TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
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B.TECH – MECHANICAL ENGINEERING

Course Structure R-22

SEMESTER I

S.No.	Course Classification	Course Code	Name of the subject	L	T	P	C	I	E	Total
1	**BS**	D1BSM1	Linear Algebra and Ordinary Differential Equations.	3	1	0	4	40	60	100
2	**BS**	D1BSEP1	Engineering Physics	3	1	0	4	40	60	100
3	**ES**	D1ESCPD	C Programming and Data Structures	3	0	0	3	40	60	100
4	**ES**	D1ESEW1	Engineering Workshop	0	1	3	2.5	40	60	100
5	**HS**	DIHSE1	English for Skill Enhancement	2	0	0	2	40	60	100
6	**BS**	D1BSEP2	Engineering Physics Laboratory	0	0	3	1.5	40	60	100
7	**HS**	DIHSE2	English Language and Communication Skills Laboratory	0	0	2	1	40	60	100
8	**ES**	D1ESCPL	C Programming and Data Structures Laboratory	0	0	4	2	40	60	100
TOTAL				**11**	**3**	**12**	**20**	**320**	**480**	**800**

SEMESTER II

S.No.	Course Classification	Course Code	Name of the subject	L	T	P	C	I	E	Total
1	**BS**	D2BSM2	Numerical Methods and Applications	3	1	0	4	40	60	100
2	**BS**	D2BSAC1	Applied Chemistry	3	1	0	4	40	60	100
3	**ES**	D2ESCEG	Computer Aided Engineering Graphics	1	0	4	3	40	60	100
4	**ES**	D2ESEM1	Engineering Mechanics	3	0	0	3	40	60	100
5	**ES**	D2ESPP2	Python Programming	2	0	0	2	40	60	100
6	**ES**	D2ESPP3	Programming with Python Lab	0	0	3	1.5	40	60	100
7	**BS**	D2BSAC2	Applied Chemistry Laboratory	0	0	3	1.5	40	60	100
8	**ES**	D2ESFLL	Fuels and Lubricants Laboratory	0	0	2	1	40	60	100
TOTAL				**12**	**2**	**12**	**20**	**320**	**480**	**800**

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MECHANICAL ENGINEERING

B.Tech I Year I Semester **L/T/P/C 3/1/0/4**

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS (D1BSM1)

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives:

To learn:

1. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations
2. Concept of Eigen values and Eigen vectors and to reduce the quadratic form to canonical form.
3. Methods of solving the differential equations of first order.
4. Find general solution to linear, homogeneous and non homogeneous ODEs with constant coefficients.
5. Evaluation of double integrals.

Course Outcomes:

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

1. Discuss the matrix representation of a set of linear equations and to analyses the solution of thesystem of equations.
2. Reduce the quadratic form to canonical form using orthogonal transformation.
3. Identify whether the given DE of first order is exact or not.
4. Can find applications of first order ODE.
5. Solve higher differential equation and apply the concept of differential equation to real worldproblems.
6. Evaluating double integrals and applying them to compute the areas of regions.

UNIT I

Matrices & System of Equations:

Types of matrices - rank of a matrix by Echelon form and normal form- inverse of nonsingular matrices by Gauss-Jordan method - System of linear equations- solving system of homogeneous and non homogeneous equations- Gauss elimination method.

UNIT II

Eigen Values and Eigen Vectors:

Eigen values and Eigen vectors and their properties - Cayley-Hamilton theorem(without proof) finding inverse and powers of a matrix by Cayley-Hamilton theorem- diagonalization of a Matrix - linear transformation andorthogonal transformation - quadratic forms and nature of the quadratic forms- reduction of quadratic form toCanonical forms by orthogonal transformation.

UNIT III

Ordinary Differential Equations of First Order, First Degree and its applications

Applications:

Exact- linear and Bernoulli's equations- orthogonal trajectories - applications - Newton'slaw of cooling-law of natural growth and decay.

UNIT IV

Second Order Ordinary Linear Differential Equations:

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 $xV(x)$ - method of variation of parameters.

