:**

1. Preparation of Bakelite.
2. Preparation Nylon – 6.

VI. **Lubricants:**

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

VII. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence ofinhibitor.

VIII. **Virtual lab experiments**

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

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 Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

FUELS AND LUBRICANTS LABORATORY

B.Tech. I Year II Sem. **L T P C**

0 0 2 1

Prerequisite: Chemistry

Course Objectives:

- To Understand the fuel and lubricants properties.
- The main objective of this lab is to develop an idea of fuel properties and their variation with temperature, determination of kinematic viscosity and calorific value of fuels.
- To determine properties of several fuels and lubricants, compare them with standards so as to get an idea about its quality.
- This lab will supplement theoretical inputs in the basic sciences and engineering courses.
- Learn how to use of proper lubrication under different condition to improve engine performance.

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

- **CO1:** Find the kinematic viscosity of lubricants and its variation with temperature
- **CO2:** Determine the flash point, fire point, cloud point and pour point of liquid fuels
- **CO3:** Determine the calorific value of solid, liquid and gaseous fuels
- **CO4:** Determination of the dropping point of lubricating grease
- **CO5:** Determination of distillation characteristics of petroleum products

List of Experiments:

1. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Abels Apparatus
2. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Pensky MartensApparatus
3. Carbon residue test: Liquid fuels.
4. Determination of Viscosity of Liquid lubricants and Fuels using: Saybolt Viscometer
5. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer
6. Determination of Viscosity of Liquid lubricants and Fuels using: Engler Viscometer
7. Determination of Calorific value: of Gaseous fuels using: Junkers Gas Calorimeter.
8. Determination of Calorific value: Solid/Liquid/ fuels using: Bomb Calorimeter.
9. Drop point and Penetration Apparatus for Grease.
10. ASTM Distillation Test Apparatus.
11. Cloud and Pour Point Apparatus.

Note: Preform any 10 out of the 11 Exercises.

REFERENCE BOOKS:

1. Dictionary of Mechanical Engineering – G.H.F. Nayler, Jaico Publishing House.
2. ASTM Manual Series, Mnl 37 by George E. Totten (Author), Rajesh J. Shah (Author).
3. Ganesan V., "Internal Combustion Engines", Tata McGraw Hill Publishing Co., New Delhi, 2012.
4. Srivastava S.P., Jenõ Hancsók "Fuels and Fuel-Additives" Wiley; 1st Edition, 2014.
5. Gupta O.P., "Elements of Fuel & Combustion Technology", Khanna Book Publishing; 1st Edition, 2018.

PROBABILITY, STATISTICS & COMPLEX VARIABLES

B.Tech. II Year I Semester **L T P C**

3 1 0 4

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn

- The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basic ideas of statistics including measures of central tendency, correlation and regression.
- The statistical methods of studying data samples
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem and expansion of complex functions using Taylor's and Laurent's series.

Course Outcomes: After learning the contents of this paper the student must be able to

- **CO1:** Formulate and solve problems involving random variables.
- **CO2:** Formulate and apply statistical methods for analyzing experimental data.
- **CO3:** Apply concept of estimation and testing of hypothesis to case studies.
- **CO4:** Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
- **CO5:** Analyze the complex function with reference to their integration using Cauchy's integral and residue theorems. Taylor's and Laurent's series expansions of complex function.

UNIT-I: Basic Probability **8 L**

Probability spaces, conditional probability, independent events, and Baye's theorem. Random variables: Discrete and continuous random variables, Expectation of Random Variables, Variance of random variables

UNIT - II: Probability distributions **10 L**

Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution, Continuous random variables and their properties, distribution functions and density functions, Normal and exponential, evaluation of statistical parameters for these distributions

UNIT - III: Estimation & Tests of Hypotheses **10 L**

Introduction, Statistical Inference, Classical Methods of Estimation.: Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Estimating a Proportion for single sample, Difference between Two Means, difference between two proportions for two Samples.

Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Tests Concerning a Single Mean, Tests on Two Means, Test on a Single Proportion, Two Samples: Tests on Two Proportions.

