HYDERABAD INSTITUTE OF TECHNOLOGY AND MANAGEMENT					
B.TECH. HR-24 COURSE STRUCTURE					
MECHANICAL ENGINEERING					
(Applicable for the batch admitted from 2024-25 onwards)					
Induction Program-2 Weeks					
I-Semester (1 Year)					
S. No.	**Course code**	**Course title**	**Hours Per Week**		**Credits**
			L	**T**	**P**	
1	24BS1MT01	Matrix Algebra and Calculus	3	1	0	4
2	24ES1ME03	Computer Aided Engineering Graphics*	1	0	4	3
3	24HS1EG01	English for Skill Enhancement	2	0	0	2
4	24ES1CS01	Programming for Problem Solving*	3	1	2	5
5	24BS1PH01	Applied Physics	3	0	0	3
6	24ES1EE01	MATLAB & SIMULINK	0	0	2	1
7	24HS1EG02	English for Skill Enhancement Lab	0	0	2	1
8	24BS1PH02	Applied Physics Lab	0	0	2	1
TOTAL			**12**	**2**	**12**	**20**
II-Semester (1 Year)					
S. No.	**Course code**	**Course title**	**Hours Per Week**		**Credits**
			L	**T**	**P**	
1	24BS2MT02	Ordinar Differential Equations and Vector Calculus	3	1	0	4
2	24PC2ME01	Engineering Mechanics	3	0	0	3
3	24BS2CH01	Chemistry for Engineers	3	0	0	3
4	24ES2CS02	Python Programming*	3	0	2	4
5	24BS2CH02	Chemistry for Engineers Lab	0	0	2	1
6	24ES2ME01	Engineering/IT Workshop*	0	2	2	3
7	24ES2ME0	Design Thinking Lab	1	0	2	2
TOTAL			**13**	**3**	**8**	**20**
Non Credit Courses					
8	24MC2HS01	Environmental Science	0	2	0	0

B. Tech I Year–I Sem	**L**	**T**	**P**	**C**
Subject Code:24BS1MT01	**3**	**1**	**0**	**4**

MATRIX ALGEBRA AND CALCULUS
(Common to EEE/MECH/ECE/CSE/CSD/CSM)

Pre-requisite: Basics of Matrices, Differentiation and Integration

Course Objectives: To provide the student with

1. Concept of rank of a matrix and applying this concept to find the solution for system of equations, if it exists.
2. Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form of a matrix.
3. Partial differentiation, concept of total derivative.
4. Finding maxima and minima of function of two and three variables.
5. Evaluation of surface areas and volumes of revolutions of curves.
6. Evaluation of multiple integrals and their applications.

MODULE I

Matrices: Types of real matrices, symmetric, skew-symmetric and orthogonal matrices; Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method;
System of linear equations: Consistency of Homogeneous and Non-Homogeneous equations, LU Decomposition method

MODULE II

Eigen Values and Eigen Vectors: Eigen values and eigenvectors and their properties, Diagonalization of matrices; Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem.

MODULE III

Complex Matrices and Quadratic Forms: Types of complex matrices; Hermitian; Skew, Hermitian, Unitary Matrices and its properties; Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical form using Orthogonal Transformation and Congruent Transformation.

MODULE IV

Functions of Several Variables: Definitions of Limits, Continuity. Partial differentiation: partial derivatives of first and second order, Euler's theorem, Total derivative, Jacobian, Functional dependence, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined Multipliers. Indefinite Integrals Gamma and Beta Functions (For Students reference)

MODULE V

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

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2021.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 10th Edition, John Wiley & Sons, 2020.