UNIT V

Double Integrals and Applications:

Evaluation of double Integrals (cartesian and polar coordinates) - change of order of integration(only cartesian form)- change of variables (cartesian to polar) for double integrals- applications of double integrals to evaluate surface areas of curves (only in Cartesian Coordinates).

Text Books

1. B.S.Grewal- Higher Engineering Mathematics- Khanna Publishers- 40th Edition-2015.
2. Ramana B.v.- Higher Engineering Mathematics- Tata McGraw Hill New Delhi- 11th Reprint- 2010.
3. Engineering Mathematics by TKV Iyengar, B. Krishna Gandhi, S. Chand and publications

Reference Books

1. N.P. Bali and Manish Goyal- A text book of engineering Mathematics-Laxmi Publications-Reprint-2008.
2. Erwin Kreyszig –Advanced Engineering Mathematics- 10thEdition- Wiley - 2021
3. Advanced Engineering Mathematics by S.R.K. Iyengar R.K. Jain – Narosa Publications.

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MECHANICAL ENGINEERING

B.Tech I Year I Semester **L/T/P/C**
3/1/0/4

ENGINEERING PHYSICS (D1BSEP1)

COURSE OBJECTIVES:

Students will be able to

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Gain the fundamental concepts related to the dielectric and energy materials.
4. Understand the fundamental concepts of magnetic and superconducting materials
5. Understand the characteristics of lasers and optical fibers.

COURSE OUTCOMES:

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

1. Analyze the concepts of quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering applications.
3. Explore the fundamental properties of dielectric and energy materials for their applications.
4. Knowing the concepts related to magnetic and superconducting materials for different engineering applications.
5. Explore the various aspects of lasers and optical fiber and their applications in diverse fields.

UNIT I

QUANTUM MECHANICS AND BAND THEORY OF SOLIDS

Quantum Mechanics: Wave particle duality, de Broglie's matter waves, Davisson and Germer's experiment, Heisenberg uncertainty principle, Born interpretation of the wave function, Time independent Schrodinger's wave equation, Particle in one dimensional potential box.

Band theory of solids: Electron in periodic potential- Bloch's theorem, Kronig-Penney model, E-K diagram, Effective mass of an electron, Origin of energy bands, Classification of solids.

UNIT II

SEMICONDUCTORS AND SEMICONDUCTOR DEVICES

Semiconductors: Intrinsic and extrinsic semiconductors, carrier concentration in intrinsic and extrinsic semiconductors, Hall Effect.

Semiconductor devices : Construction, Principle of operation and characteristics of P-N Junction diode, Direct and Indirect band gap semiconductors, structure and working principle and characteristics of LED, Photo diode and solar cells.

UNIT III

DIELECTRIC AND ENERGY MATERIALS

Dielectric Materials: Basic definitions, Types of polarizations (qualitative), Ferroelectric, Piezoelectric, and Pyroelectric materials, Applications.

Energy Materials: Conductivity of liquid and solid electrolytes, Superionic conductors, materials and electrolytes for super capacitors, Rechargeable ion batteries, Solid fuel cells.

UNIT IV

MAGNETIC MATERIALS AND SUPERCONDUCTIVITY

Magnetic materials: Basic Definitions, Origin of magnetic moment in solids, Classification of magnetic materials. Domain theory of ferromagnetism, Hysteresis-soft and hard magnetic materials.

Superconductivity: Introduction, Effect of Temperature, Magnetic field and current on superconductors, Types of superconductors: Type-I, Type-II superconductors, Magnetic levitation, Applications of superconductors.

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, Semiconductor laser, Applications .

Fiber Optics: Introduction to optical fibers, Advantages of optical fibers, Total internal reflection, Construction of optical fibers, Classification of optical fibers, Acceptance angle - Numerical aperture, Losses in optical fiber, Optical fiber for communication system, Applications.

TEXT BOOKS:

1. P.K PalaniSwami, Engineering Physics-II, 2nd edition Scitech publication-2012
2. P.K.Palaniswamy Engineering Physics, 4th edition Scitech publication-2014
3. M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications, 11th Edition 2019.
4. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
5. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, McGraw Hill, 4th Edition,2021.
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022.