UNIT - IV: Complex Differentiation **10 L**

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties, Conformal mappings, Mobius transformations

UNIT-V: Complex Integration **10L**

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem (All theorems without Proof)

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statistics for engineers and scientists, 9th Edition, Pearson Publications

REFERENCE BOOKS:

1. Fundamentals of Mathematical Statistics, Khanna Publications, S. C. Guptha and V. K. Kapoor.
2. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill, 2004.

MECHANICS OF SOLIDS

B.Tech. II Year I Sem. **L T P C**

3 0 0 3

Course Pre-Requisites: Engineering Mechanics

Course Objectives: The objectives of this course are to:

- Understand the concepts of internal forces, moments, stress, strain, and deformation of solids with applications to bars, beams, and columns.
- Learn the fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements.
- Study twisting of circular bars and hollow shafts acted on by torsional moments.
- Define the state of stress at a point on a body and to develop stress transformations.
- Introduce the concept of theories of elastic failure and their significance in the design.

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

- **CO1:** Evaluate the internal forces, moments, stresses, strains, and deformations in structures madeof various materials acted on by a variety of loads.
- **CO2:** Draw axial force, shear force and bending moment diagrams for beams and frames.
- **CO3:** Develop the Bending and Torsion formula and apply to the design of beams and shafts.
- **CO4:** Use the stress transformation equations to find the state of stress at a point for various rotated positions of the stress element and display the same in graphical form as Mohr's circle.
- **CO5:** Understand the different criteria for the safety of the component by applying the theories of elastic failure.

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 – Gradual, sudden, impact and shock loadings.

UNIT – II:

Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III:

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

Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle 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 circleof stresses – Principal stresses and strains – Analytical and graphical solutions.

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

UNIT – V:

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\theta/L$

– Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

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

TEXT BOOKS:

1. Barry J. Goodno and James M. Gere, "Mechanics of Materials" Ninth Edition, Cengage Learning,2018.
2. S. S. Rattan, "Strength of Materials", Second Edition Tata McGraw Hill Education Pvt. Ltd,New Delhi,2011

REFERENCE BOOKS:

1. U. C. Jindal, "Strength of Materials", Pearson Education India,2012
2. Egor P. Popov, Toader A. Balan, "Engineering Mechanics of Solids", PHI Learning, 2010
3. G. H. Ryder, "Strength of Materials", Macmillan Long Man Publications, 1961
4. W. A. Nash and M. C. Potter, "Strength of Materials", Fifth Edition, Schaum's Outline Series,2011
5. Dr.B.C. Punmia, "Mechanics of Materials" Laxmi Publications; Revised edition (1 January 2017).
6. Dr. Sadhu Singh "Strength of Materials" KHANNA Publishers, 2013.

METALLURGY & MATERIAL SCIENCE

B.Tech. II Year I Sem. **L T P C**

3 0 0 3

Course Objectives: Students will be able to

- Learn the concepts of metallurgy and materials science in manufacturing processes.
- Interpret phase diagrams of different alloy systems.
- Describe the concept of heat treatment and other strengthening mechanisms.
- Materials engineering is an interdisciplinary field involving the properties of matter and its applications to various fields of science and engineering.
- Chemical metallurgy deals with chemical properties of metals including uniting of different metals with one another to form alloys.

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

- **CO1:** Memorize the types of Crystal structures and their defects.
- **CO2:** Learn the necessity of alloying and identify types of alloy phases.
- **CO3:** Demonstrate importance of critical understanding of heat treatment in achieving requiredproperties.
- **CO4:** Apply the knowledge of heat treatment to enhance surface properties.
- **CO5:** Analyze the properties and microstructure of ferrous and non-ferrous alloys.

UNIT – I

Crystal Structure: Unit cells, Metallic and Ceramic crystal structures. Imperfection in solids: Point, line, surface and volume defects; dislocations, strengthening mechanisms, slip systems, critical resolved shear stress.

UNIT – II

Hume – Rothery Rules: Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, Eutectiod, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstrctural aspects of ledeburite, austenite, pearlite, ferrite and cementite.

UNIT –III

Heat treatment of steels: Isothermal transformation diagrams for Fe-C alloys and microstructures development. Martensite, Bainite. Annealing. Normalising, Hardening, Tempering and Spheroid sing.

UNIT – IV

Continuous cooling curves and interpretation of final microstructures and properties- Thermo mechanical treatments like austempering, martempering, surface hardening methods like case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening.