REFERENCE BOOKS:

1. Linear Algebra and its Applications, Gilbert Strang, Cengage Publication.

2. Advanced Modern Engineering Mathematics Glyn James, 5th edition, Prentice Hall, 2018.
3. Engineering Mathematics, Srimanta Pal, Subodh C. Bhunia, Oxford University Press, 2015

MOOC Courses:
   1. Calculus: https://nptel.ac.in/courses/111/107/111107108/
   2. Calculus: https://nptel.ac.in/courses/111/105/111105122/

E- Books:

 1.Advanced Engineering Mathematics by R.K. Jain https://1lib.in/book/16822856/8e87eb

2.Higher Engineering Mathematics" B.S. Grewal https://1lib.in/book/2352263/9368cb

3.Advanced Engineering Mathematics by Erwin Kreyszig
https://1lib.in/book/1213502/92e465

4.Advanced Modern Engineering Mathematics by Glyn James
https://1lib.in/book/1204739/431eb2

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

CO1: Determine the rank of a matrix, solution of the system of equations, Eigen values and Eigen vectors of the matrix

CO2: Reduce the quadratic form into canonical form by orthogonal transformation.

CO3: Find the extremum of a multi-variate function with or without constraints

CO4: Apply Multiple integrals in relevant in engineering problems.

Course Outcomes (COs)	**CO-PO/PSO Mapping Chart** **(3/2/1 indicates strength of correlation)** **3 – High; 2 – Medium; 1 – Low**

Course Outcomes (COs)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1										
CO2	3	1										
CO3	3	1										
CO4	3	1										

B.Tech I Year–I/II Sem	**L**	**T**	**P**	**C**
Subject Code: 24ES1ME03	**1**	**0**	**4**	**3**

Computer-Aided Engineering Graphics
(Common to All Branches)

Pre-requisite: Basic Geometry and maths.

Course Objectives:
1. To provide basic concepts in engineering drawing.
2. To impart knowledge about standard principles of orthographic projection of objects
3. To draw sectional views and pictorial views of solids.
4. To know development of different types of surfaces.
5. To draw Isometric to Orthographic Projections and Vice-versa.

Module I

Introduction to Engineering Graphics and CAD:

Drawing Instruments and their uses, types of lines, Lettering, Rules of dimensioning. Construction of polygons - practice only. Conic Sections: Ellipse, Parabola, Hyperbola including the Rectangular Hyperbola - General method only.

Cycloid, Epicycloid, and Hypocycloid, Scales – Construction of Plain & Diagonal scales. Introduction to CAD software packages commands.

Module II
Orthographic Projections of Points and Lines:

Orthographic Projection of points: Projection of points placed in different quadrants, Orthographic Projection of straight lines inclined to one and two reference planes placed in the first quadrant only.

Module III
Orthographic Projections of Planes and Solids:

Projections of Planes inclined to one and two reference planes placed in the first quadrant only.

Projections of Solids: Projections of Regular Solids – Regular Polyhedra, solids of revolution, Axis inclined to both planes. Computer aided projections of solids.

Module IV
Sections of Solids and Development of Lateral Surfaces

Introduction to Auxiliary views, Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone .

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

Module V
Isometric Projections/views:

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. Conversion of orthographic views to Isometric views using computer aided drafting.
Transformation of Projections:
Conversion of Isometric views to orthographic views.

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

   Equivalent Mooc Courses :
      1. **https://nptel.ac.in/courses/112/104/112104172/**
      2. https://nptel.ac.in/courses/112/103/112103019/
      3. **https://www.classcentral.com/course/swayam-engineering-graphics-5305**
      4. **https://www.greatlearning.in/academy/learn-for-free/courses/engineering- graphics-drawing**
      5. **https://www.classcentral.com/course/swayam-engineering-architectural- graphics-part-i-orthographic-projection-22964**

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

1. CO1 – Identify the suitable scale and Construct engineering curves using CAD.
2. CO2 – Demonstrate the orthographic projections of all planes and Solids.
3. CO3 – Illustrate the position of the sectional planes for given sections of solids using CAD.
4. CO4 – Convert the isometric to orthographic projections and orthographic to isometric projections of solids.