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, PragathiPrakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksan Dr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022

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MECHANICAL ENGINEERING

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

C PROGRAMMING AND DATA STUCTURES (D1ESCPD)

Course Objectives:

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

Course Outcomes:

The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in the C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- Searching and sorting problems.

UNIT I:

Introduction to Programming

Compilers, compiling and executing a program.

Representation of Algorithm - Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudocode with examples, Program design and structured programming

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, type conversion, The main method and command line argumentsPreprocessor: include, define

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

UNIT II:

Arrays, Strings, Structures and Pointers:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays
Strings: Introduction to strings, handling strings as array of characters, String, Arrays of strings
Structures: Defining structures, initializing structures, unions, Array of structures
Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Dynamic memory allocation, Use of Pointers in self-referential structures, Enumeration data type

UNIT III:

Function and Files

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Storage classes (auto, extern, static and register), Some C standard functions and libraries
Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions
Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT IV:

Searching and Sorting:

Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

UNIT V:

Stack and Queues, Applications of stacks and queues, Self referential structures in linked list: Singly linked List, Trees: Binary trees and Binary Search Trees basics

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

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MECHANICAL ENGINEERING

B.Tech. I Year I Semester **L/T/ P/C**
0/ 1/3/2.5

ENGINEERING WORKSHOP (D1ESEW1)

Pre-requisites: Practical skill

Course Objectives:

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

Course Outcomes:

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

1. Design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint.
2. Develop and model various basic prototypes in the trade of fitting such as Straight and L fit.
3. Construct various basic prototypes in the trade of Tin smithy such as rectangular tray, Scoop.
4. Inspect various basic house wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, Series wiring.
5. Build various basic prototypes in the trade of Welding such as Lap joint, Butt joint

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

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MECHANICAL ENGINEERING

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

ENGLISH FOR SKILL ENHANCEMENT (D1HSE1)

Course Objectives:

This course will enable the students to:

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

Course Outcomes:

Students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports invarious contexts.
6. 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 of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.**

UNIT II

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

Vocabulary: **Words Often Misspelt - Homophones, Homonyms and Homographs**
Grammar: **Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement andSubject-verb Agreement.**
Reading: **Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice**

Writing: **Nature and Style of Writing- Defining /Describing People, Objects, Places and Events**
– **Classifying- Providing Examples or Evidence.**

UNIT III

Chapter entitled **'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from

"English: Language, Context and Culture" published by Orient BlackSwan, Hyderabad.
Vocabulary:Words Often Confused - Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: **Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises 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 are coveredin 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 theneeds 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 Black Swan 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 Engineering Students.Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

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MECHANICAL ENGINEERING

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

ENGINEERING PHYSICS LAB (D1BSEP2)

COURSE OBJECTIVES:

1. Study of the wavelength and V-I characteristics of laser diode.
2. Understand the numerical aperture and bending loss of an optical fiber.
3. Study the variation of current with voltage of optoelectronic devices.
4. Understand the Hall Effect in semiconductor.
5. Acquire the knowledge to find Plank's constant using photoelectric effect experiment.

COURSE OUTCOMES:

1. Identify the V-I characteristics of Laser diode.
2. Evaluate the numerical aperture and bending loss of a given optical fiber.
3. Analyze the V-I characteristics of LED and photodiode devices.
4. Identify the type of semiconductor by using Hall Effect experiment.
5. Measure the Plank's constant using Photocell.

LIST OF EXPERIMENTS:

1. Energy Band gap: To determine the energy band gap of a given semiconductor diode.
2. Plank's Constant: To determine the Plank's constant using photoelectric effect.
3. Hall Effect: To evaluate the Hall coefficient of a given semiconductor.
4. Stewart and Gee's Experiment: To determine the magnetic field on the axis of a current carrying coil
5. LED: To study the V-I characteristics of Light Emitting Diode.
6. Laser diode: To study the V-I characteristics of semiconductor laser diode.
7. Laser Diffraction: To determine the wavelength of given Laser beam.
8. Numerical aperture& Bending losses: To determine the numerical aperture of an optical fiber and to estimate the bending loss in an optical fiber.
9. Photodiode: To study the V-I characteristics and measure the dark current in the photodiode.
10. Solar Cell: To find the fill factor of solar cell using V-I characteristics.
11. LCR Circuit: To determine the series and parallel resonance frequency using LCR experiment