UNIT – V

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),

copper and its alloys (Brass andbronze)- Aluminium and its alloys (Al-Cu Alloys) - Titanium and its alloys & Magnesium and its alloys.

TEXT BOOKS:

1. V. Raghavan, "Material Science and Engineering', Prentice Hall of India Private Limited, FifthEdition.
2. William. D. Callister, David G. Rethwisch, "Materials Science and Engineering: AnIntroduction", John Wiley & Sons, 2018.
3. SIDNEY H AVNER, Introduction to Physical Metallurgy, McGraw Hill,2017

REFERENCE BOOKS:

1. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of IndiaPrivate Limited, 9th Edition, Indian Reprint, 2009.
2. U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011.
3. Pakirappa, "Metallurgy and Material Science", 8ed Durga Publishing House, Publishing, 2019.
4. V.D. Kodgire & S.V. Kodgire, "Metallurgy and Material Science", 45th, Everest Publishing House,2019.

PRODUCTION TECHNOLOGY

B.Tech. II Year I Sem. **L T P C**

3 0 0 3

Pre-requisites: None

Course Objectives:

- To expose the students to understand the concept of basic casting processes & furnaces.
- To provide a technical understanding of various joining processes used in the manufacturingindustry.
- To impart the students to the concepts of solid-state welding processes.
- To teach the concepts of rolling and various press working operations.
- To provide a technical understanding of different metal forming processes like extrusion,forging and high energy rate forming processes.

Course Outcomes: Student will be able to:

- **CO1:** Elaborate the fundamentals of various moulding, casting techniques and furnaces.
- **CO2:** Identify the importance of permanent joining and principle behind different welding processes.
- **CO3:** Explain the concepts of solid-state welding processes
- **CO4:** Understand the concepts of rolling and sheet metal operations in metal working.
- **CO5:** Elaborates the uniqueness of extrusion, forging and high energy rate forming processes inmetal 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 mouldingmethods. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Principlesof Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design. Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding

UNIT – II:

Welding: Classification – Types of welds and welded joints and their characteristics, Welding Positions - Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, Shielded metal arc welding, submerged arc welding, Resistance welding, Thermit welding.

UNIT – III:

Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, Friction Stir Welding, induction welding, explosive welding, Laser 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, strain hardening, recovery, recrystallisation and grain growth. Sheet metal Operations: Stamping, Blanking and piercing, Coining, Strip layout, Hot and cold spinning – Bending and deep drawing. 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 – Types of presses and press tools. Forces and power requirement in the above operations.

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 operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

High Energy Rate Forming Processes: Principles of Explosive Forming, Electro-hydraulic Forming, Electro-magnetic forming and rubber pad Forming.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao/ Vol.1 / Mc Graw Hill Education/ 5th Edition, 2018.
2. Manufacturing Engineering & Technology / Serope Kalpakjian / Steven R. Schmid / Pearson,7th Edition,2014

REFERENCE BOOKS:

1. Production Technology Vol.: 1, WILEY, sreeramulu M, 2018
2. A Text book of Production Technology (Manufacturing Processes) / Dr.P.C. Sharma / S.Chand Publications /1st Edition, 2006.
3. Manufacturing processes H. S. Shan, Second Edition, Cambridge University Press, 2017.
4. Production Technology: Manufacturing Processes, Technology and Automation / R. K. Jain Vol.1/Khanna Publishers /19th Edition, 2009.
5. 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

B.Tech. II Year I Sem. **L T P C**

3 1 0 4

Pre-requisite: Engineering Chemistry and Physics

Course Objective:

- To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications.
- To present a comprehensive and rigorous treatment of classical thermodynamics while retaining an engineering perspective.
- To lay the groundwork for subsequent studies in such fields as fluid mechanics, heat transfer and to prepare the students to effectively use thermodynamics in the practice of engineering.
- To develop an intuitive understanding of thermodynamics by emphasizing the physics and physical arguments.
- To present a wealth of real world engineering examples to give students a feel for how thermodynamics is applied in engineering practice.