Course Outcomes (COs)	CO-PO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low											
	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H	M										
CO2	H	M										
CO3	H	M										
CO4	H	M										

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

Subject Code:24BS1EG01   **2   0   0   2**

English for Skill Enhancement

PREREQUISITE(S):

1. Basic knowledge of English language
2. Structure of Sentences/ Sentence formation
3. Basic Grammar rules (LSRW Skills)
4. Basic Communication Skills

COURSE OBJECTIVES:

1. To improve the language proficiency of students in English with an emphasis on vocabulary, Grammar, Reading and Writing skills.
2. To comprehend the given texts and respond appropriately
3.
4. To integrate their ideas with those of others using summary, paraphrasing, analysis, and synthesis of relevant sources.
5.
6. To develop learning skills and communication skills in formal and informal situations.
7.
8. The students will analyses work(s) of literature in one or more interpretive contexts or frameworks

UNIT – I

Chapter entitled '**Toasted English'** by R.K. Narayan from **"English: Language, Context and Culture**" 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. Types of Conjunction and their usages

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 '**ApproJRD'** by Sudha Murthy from **"English: Language, Context and Culture"** published by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Misspelled - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun

Agreement and Subject-verb Agreement.
Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice Study the use of Graphic elements in texts.
Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

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

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

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

Vocabulary: Standard Abbreviations in English , One word Substitute
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, Summarizing -identifying main idea

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

Vocabulary: Technical Vocabulary and Business Vocabulary their Usage
Grammar: Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units) Active and Passive Voice
Reading: Reading Comprehension and-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 covered in the syllabus of ELCS Lab Course.

   4. **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.

5. **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:

- *English for Engineers*. Sudarshana, N.P. and Savitha, C. Cambridge University Press. 2018.
- "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.
- https://www.cambridgeone.org/class/learner/user_clms_8241785/bundle/ic1
- https://www.cambridge.org/bs/cambridgeenglish/catalog/adult-courses/interchange-5th-edition/components

REFERENCE BOOK

1. *Practical English Usage*, Swan, M. Oxford University Press. 2016
2. Effective Academic Writing by Liss and Davis (OUP)
3. *Communication Skills*. Kumar, S and Lata, P. Oxford University Press. 2018
4. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
5. *Remedial English Grammar*. Wood, F.T. Macmillan. 2007
6. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
7. *On Writing Well* Zinsser, William. Harper Resource Book. 2001
8. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
9. *Study Writing*. Hamp-Lyons, L. Cambridge University Press. 2006
10. Technical Communication. Wiley India Pvt. Ltd. (2019).
11. Vishwa Mohan, Aysha . (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
12. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition

E-books:
1. High School English Grammar (issuhub.com)
2.https://www.fluentu.com/blog/english/free-english-ebooks/

Eloquent MOOC Courses:

1. http://nptel.ac.in/courses/109106067/
2. http://nptel.ac.in/courses/109104031/
3. http://www.englishpage.com/listening/
4. https://onlinecourses.swayam2.ac.in/aic21_ge24/preview

5. https://onlinecourses.swayam2.ac.in/nos22_sc61/preview

Course Outcomes:
After undergoing this course, students will be able to:
CO 1: Understand explicit and implicit meaning of a text through known and unknown passages.
CO 2: Demonstrate Language skills in both formal and informal communication.
 CO 3: Construct sentences using logical flow of thought and organize ideas.
CO 4: Select appropriate words, phrases & grammatical units and   apply them in both
          spoken & written communications.

CO-PO Mapping Chart											
(3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low											
Course Outcomes (COs)	Program Outcomes (POs)										
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1									2	2		
CO2									2	2		
CO3									2	2		
CO4									3	3		

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

Subject Code: 24ES1CS01   **3   1   2   5**

Programming for Problem Solving
(Common to CSE/CSM/CDS/ECE/EEE)

Prerequisite: Basic mathematical, analytical and logical capability

Course Objectives:

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. Enable learners to design, develop and apply logic to solve mathematical and scientific problem.

Module I

Introduction to Computer

Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs

Algorithms, Flowcharts, Pseudo code with examples, from algorithm to Programs and Source Code.