Note: Any nine experiments are to be performed compulsory

REFERENCE BOOKS:

1. Ruby Das, Rajesh Kumar, C. S. Robinson, Prashanth Kumar Sahu, A Textbook of Engineering Physics Practical, Second Edition, University Science Press, New Delhi, 2016.
2. C.V. Madhusudana Rao, V. Vasanth Kumar, Engineerng Physics Lab Manual, Scitech publications(India) Pvt.Ltd.-2014
3. Dr.Y. Aparna & Dr .K.VenkateswaraRao, Laboratory Manual of Engineering Physics, V.G.S Book Links, Vijayawada,2010

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MECHANICAL ENGINEERING

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

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB (D1HSE2)

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

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

Course Outcomes
Students will be able to:

1. Understand the nuances of English language through audio- visual experience and group activities.
2. Neutralize their accent for intelligibility
3. 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 LSRWskills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speechof 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 professionalcontexts
    - 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 – ICALL 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 – IICALL 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 pattern insentences – 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 andSeeking Permissions - Telephone Etiquette.

Exercise - IIICALL Lab:
Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).
Practice: Common Indian Variants in Pronunciation – Differences between British and AmericanPronunciation -*Testing Exercises*

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

Exercise – IV CALL Lab:
Understand: Listening for General Details.
Practice: Listening Comprehension Tests - Testing Exercises

ICS Lab:
Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.
Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V CALL Lab:
Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests -Testing Exercises

ICS Lab:
Understand: Group Discussion
Practice: Group Discussion

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 contentsof the syllabus.

Suggested Software:

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

REFERENCE BOOKS:

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* CengageLearning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* CambridgeUniversity Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford UniversityPress
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.*

5. Orient Black Swan Pvt. Ltd.
6. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* CambridgeUniversity Press.

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MECHANICAL ENGINEERING

B.Tech I Year I Semester **L/T/P/C**
0/0/4/2

C PROGRAMMING AND DATA STRUCTURES LAB (D1ESCPL)

Course – Objectives

Write programs in C using structured programming approach to solve the problems.

Course - Outcomes

After learning the contents of this course, the student will be able to

1. Design and test programs to solve mathematical and scientific problems. (L5)
2. Write structured programs using control structures and functions. (L3)

Experiments:

1. a) Write a C program to find the factorial of a positive integer.
   b) Write a C program to find the roots of a quadratic equation.
2. a) Write a C program to determine if the given number is a prime number or not.
   b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1.Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. a) Write a C program to construct a pyramid of numbers.
   b) Write a C program to calculate the following Sum: Sum=1-x2/2! +x4/4!-x6/6!+x8/8!-x10/10!
4. a) The Least Common Multiple (LCM) of two positive integers a & b is the smallest integer that is evenly divisible by both a and b. Write a C program that reads two integers and calls GCD (a, b) function that takes two integer arguments and returns their LCM. The lcm (a, b) function should calculate the least common multiple by calling the GCD (a,b) function and using the following relation: LCM (a,b) = ab / GCD (a,b)
   b) Write a C program that reads two integers n and r to compute the ncr value using the following relation: ncr (n,r) = n! / r! (n-r)! . Use a function for computing the factorial value of an integer.
5. a) Write C program that reads two integers x and n and calls a recursive function to compute xn.
   b) Write a C program that uses a recursive function to solve the Towers of Hanoi problem.
   c) Write a C program that reads two integers and calls a recursive function to compute ncr value.
6. a) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user using Sieve of Eratosthenes algorithm.
   b) Write a C program that uses non recursive function to search for a Key value in a given list of integers. Use linear search method.