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

- **CO1:** Understand the basics of Thermodynamics
- **CO2:** Apply first and second laws of thermodynamics to different systems
- **CO3:** Determine the feasibility of a process w.r.to entropy changes
- **CO4:** Apply concepts of thermodynamic property relations to ideal gas and real gases
- **CO5:** Evaluate performance of power cycles and refrigeration cycles

Tables/Codes: Steam Tables and Mollier Chart, Refrigeration Tables

UNIT – I:

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, 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:

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.

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics

UNIT – III:

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

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

UNIT – IV:

Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables

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, Atmospheric air - Psychrometric

Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart.

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 – comparison of Cycles, Brayton and Rankine cycles – Performance Evaluation.

Refrigeration Cycles: Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS:

1. Engineering Thermodynamics / PK Nag / Mc Graw Hill
2. Thermodynamics – An Engineering Approach by Yunus A. Cengel & Michael A. Boles, TMH
3. Fundamentals of Classical Thermodynamics by G. Van Wylan & R.E. Sonntag, John Wiley Pub

REFERENCE BOOKS:

1. Engineering Thermodynamics by Jones & Dugan, PHI, 2007.
2. Thermodynamics by M. Achutan, PHI, 2nd Edition, 2013.
3. Thermodynamics & Heat Engines by R. Yadav, Central Book Depot, Allahabad.
4. Thermodynamics by S.C. Gupta, Pearson Publications.

PRODUCTION TECHNOLOGY LABORATORY

B.Tech. II Year I Sem. **L T P C**

0 0 2 1

Pre-requisites: Production Technology

Course Objectives:

- Know about the basic Physical, Chemical Properties of materials.
- Learn the basic operation of various manufacturing processes.
- Design and fabricate a simple product.
- Understand how process conditions are set for optimization of production.
- Arc welding, gas welding and resistance welding equipment for the fabrication of welded joints

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

- **CO1:** Analyze the given problem and conducts investigation on the experimental setup.
- **CO2:** Operate different types of welding machines
- **CO3:** Perform operations on mechanical press.
- **CO4:** Get familiarity with processing of Plastics.
- **CO5:** Effectively communicate and explain the experimental analysis.

Minimum of 12 Exercises need to be performed

I. Metal Casting Lab:

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

II. Welding Lab:

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises (Water Plasma Device)

III. Mechanical Press Working:

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

IV. Processing of Plastics

1. Injection Moulding
2. Blow Moulding

REFERENCE BOOK:

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

MATERIAL SCIENCE & MECHANICS OF SOLIDS LABORATORY

B.Tech. II Year I Sem. **L T P C**

0 0 2 1

Pre-Requisites: Material Science and Metallurgy

Course Objective:

- The Objective is to make the students to learn the concepts of Metallurgy and Material Science in manufacturing processes, which convert raw materials into useful products.
- Students will be able to understand basic structure and crystal arrangements of materials and classify and distinguish different microstructures of steels, cast irons and non-ferrous alloys.
- To impart the required material for products based on micro structure.
- To know the properties of materials at higher elevated temperatures.
- To know the properties of materials at higher elevated temperatures.

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

- **CO1:** Design different crystal structures and their models.
- **CO2:** Infer the microstructures developed for different ferrous and non-ferrous metals.
- **CO3:** Correlate the microstructures, properties, performance and processing of alloys.
- **CO4:** Ability to relate properties to microstructure.
- **CO5:** Ability to select metals and alloys for industrial applications.

List of Experiments:

1. Preparation and study of crystal models for simple cubic, body centred cubic, face centredcubic and hexagonal close packed structures.
2. Preparation and study of the Microstructure of pure metals like Iron, Cu and Al.
3. Preparation and study of the Microstructure of Mild steels, low carbon steels, high Carbonsteels.
4. Study of the Microstructures of Various Cast Irons.
5. Study of the Microstructures of Non-Ferrous alloys. (Al, Cu, Mg)
6. Hardenability of steels by Jominy End Quench Test.

MECHANICS OF SOLIDS LAB:

Course Objectives: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

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

- Analyze the behavior of the solid bodies subjected to various types of loading.
- Apply knowledge of materials and structural elements to the analysis of simple structures.
- Undertake problem identification, formulation and solution using a range of analytical methods
- Analyze and interpret laboratory data relating to behavior of structures and the materials theyare made of and undertake associated laboratory work individually and in teams.
- Expectation and capacity to undertake lifelong learning.