Basic Elements of C

Introduction to C programming – C character set – Identifiers, keywords, data types, constants, variable, declarations, expressions, statements, symbolic constants, Operators and Expressions Operator precedence and associativity of operators -Input and Output Functions-Library Functions - Header Files

Programs:

1. Write an Algorithm to find Area, Diameter and Circumference of a Circle.
2. Draw a flowchart to compute the final price of an item after figuring in sales tax.
3. Write a C program to evaluate algebraic expression (ax+b)/(ax-b)

Module II

Selection-Decision Making and Repetition

Decision Making: if statement - if-else statement - else-if ladder –Looping statements –While –do-while- Still more looping-For statement, Nested control statements- switch statement – the break statement -? : Operator - Continue statement - goto statement.

Arrays and Strings

Defining and Processing an Array - Passing Arrays to Functions - Multidimensional Arrays - Arrays and Strings - Enumerated Data Types-**Programs using sorting, searching and merging of arrays.**

Programs:

1. Write a C program to find whether a character is consonant or vowel using switch statement.
2. Write a C program to compute the gross salary of Mr. HARISH. Input his basic salary. His DA is 40% of basic salary, and HRA is 20% of basic salary
3. Write a C program to compute sum of the elements stored in an array using pointers and user defined function.
4. Write a C program to use function to insert a sub-string in to given main string from a given position.
5. Write a C program that uses functions to perform Multiplication of Two Matrices.

Module III

Storage Classes

Storage Classes -Automatic Variables -External Variables – Static and Register Variables.

User Defined Functions

Need for User defined functions, a multifunction program- Elements of user defined functions Definition of Functions- Return values and their Types- Function Calls-Function Declaration Category of functions- Nesting of functions –Recursion.

Programs:

1. Write a C program to find the factorial of a given integer using recursive function.
2. Write a C program Check prime and Armstrong number by making functions.
3. Write a C program Check whether a number can be expressed as the sum of two prime numbers.

Module- IV

Pointers

Pointer Fundaments - Pointer Declarations - Passing Pointers to Functions - Arrays and Pointers - Pointers and One-Dimensional Arrays - Pointers and Multidimensional Arrays - Operations on Pointers

Structures & Unions

Defining a Structure - Processing a Structure – User defined Data Types – Nested structure - Structures and Pointers - Passing Structures to Functions - Self Referential Structures- Arrays and & Structures Union.

Programs:

1. Write a C program, by using structure to read and print data of n employees (Name, Employee Id and Salary)
2. Write a C program, which Declare a union containing 5 string variables (Name, House Name, City Name, State and Pin code) each with a length of C_SIZE (user defined constant). Then, read and display the address of a person using a variable of the union.

Module V

Dynamic Memory Management

Dynamic Memory Allocation –Allocating a Block of memory, multiple blocks, releasing used space, altering the size of block.

Preprocessor Directives

Commonly used Preprocessor commands like include, define, elif, else, endif, undef, if, ifdef, ifndef

Programs:

1. Write a C program for #ifdef, #else and #endif
   - "#ifdef" directive checks whether particular macro is defined or not. If it is defined, "If" clause statements are included in source file.
   - Otherwise, "else" clause statements are included in source file for compilation and execution.
2. Write a C program to Display array elements using calloc( ) function

TEXT BOOKS:

1. Byron S. Gottfried, "Programming with C", Second Edition, Tata McGraw Hill, 2010.
2. S.K. Srivastava and Deepali Srivastava "C in Depth" BPB Publications,3rd Revised and Updated Edition.

REFERENCE BOOKS:

1. Reema Thareja, "Programming in C", Oxford university press, 2nd Edition, 2016.
2. W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd Edition, 1988.
3. Yashavant Kanetkar, "Exploring C", BPB Publishers, 2nd Edition, 2003.
4. Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014.
5. R. S. Bichkar, "Programming with C", Universities Press, 2nd Edition, 2012.
6. Dey Pradeep, Manas Ghosh, "Computer Fundamentals and Programming in C", Oxford University Press, 2nd Edition, 2006.
7. Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.