7. Write a menu-driven C program that allows a user to enter n numbers and then choose **between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.**
   b) Write a C program that uses non recursive function to search for a Key value in a given sorted listof integers. Use binary search method.
8. a) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.
   b) Write a C program that reads two matrices and uses functions to perform the following:
   i) Addition of two matrices
   ii) Multiplication of two matrices
9. a) Write a C program that uses functions to perform the following operations:
   i) to insert a sub-string into a given main string from a given position.
   ii) to delete n characters from a given position in a given string
   b) Write a C program that uses a non-recursive function to determine if the given string is apalindrome or not.
10. a) Write a C program to replace a substring with another in a given line of text.
   b) Write a C program that reads 15 names each of up to 30 characters, stores them in an array, anduses an array of pointers to display them in ascending (ie. alphabetical) order.
11. a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
   b) Write a C program to convert a positive integer to a roman numeral. Ex. 11 is converted to XI.
12. a) Write a C program to display the contents of a file to standard output device.
   b) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
13. a) Write a C program to count the number of times a character occurs in a text file. The file name andthe character are supplied as command-line arguments.
   b) Write a C program to compare two files, printing the first line where they differ.
14. a) Write a C program to change the nth character (byte) in a text file. Use fseek function.
   b) Write a C program to reverse the first n characters in a file. The file name and n are specified on the command line. Use f seek function.
15. a) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).
   b) Define a macro that finds the maximum of two numbers. Write a C program that uses the macro and prints the maximum of two numbers.
16. a) Write a C Program to calculate the sum of n numbers entered by the user using malloc( ) and free() functions.
   b) Write a C Program to calculate the sum of n numbers entered by the user using calloc( ) and free() functions.

Text Books:

1. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publishers.
2. Computer Programming using C in C, V. Rajaraman, PHI.
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. C++: The complete reference, H. Schildt, TMH Publishers.

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MECHANICAL ENGINEERING

B.Tech I year II SEM **L/T/P/C**
3/1/0/4

NUMERICAL METHODS AND APPLICATIONS (D2BSM2)

Pre-requisites: Mathematical Knowledge at pre-university level

COURSE OBJECTIVES:

To Learn

The objective of this course is to familiarize the prospective engineers with techniques in numerical methods.

It aims to equip the students to deal with advanced level of mathematics and application that would be essential for their disciplines

The topics of those deals with methods to find roots of an equation.

The topics of integration that deals using numerical techniques.

The topics deals with the solution of PDE using numerical methods.

COURSE OUTCOMES:

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

Find the root of an equation using numerical methods.

Finding integral values using numerical techniques.

To find the numerical solution of PDE.

Learn the methods of interpolation

Solve the problems using numerical differentiation

UNIT I

Solution of Algebraic and transcendental equations: Bisection method- Newton- Raphson method and Regula-falsi method, Iteration method, Gauss jacobi and Gauss Siedal methods.

UNIT II

Interpolation and Integration: Finite differences- interpolation using Newton's forward and back ward difference formulae. Central difference interpolation- Gauss' forward and backward formulae. Interpolation with unequal intervals newton's divided difference and Lagrange's formulae.

UNIT III

Numerical Differentiation & Integration: Numerical Differentiation -Numerical Integration- Trapezoidal rule and Simpson's1/3 and 3/8 rules

UNIT IV

Numerical solutions of Ordinary Differential Equations: Ordinary differential equations- Taylor's series- Euler and modified Euler's methods. Runge- Kutta method of fourth order for solving first and second order equations.

UNIT V

Numerical Solutoins of Partial Differential Equations: Partial differential equations finite difference solution two dimensional Laplace equation and poison equation- implicit and explicit methods for one dimensional heat equation (bender- Schmidt and crank-Nicholson methods) finite difference explicit method for wave equation.

TEXT BOOKS

Ramana B.v.- Higher Engineering Mathematics- Tata McGraw Hill New Delhi- 11th Reprint- 2010.
Engineering Mathematics by TKV Iyengar, B. Krishna Gandhi, S. Chand and publications
N.P. Bali and Manish Goyal- A text book of engineering Mathematics- Laxmi Publications- Reprint- 2008.
B.S. Grewal- Higher Engineering Mathematics- Khanna Publishers- 40th Edition- 2015

REFERENCE BOOKS

Erwin Kreyszig –Advanced Engineering Mathematics- 10th Edition- Wiley – 2021
S.S.Sastry introductory methods of numerical analysis- PHI-4th edition 2005
VeerarajanT.- Engineering Mathematics for first year-TATAMcGraw-Hill- New delhi- 2008.