List of Experiments:

1. Direct tension test (Tensile Test, Comparison 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.

Reference Books:

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

COMPUTER AIDED MACHINE DRAWING

B.Tech. II Year I Sem. **L T P C**

0 0 2 1

Pre-requisites: Engineering Graphics

Course objectives:

- To familiarize with the standard conventions for different materials and machine parts in working drawings.
- To gain knowledge of conventional representation of various machining and mechanical details as per IS.
- To make part drawings including sectional views for various machine elements. To prepare assembly drawings given the details of part drawings.
- To gain knowledge of threads, bolts, nuts, stud bolts, tap bolts, set screws, Keys, cottered joints and knuckle joint.
- To prepare assembly drawings given the details of part drawings

Course Outcomes:

- **CO1:** Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components.
- **CO2:** Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- **CO3:** Types of sections – selection of section planes and drawing of sections and auxiliary sectionalviews. Parts not usually sectioned.
- **CO4:** Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
- **CO5:** Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts

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

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 footstep 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. Steam engine parts – stuffing box, cross head, Eccentric.
2. Machine tool parts: Tail stock, Tool Post, Machine Vices.
3. Other machine parts - Screw jack, Connecting rod, Plumber block, Fuel Injector.
4. Valves - Steam stop valve, spring loaded safety valve, feed check valve and air cock.

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

NOTE: 1. First angle projection to be adopted.
2. All the drawing components/Assembly to be drawn using any Computer aided drafting package.

TEXT BOOKS:

1. Machine Drawing / N.D. Bhatt / Charotar.
2. Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson.

REFERENCE BOOKS:

1. Machine Drawing by / Bhattacharyya / Oxford
2. Machine Drawing / Ajeet Singh / Mc Graw Hill
3. Machine Drawing by / K.C. Jhon.

Note: - External examination is conducted in conventional mode and internal evaluation to be done byboth conventional as well as using computer aided drafting.

CONSTITUTION OF INDIA

B.Tech. II Year I Sem.

L	T	P	C
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Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rightsperspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutionalrole and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before thearrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed theconceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

Unit - 1 History of Making of the Indian Constitution- History of Drafting Committee.

Unit - 2 Philosophy of the Indian Constitution- Preamble Salient Features

Unit - 3 Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

Unit - 4 Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit - 5 Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO ZilaPanchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit - 6 Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH. II YEAR II SEMESTER **L T P C**

0 0 2 1

Prerequisite: Matrices and Calculus, Intermediate Physics.

Course Objectives:

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concepts of diodes & transistors

Course Outcomes: Upon completing this course, the student will be able to

CO1: To analyze and solve electrical circuits using network laws and theorems.

CO2: To understand and analyze basic Electrical and Magnetic circuits

CO3: To study the working principles of Electrical Machines

CO4: To introduce components of Low Voltage Electrical Installations

CO5: To identify and characterize diodes and various types of transistors

UNIT: I D.C. & A.C. CIRCUITS **10L**

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Three phase balanced circuits, voltage and current relations in star and delta connections Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries.

UNIT: II DC MACHINES & TRANSFORMERS **10L**

Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors

Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections.

UNIT: III AC MACHINES **10L**

Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

UNIT: IV P-N JUNCTION AND ZENER DIODE **10L**

Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications. Rectifiers and Filters: P-N junction as a

rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L-section Filters, π- section Filters.

UNIT: V BIPOLAR JUNCTION TRANSISTOR (BJT) 10L

Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University,2012
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education,1st Edition,2017.
3. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications, 3rd Edition,2019(Reprint)

REFERENCE BOOKS:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company,2013
3. Network Theory by Sudhakar, Shyam Mohan Palli, TMH, 5th Edition, 2017.
4. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
5. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 2007.

WEB REFERENCES:

1. https://nptel.ac.in/courses/108108076
2. https://nptel.ac.in/courses/108105053

KINEMATICS OF MACHINERY

B.Tech. II Year II Sem. **L T P C**

3 0 0 3

Prerequisites: Basic principles of Mechanics

Course Objectives: The objectives of this course are

- To introduce the concept of machines, mechanisms and related terminologies and the relative motion, velocity, and accelerations of the various elements in a mechanism.
- To make the students become familiar with the most commonly used mechanisms such as four bar/slider crank/double slider crank mechanisms and their inversions.
- To provide an overview of straight-line motion mechanisms, steering mechanisms and Hooke's joint.
- To familiarize higher pairs like cams and principles of cams design.
- To understand the kinematic analysis of gears & gear trains.