WEB RESOURCES:

- http://computer.howstuffworks.com/c.htm

- http://www.le.ac.uk/cc/tutorials/c/

- http://www.eskimo.com/~scs/cclass/notes/top.html (for notes)

- http://www.cprogramming.com/tutorial.html

- http://www2.its.strath.ac.uk/courses/c/

E-BOOKS:

Course Outcomes:

CO1 - Apply the fundamentals of computer and programming language, to draw flow chart, algorithm to solve given program.

CO2 - Comprehend the general structure of C program using control structures, functions, recursion to support reusability.

CO3 - Apply searching and sorting algorithms for the given list of elements

CO4 - Design an application to solve real world problem.

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*		
CO-PO/PSO Mapping Chart **(3/2/1 indicates strength of correlation)** **3 – High; 2 – Medium; 1 - Low**															
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	1	2										2		
CO2	3	1	2										1		
CO3					2								1		
CO4					2								1		

B.Tech. I Year I Sem /II Sem   **L T P C**
Course Code: 24BS1PH01/ 24BS2PH01   **3   0 0 3**

APPLIED PHYSICS
(Common to CSE/EEE/ECE/MEC/CSM/CSD)

Course Objectives:
The objectives of this course for the student are 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. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
4. Study the characteristics of lasers and optical fibres.
5. Study the fundamental concepts related to the dielectric, magnetic and nano materials.

Pre-requisite: Basic definitions and concepts of Intermediate Physics (10+2)

Module I QUANTUM PHYSICS (10hrs)
Quantum Mechanics: Introduction to quantum physics, Planck's radiation law - photoelectric effect – de-Broglie's hypothesis, Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Module II   SEMICONDUCTORS AND DEVICES (8hrs)
Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

Module III: WAVE OPTICS & NANOTECHNOLOGY (10 hrs)
Interference: Coherence, division of amplitude and division of wave front, Newton's rings experiment.
Diffraction: Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to single slit, diffraction grating, determination of wavelength of light using diffraction grating.
Nanotechnology: Nano scale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, top-down fabrication: ball milling, characterization: TEM.

Module IV: LASERS AND FIBRE OPTICS (8 hrs)
Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations lasing action - pumping methods- ruby laser, He-Ne laser, semiconductor laser diode- 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 - applications.

Module V: DIELECTRIC, MAGNETIC MATERIALS (10 hrs)
Dielectric Materials: Dielectric constant, polarization, polarization vector, susceptibility, -types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyro electric materials – applications.
Magnetic Materials: Origin of magnetic moment, -hysteresis - soft and hard magnetic materials - magnetostriction, magneto resistance – applications.
Energy Source: Conductivity of liquid and solid electrolytes- super-ionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries,

Text Books:
1. Applied Physics, Dr. M. N. Avadhanulu, Dr. TVS Arun Murthy, - S Chand and Company Ltd. Publications.
2. Engineering Physics, P. K. Palanisamy, SCITECH Publications, Enlarged & Revised 2014 Edition.

Reference Books:
1. Concepts of modern Physics by Arthur Beiser, McGraw-Hill Education, 7th edition, SIE
2. Semiconductor Optoelectronics: Physics and Technology, J. Singh, Mc Graw-Hill Inc., (1995).
3. Modern Engineering Physics by Dr.K.Vijaya Kumar, Dr. S.Chandralingam, S.CHAND & COMPANY LTD., Publishers.
4. Applied Physics by P.K.Mittal, I K International Publishers
5. Introduction to Solid State Physics by Charles Kittel, Wiley India Pvt Ltd, 7th Edition
6. Modern Physics R Murugeshan , Kiruthiga Sivaprasath S.Chand publications
7. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012
8. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018
9. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019
10. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019
11. Essentials of Nanoscience & Nanotechnology, Dr Narasimha Reddy Katta,2021.

MOOC Courses:
1. "Semiconductor Optoelectronics" By Prof. M. R. Shenoy, Department of Physics, IIT Delhi NPTEL visit http://nptel.iitm.ac.in
2. "Laser: Fundamentals and Applications" By Prof. Manabendra Chandra, IIT Kanpur NPTEL visit https://onlinecourses.nptel.ac.in/noc20_cy17

Course Outcomes:
- CO1: Explain the concepts of Quantum Physics in describing particle at micro state.
- CO2: Understand the working mechanism and characteristics of semiconductor optoelectronic devices.