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MECHANICAL ENGINEERING

I Year B.Tech II Semester **L/T/P/C**
3/1/0/4

APPLIED CHEMISTRY (D2BSAC1)

Course Objectives:

1. To bring adaptability to new developments in Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of treatment of water in Industries.
3. To acquire required knowledge about Batteries and their applications.
4. To bring Basic Knowledge of polymers and their applications.

Course Outcomes:

1. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
2. They will acquire the Knowledge of chemistry in Batteries.
3. They can learn the fundamentals and general properties of polymers and their engineering materials.
4. Students are able to Understand the functioning of Engineering Materials.
5. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT - I

Water and its treatment

Introduction to hardness of water – Estimation of hardness of water by complex metric 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.

Boiler troubles: Sludges, 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

Introduction -Classification of batteries- primary, secondary batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of Lithium-ion battery, Applications of Li-ion battery. Fuel Cells-Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell

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.

UNIT III

Polymeric materials

Definition–Classification of polymers with examples–Types of polymerizations–
Addition (free radical addition) and condensation polymerization with Nylon 6:6.

Plastics: Definition and characteristics-thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite and Teflon.

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics–preparation–properties and applications of Buna-S, Butyl rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of Conducting polymer; trans-poly acetylene and applications of conducting polymers.

Biodegradable polymers;

Concept and advantages- Poly lactic acid and Poly vinyl alcohol and Applications.

UNIT IV

Energy Sources

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

UNIT V

Engineering Materials

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

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.

Refractories: Classification & Characteristics of a Good Refractory.

TEXTBOOKS:

- Engineering Chemistry, Dr.Bharathi Kumari Yalamanchili VGS Techno series Publishing Company, 2018
- Engineering Chemistry P.C.JainandM.Jain,Dhanpatrai & CO PublishingCompany,2010
- Engineering Chemistry RamaDevi, Venkata RamanaReddy and Rath, Cengage learning,2016
- A textbook of Engineering Chemistry M.Thirumala Chary,E. Laxminarayana andK.Shashikala,PearsonPublications,2021.
- Textbook of Engineering Chemistry Jaya Shree Ani reddy, Wiley Publications.

REFERENCEBOOKS:

- Engineering Chemistry by ShikhaAgarwal, CambridgeUniversityPress,Delhi(2015)
- Engineering Chemistry by Shashi Chawla,Dhanpatrai and Company(P) Ltd. Delhi (2011)

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MECHANICAL ENGINEERING

B.Tech. I Year II Semester **L/T/P/C**
1/0/4/3

COMPUTER AIDED ENGINEERING GRAPHICS (D2ESCEG)

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

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

- Apply computer aided drafting tools to create 2D and 3D objects
- sketch conics and different types of solids
- Appreciate the need of Sectional views of solids and Development of surfaces of solids
- Read and interpret engineering drawings
- 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 publishing house Pvt Ltd
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T.Jeyapoovan, Vikas and company Ltd.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill Pvt Ltd
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rana, Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford University press.
5. Computer Aided Engineering Drawing,Edited by K Balaveera Reddy at al- CBS 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

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MECHANICAL ENGINEERING

B.Tech. I Year II Semester **L/T/P/C**
3/0/0/3

ENGINEERING MECHANICS (D2ESEM1)

Course Objectives:

The objectives of this course are to

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

Course Outcomes:

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

1. Develop familiarity with the physical concepts and facility with the mathematical methods of classical mechanics.
2. Adapt the techniques for analyzing the forces in the bodies.
3. Develop and apply the concept of centroid, centre of gravity and moment of inertia.
4. Evaluate the different principles to study the motion of a body, and concept of relative velocity and acceleration and describe the trajectory of a particle under projectile motion.
5. Determine the natural frequency of transverse vibrations of the shaft and torsional vibrations of rotor systems.