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

- **CO1:** Understand the various elements in mechanism and the inversions of commonly used mechanisms such as four bar, slider crank and double slider crank mechanisms.
- **CO2:** Draw the velocity and acceleration polygons for a given configuration of a mechanism.
- **CO3:** Understand the conditions for straight line motion mechanisms, steering mechanism and theusage of Hooke's joint.
- **CO4:** Draw the displacement diagrams and cam profile diagram for followers executing differenttypes of motions and various configurations of followers.
- **CO5:** Calculate the number of teeth and velocity ratio required for a given combination of gears.

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, Mechanical Advantage.

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. Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration

Analysis of Mechanisms: Analysis of slider crank chain for displacement- velocity and acceleration of slider –Analytical Method.

UNIT – III:

Straight-line motion mechanisms: Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -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. Cycloidal Motion, Maximum velocity, and maximum acceleration during outward and return strokes in the above 4 cases.

Analysis of motion of followers: Tangent cam with Roller follower – circular arc cam with straight, concave and convex flanks.

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

Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements– Introduction to Helical – Bevel and worm gearing

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.
2. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", 4 th Edition, Oxford University Press, 2014.

REFERENCE BOOKS:

1. Sadhu Sigh, "Theory of Machines", Third Edition, Pearson Education, 2012.
2. Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors, 2005.
3. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.
4. Rao. J.S. and Dukkipati. R.V. "Mechanisms and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.

FLUID MECHANICS & HYDRAULIC MACHINES

B.Tech. II Year II Sem. **L T P C**

3 0 0 3

Course Objectives: To enable the student:

- To understand the basic principles of fluid mechanics
- To identify various types of flows
- To understand boundary layer concepts and flow through pipes
- To evaluate the performance of hydraulic turbines
- To understand the functioning and characteristic curves of pumps

Course Outcomes:

- **CO1:** Able to explain the effect of fluid properties on a flow system.
- **CO2:** Able to identify type of fluid flow patterns and describe continuity equation.
- **CO3:** To analyze a variety of practical fluid flow and measuring devices and utilize Fluid Mechanicsprinciples in design.
- **CO4:** To select and analyze an appropriate turbine with reference to given situation in power plants.
- **CO5:** To estimate performance parameters of a given Centrifugal and Reciprocating pump.

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.

UNIT – III:

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

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. Measurement of flow: Pitot tube, venturi meter, and orifice meter, Flow nozzle

UNIT – IV:

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.

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, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT – V:

Centrifugal pumps: Classification, working, work done – barometric head- losses and efficiencies specific speed- performance characteristic curves, NPSH.
Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Hydraulics, Fluid mechanics and Hydraulic Machinery - MODI and SETH, 21st Edition, standard Book House.
2. Fluid Mechanics and Hydraulic Machines by Er. R. K. Rajput, S. Chand,2019.

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K. Kataria & Sons,2018
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International publishers
3. Hydraulic Machines by T.R.Banga & S.C. Sharma, 7th Edition, Khanna Publishers
4. Fluid Mechanics & Hydraulic Mechanics by R.k Bansal, Laxmi Publicatios, Revised Ninth Edition 2010.
5. Fluid Mechanics: Fundamentals and Applications (4th edition, SIE), McGraw-Hill; Fourth edition (28 May 2019).

IC ENGINES & GAS TURBINES

B.Tech. II Year II Sem. **L T P C**

3 0 0 3

Pre-requisite: Thermodynamics

Course Objective:

- Explain the Components of IC Engines and systems.
- Analyze the stages of combustion to improve the performance of IC engines with respect to fuel economy and control of emissions in global, environmental and social context.
- Understand and evaluate the performance analysis of the major components and systems of IC engines and their applications.
- Explore to the components and working principles of rotary, reciprocating, dynamic andaxial compressors.
- Understand the significance of gas turbines in real context in power generation.