- CO3: Explore the characteristics of lasers & optical fibres and their applications in various sectors by using the concepts of wave optics.
- CO4: Apply the properties of dielectric, magnetic and Nano materials in diver's fields of applications.

CO-PO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low												
Course Outcomes (COs)	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3									2		1
CO2	3									2		1
CO3	3									2		1
CO4	3									2		1

B.Tech I Year – II Sem	**L**	**T**	**P**	**C**
Subject Code: 24ES3EE01	**0**	**0**	**2**	**1**

Matlab & Simulink

Pre-requisite: Basic Mathematics & Physics

Course Objectives:
1. To provide knowledge in the design of schematics for basic circuits.
2. To make the students to gain more proficient of MATLAB Modules.
3. To train the students to create their own designs using MATLAB.
4. Apply MATLAB for the control of industrial applications.

All experiments are compulsory by using any open source software

1. Compute the basic mathematical calculations like trigonometric, exponential, logarithmic functions, complex numbers, logical.
2. Compute the matrix operations and arrays.
3. Write a program for computing the factorial of any integer n and the geometric series $1+r+r^2+ r^3+.... r^n$ for a given r and n.
4. Write a program for printing the Fibonacci series using 'for' loop.
5. Create sine plot, cosine plot and show them in the two of 4 subplots by using MATLAB Graphic commands.
6. Draw 3D plots using MATLAB commands.
7. Draw sine wave and measure the current and voltage using SIMULINK.
8. Design the rectifier and Inverter using SIMULINK.
9. Introduction to tool boxes in SIMULINK.
10. Design of simple RLC circuits and measurement of voltage and current using SIMULINK.

Text Books:

1. "MATLAB and Its Applications in Engineering", by Ashok K. Goel, Manoj Kumar Sharma, and Raj Kumar Bansal, 2016.
2. **Introduction to MATLAB Third Edition by Delores Etter, Pearson India, 2020.**

Reference Books:

1. A Guide to MATLAB: For Beginners and Experienced Users, Book by Brian R. Hunt, Jonathan Rosenberg, and Ronald L. Lipsman

Web Resources:

1. https://in.mathworks.com/academia/student_center/tutorials/mltutorial_launchpad.html?requestedDomain=www.mathworks.com

E-Books:

1. MATLAB Programming for Engineers Stephen J. Chapman.
2. Essentials of MATLAB Programming Stephen J. Chapman.
3. Introduction to MATLAB for Engineers William J. Palm III.

Course Outcomes: At the end of the course student will be able to do
  1. CO1 – Apply different types of commands to execute the instructions in MATLAB.
  2. CO2 – Able to understand the functions and loops to implement for real-time

   applications.

  3. CO3 – Able to analyse the various tool box with real-time applications

  4. CO4 –Able to design the multidisciplinary projects.

CO-PO/PSO Mapping :

Course Outcomes (COs)	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2										
CO2	1	2			2							
CO3	2	2			2							
CO4	2	1			2							

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low

B.Tech I Year–I/II Sem	**L**	**T**	**P**	**C**
Subject Code:	**0**	**0**	**2**	**1**
24HS1EG02/24HS2EG02				

English for Skill Enhancement Laboratory

Course Objectives:
1. To facilitate computer-assisted multimedia 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 speaking in English and neutralize their mother tongue interference.
5. To train students use language appropriately speaking in various activities like role plays, group discussions, interviews and presentation skills etc.