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

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

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, McGraw 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.

Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University.

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MECHANICAL ENGINEERING

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

PYTHON PROGRAMMING (D2ESPP2)

Course Objective:

To understand and learn the concepts of basic python programming, as it is a current programming constructs used for real time applications.

Course Outcomes:

After completion of course the student will be able to
1. Understand the basic concepts of python programming
2. Illustrate operators, conditional statements, loops in python
3. Construct code and test small python programs using functions and data structures
4. Develop different programs using file concept modules of python
5. Apply the concepts of object – oriented programming in python

UNIT I
INTRODUCTION
Introduction to Python, History, Need of Python Programming, features Applications, python environment setup, Basic syntax, Variables, Data Types, Keywords, Input-Output, Indentation, script structure, Running Python Scripts.

UNIT II
OPERATORS
Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations, Conditional statements if, if-else Looping Control Structures for, while Control Statements: Break, Continue, Pass.

UNIT III
FUNCTIONS
Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.
DATA STRUCTURES
Lists, Tuples, dictionaries, sets, Sequences, Comprehensions.

UNIT IV
FILES
File input/output, Text processing file functions.
MODULES
Creating modules, import statement, from. Name spacing, Packages, using packages, implementing packages: numpy, pandas, Django framework, iterator tools, scipy, matplot lib.

UNIT V

Object Oriented Programming in Python

Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.

Error and Exception Handling

Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

Text Books:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Wesley J. Chun “Core Python Programming”, Second Edition, Prentice Hall.

Reference Books:

1. Allen Downey, “Think Python”, Second Edition , Green Tea Press.
2. Introduction to Computation & Programming Using Python, Spring 203 Edition, By John V.Guttag. Programming in Python
3: A Complete Introduction to the Python Language (Developer's Library), by Mark Summerfield, 2ndEdition

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MECHANICAL ENGINEERING

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

0/0/3/1.5

PROGRAMMING WITH PYTHON LAB (D2ESPP3)

Course Objective:

Write and execute the programs based on operators, functions, simple data structures, basic packages using python programming constructs.

Course Outcomes:

After completion of course the student will be able to

1. Use fundamental programming elements : operators ,statements, conditional andcontrol flow statements-L3
2. Compare & contrast predefined functions and build functions- L4
3. Solve various computing problems using python modules and data structures –L4
4. Apply oops concepts using python –L3

List of programs

1. Write a python program to print ‑HelloWorld‖.
2. Running instructions in Interactive interpreter and a Python Script.
3. Write a Python Programming to demonstrate the Indentation.
4. Write a Python program to calculate number of days between two dates.
5. Write a python program that takes 2 numbers as command line arguments and prints itsproduct.
6. Write a Python program to test whether a given letter is a vowel or not.
7. Write a Python program to create a pattern.

```
*
**
***
****
*****
```

8. Write a Python program to count the number 6 in a given list.
9. Write a python program to find the sum of the first n positive integers.
10. Write a Python program to calculate the sum of the digits in an integer
11. Write a Python program that prints all the numbers from 0 to 50 except multiples of 10
12. Write a Python program to check if a number is positive, negative or zero.
13. Write a Python program that will accept the base and height of a triangle nd compute thearea.
14. Write a Python program to compute the greatest common divisor (GCD) of two positiveintegers.
15. Write a Python program Make a Simple Calculator
16. Write a Python program to count the number of even and odd numbers from a series ofnumbers.
17. Write a Python function to calculate the factorial of a number(anon-negative integer).Thefunction should accept the number as an argument.