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

- **CO1:** Elaborate the working principles of IC Engine systems and its classification.
- **CO2:** Explore the combustion stages of SI and CI engines, and factors influence for bettercombustion.
- **CO3:** Evaluate the testing and performance parameters of IC engines.
- **CO4:** Explain the function and working principles of rotary, reciprocating, dynamic axialcompressors.
- **CO5:** Understand the working principle of gas turbine and its classification with thermodynamicanalysis.

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:

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of 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.

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

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.

Dynamic Compressors: 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.

Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.

UNIT – 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
2. Thermal Engineering, Mahesh M Rathore, Tata Mc Graw Hill, 2010

REFERENCE BOOKS:

1. Applied Thermodynamics for Engineering Technologists, Eastop & McConkey, Pearson
2. Fundamentals of Classical Thermodynamics, Vanwylen G.J., Sonntag R.E., Wiley Eastern
3. Internal Combustion Engines Fundamentals, John B. Heywood, McGraw Hill Ed.

INSTRUMENTATION AND CONTROL SYSTEMS

B.Tech. II Year II Sem. **L T P C**

3 0 0 3

Prerequisite: Mathematics-I, Thermodynamics, Basic of Electrical and Electronics Engineering.

Course Objectives:

- To impart the basic knowledge of the functional blocks of measurement systems.
- To provide technical understanding of various Temperature and pressure measuring instruments.
- To expose the students to know the working of various physical variable Level, Flow, Speed and Acceleration measuring instruments.
- To understand the working of various physical and Electrical variables Stress, Humidity,Force, Torque and Power measuring instruments.
- To understand the concept of control system and calculate transfer functions of mechanical and translational systems with different techniques.

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

- **CO1:** Know the basic knowledge of the functional blocks of measurement systems.
- **CO2:** Describe the working of various physical variable Temperature and pressure measuring instruments.
- **CO3:** Explain the working of various physical variable Level, flow, Speed and Acceleration measuring instruments.
- **CO4:** Understand the working of various physical and Electrical variables Stress, Humidity, Force,Torque and Power measuring instruments.
- **CO5:** Understand the concept of control system and calculate transfer functions of mechanical andtranslational systems with different techniques.

UNIT – I:

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

UNIT – II:

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; Changes in Chemical Phase: Fusible Indicators andLiquid crystals. Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge Tester (Piston gauge), Bourdon pressure gauges, Bulk modulus pressure gauges, Bellows, Diaphragm gauges. Low pressure measurement – Thermal conductivitygauges, ionization pressure gauges, McLeod pressure gauge.

UNIT – III:

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

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

Measurement of Speed: Mechanical Tachometers, Electrical tachometers, Non-contact type Stroboscope; Measurement of Acceleration and Vibration: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle- Piezo electric accelerometer.

UNIT – IV:

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.

Measurement of Humidity: Moisture content of gases, Sling Psychrometer, Absorption Psychrometer, Dew point meter. Measurement of Force, Torque and Power- Elastic force meters, load cells, Torsion meters, Dynamometers.

UNIT – V:

Elements of Control Systems: Introduction, Importance – Classification – Open and closed systems- Servomechanisms – Examples with block diagrams – Temperature, speed and position controlsystems- Transfer functions- First and Second order mechanical systems

TEXT BOOKS:

1. Principles of Industrial Instrumentation & Control Systems/Chennakesava R alaavala, - Cengage Learning/1st Edition, 2009.
2. Basic Principles – Measurements (Instrumentation) & Control Systems /S. Bhaskar/ AnuradhaPublications

REFERENCE BOOKS:

1. Measurement Systems: Applications & design, E. O. Doebelin, TMH, Tata Mcgraw Hill/6thEdition, 2017.
2. Instrumentation, Measurement & Analysis, B.C. Nakra & K.K. Choudhary, TMH, 4th Edition,2016.
3. Experimental Methods for Engineers / Holman
4. Mechanical and Industrial Measurements / R. K. Jain/ Khanna Publishers.
5. Mechanical Measurements / Sirohi and Radhakrishna / New Age International, 3rd Edition,2013.
6. Mechanical Measurements-Revision | 6th Edition (English, Paperback, Thomas G. Beckwith, Roy D. Marangoni, John H. Lienhard V), Pearson Education, 2020.

ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

B.TECH. II YEAR II SEMESTER

L	T	P	C
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Prerequisite: Elements of Electrical & Electronics Engineering

Course Objectives:

- To introduce the concepts of electrical circuits and its components
- To import the knowledge of various electrical installations.
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC machines, Transformers and AC machines.
- To introduce the concepts of diodes & transistors

Course Outcomes: Upon completing this course, the student will be able to

- **CO1:** To analyze and solve electrical circuits using network laws and theorems.
- **CO2:** To introduce components of Low Voltage Electrical Installations
- **CO3:** To understand and analyze basic Electrical and Magnetic circuits
- **CO4:** To study the working principles of Electrical Machines
- **CO5:** To identify and characterize diodes and various types of transistors

List of experiments/demonstrations: **PART A: ELECTRICAL**

1. Verification of KVL and KCL
2. Measurement of Three phase Power in a balanced Three-phase circuit
3. Performance Characteristics of a Separately Excited DC Shunt Motor
4. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
5. Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta star, Star-Star) in a Three Phase Transformer
6. Performance Characteristics of a Three-phase Induction Motor
7. No-Load Characteristics of a Three-phase Alternator

PART B: ELECTRONICS

1. Study and operation of (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies
   (iv) CRO.
2. PN Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Input & Output characteristics of Transistor in CB / CE configuration
5. Full Wave Rectifier with & without filters
6. Input and Output characteristics of FET in CS configuration

WEB REFERENCES: 1 . http://vlabs.iitkgp.ernet.in/be/#

FLUID MECHANICS & HYDRAULIC MACHINES LABORATORY

B.Tech. II Year II Sem. **L T P C**

0 0 2 1

Course Objectives:

- To understand the basic principles of fluid mechanics.
- To identify various types of flows.
- To understand boundary layer concepts and flow through pipes.
- To evaluate the performance of hydraulic turbines.
- To understand the functioning and characteristic curves of pumps.

Course Outcomes:

- **CO1:** Able to explain the effect of fluid properties on a flow system.
- **CO2:** Able to identify type of fluid flow patterns and describe continuity equation and demonstrate boundary layer concepts
- **CO3:** To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanicsprinciples in design.
- **CO4:** To select and analyze an appropriate turbine with reference to given situation in power plants.
- **CO5:** To estimate performance parameters of a given Centrifugal and Reciprocating pump.

List of Experiments:

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Verification of Bernoulli's Theorems.

Note: Perform any 10 out of the 12 Exercises.

Reference Books:

1. Dictionary of Mechanical Engineering – G.H.F. Nayler, Jaico Publishing House.
2. Fluid Mechanics with Laboratory Manual by BIRESWAR MAJUMDAR, Prentice Hall India Learning Private Limited (1 January 2010).

INSTRUMENTATION AND CONTROL SYSTEMS LABORATORY

B.Tech. II Year II Sem. **L T P C**

0 0 2 1

Pre-requisites: Basic principles of Instrumentation and control systems

Course Objectives

- To impart knowledge about the principles and analysis of sensors.
- Discussion of errors and error analysis
- Emphasis on characteristics and response of transducers.
- Understand the functioning of strain gauges for measuring pressure and vibration
- Apply calibration of measuring instruments of flow and speed measurement

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

- **CO1:** Characterize and calibrate measuring devices.
- **CO2:** Identify and analyze errors in measurement.
- **CO3:** Analyze measured data using regression analysis.
- **CO4:** Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.
- **CO5:** Student learn Real time interfacing of sensor

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.
12. Measurement and control of Pressure of a process using SCADA system.
13. Measurement and control of level in a tank using capacitive transducer with SCADA.
14. Measurement and control of temperature of a process using resistance temperature detector with SCADA.

Note: Perform any 10 out of the 14 Exercises.

Reference Books:

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

GENDER SENSITIZATION LAB

B.Tech. II Year II Sem. **L T P C**
0 0 2 0

COURSE DESCRIPTION:

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

COURSE OBJECTIVE:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

COURSE OUTCOME:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labor and its relation

to politics and economics.

- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.

- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men

- Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.

-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and

Fathers. Rosa Parks- The Brave Heart.

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

- Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".
- ☞ ESSENTIAL READING: The Textbook, "Towards a World of Equals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%