18. Write a Python function that accepts a string and calculate the number of upper caseletters and lower case letters.
19. Write a Python function that checks whether a passed string is palindrome or not.
20. Write a Python program to get the Fibonacci series between 0 to 50usingrecursion
21. Write a Python program to calculate the value of 'a' to the power 'b' using recursion.
22. Write a Python program to get the factorial of a non-negative integer using recursion
23. Write a Python program to calculate the length of a string.
24. Write a Python program to count occurrences of a substring in a string.
25. Write a Python program to count and display the vowels of a given text.
26. Write a program to count the numbers of characters in the string and store them in adictionary data structure
27. Write a program to use split and join methods in the string and trace a birthday with adictionary data structure.
28. Write a program combine lists that combines these lists into a dictionary.
29. Write a Python program for binary search.
30. Write a Python program to sort a list of elements using the bubble sort algorithm
31. Write a Python program to sort a list of elements using the quick sort algorithm.
32. Write a Python program to count the frequency of words in a file.
33. Write a Python program to print last n lines of a file.
34. Write a Python program to combine each line from first file with the corresponding line insecond file.
35. Write a Python program to assess if a file is closed or not.
36. Write a Python program to get the Python version you are using.
37. Write a Python program to display the current date and time.
38. Write a Python program to print the calendar of a given month and year.
39. WriteaPythonclasswhichhastwomethodsget_Stringandprint_String.get_Stringaccepta string from the user and print_String print the string in uppercase.
40. Write a Python class named Rectangle constructed by length and width and a methodwhich will compute the area of a rectangle.
41. Solve the following linear equations using scipy library
    X+3y+5z=102x+5y+z=8 2x+3y+8z=3
42. Find the determinant for a 2 * 2 matrix using scipy library module.
43. Find the mean and variance for the following data using
    scipy[2,23,45,56,78,89,13,33,66,89]

44. Draw a barchart with the following data using matplot lib
    Men_mean=[20,35,30,35,27]Women_mean=[25,32,34,20,25], Men_std=[2,3,4,1,2]
    Women_std=[3,5,2,3,3]
45. Using matplot lib and scipy libraries, apply the following operations on an image.
    a) Display the image crop image
    b) flip
    c) rotate
    d) Display the statistical information of the image
    e) Turn upside down

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MECHANICAL ENGINEERING

B.Tech. I Year II Semester **L/T/P/C**
0/0/3/1.5

APPLIED CHEMISTRY LAB (D2BSAC2)

Course Objectives

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

1. Estimation of hardness of water to check its suitability for drinking purpose.
2. Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
3. Students will learn to prepare polymers.
4. Students will learn skills related to the lubricant properties such as surface tension and viscosity of oils.

Course Outcomes

The experiments will make the student gain skills on:

1. The concepts of error and its analysis and can also develop the skills to tabulate the experimental data and derive valid conclusions.
2. Hands on experience in performing the electro-analytical techniques such as conductometry, potentiometry and pH metry.
3. The ability to prepare polymers.
4. Estimation of Surface tension and viscosity of Lubricant oil.

List of Experiments:

- **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.
- **Conductometry:** Estimation of the concentration of an acid by Conductometry.
- **Potentiometry:**
  1. Estimation of the concentration of an acid by Potentiometry
  2. Estimation of the amount of Fe^{+2} by Potentiomentry.
- **pH Metry:** Determination of an acid concentration using pH meter.
- **Preparations:**
  - Preparation of Bakelite.
- **Lubricants:**
  - Estimation of acid value of given lubricant oil.
  - Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

- **Virtual lab experiments**
  - Construction of Fuel cell and it's working.
  - Smart materials for Biomedical applications

- **Additional Experiments:**
  - Thin layer Chromatography calculation of R_f values
  - Determination of Surface tension of given liquid by using Stalagmometer.
  - Verification of Lambert's and Beer's law using $KMno_4$.

REFERENCE BOOKS:

- Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications,New Delhi (2022)
- Vogel's text book of practical organic chemistry 5th edition
- Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
- College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
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MECHANICAL ENGINEERING

FUELS AND LUBRICANTS LABORATORY (D2ESFLL)

B.Tech. I Year II Semester **L/T/P/C**
0/0/2/1

Prerequisite: Chemistry

Course Objectives:

To Understand the fuel and lubricants properties.

Course Outcomes:

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

1. Solve the calorific values of solid and gaseous fuels.
2. Analyse the flash and fire points of liquid fuels.
3. Discuss the carbon reside for fuels.
4. Compare the Depth of penetration for different lubricants.
5. Determine calorific value of solid/liquid/ fuels using different Calorimeters.

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.