Note: All the following exercises have to be followed.
Exercise I
CALL Lab- **Introduction to Speech Sounds**
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- **Ice-Breaking activity and JAM session**
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, Discussion on eating habits

Exercise II
CALL Lab- Understand: **Structure of Syllables** – Word Stress– Weak Forms and Strong Forms – Sentence Stress – Intonation. Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Sentence Stress – 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- **Word Stress & Formation**
Understand: Errors in Pronunciation-the Interference of Mother Tongue (MTI). Practice: Common Indian Variants in Pronunciation – Differences between British and American

Pronunciation, Testing Exercises- Listening for General/ Specific Details. Practice: Listening Comprehension Tests. Testing Exercises

ICS Lab- **Descriptions and Giving Directions**
Understand: Descriptions- Narrations- Giving Directions and Guidelines. 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 - **Interpersonal Communication Skills & Building Vocabulary**
Starting a conversation – responding appropriately and relevantly – using the right body language –Discourse Skills- using Visuals-Graphical organization - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word

ICS Lab- **Oral Presentation Skills**
Understand: Structured Talks - Non-verbal Communication- Presentation Skills-Individual and Group,
 Practice: Making a Short Speech – Extempore- Making a Presentation- Individual and Group

Exercise V
CALL Lab-
ICS Lab -**Introduction to Group Discussion and Interview Skills**
Understand: Group Discussion- Interview Skills. Practice: Group Discussion- Mock Interviews through Tele-conference & video-conference. Etiquette

Lab Manuals
1. ELCS Lab Manual – A Workbook for CALL and ICS Lab Activities" by Board of Editors: Hyderabad: Orient Black Swan Pvt. Ltd. 2016. Print.
2. Hart, Steve; Nair, Aravind R.; Bhambhani, Veena. "EMBARK- English for undergraduates" Delhi: Cambridge University Press. 2016. Print.

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 University Press.
 7) TOEFL and GRE (KAPLAN, AARCO and BARRONS, USA, Cracking GRE by CLIFFS).

Reference Books:
1. *Effective Communication Skills: Tips on How to Improve Your Social Skills and Interact with Others Effectively* by Robert Cunningham, Independently Published, 2018
2. *Professional Communication* by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.

3. *English for Technical Communication for Engineering Students*, Ayesha Vishwamohan, Tata Mc Graw-Hill 2009.
4. *English Vocabulary in Use series*, Cambridge University Press 2008.

Course Outcomes:
1. CO1: Acquire vocabulary and use it contextually
2. CO2: Apply listening and speaking skills effectively
3. CO3: Develop proficiency in academic reading and writing
4. CO4: Build up the possibilities of job prospects

<table>
<tr><td colspan="13">CO-PO Mapping Chart
(3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low</td></tr>
<tr><td rowspan="2">Course Outcomes (COs)</td><td colspan="12">Program Outcomes (POs)</td></tr>
<tr><td>PO 1</td><td>PO 2</td><td>PO 3</td><td>PO 4</td><td>PO 5</td><td>PO 6</td><td>PO 7</td><td>PO 8</td><td>PO 9</td><td>PO 10</td><td>PO 11</td><td>PO 12</td></tr>
<tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>2</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>2</td><td></td><td></td></tr>
</table>

B.Tech. I Year I Sem/II Sem   **L T P C**
Course Code: 24BS1PH02/ 24BS2PH02   **0 0 2 1**

APPLIED PHYSICS LAB
(Common to CSE/EEE/ECE/MEC/CSM/CSD)

Pre-requisite: Concepts of Applied Physics Theory and knowledge of intermediate (10+2) physics

Course Objectives: The objectives of this course for the student to
1. Capable of handling instruments related to the Hall Effect and photoelectric effect experiments and their measurements.
2. 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.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behaviour of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting

List of Experiment (Perform any 8 of the following experiment)

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. V-I characteristics of a p-n junction diode and Zener diode
4. Input and output characteristics of BJT (CE configurations)
5. Diffraction Grating:
   a) To determine the wavelength of given laser and grating parameters
   b) To determine the wavelength of a given light source using grating (spectrometer)
6. Newton's Rings Experiment:
   a) To determine the radius of curvature of given Plano convex lens
7. Optical fiber:
   a) To determine Numerical aperture and Acceptance angle of a given optical fiber cable.
8. Energy band gap of Semiconductor:
   a) To determine Energy band gap of a semiconductor diode
9. Optoelectronics Devices:
   a) Light Emitting Diode: To study the V-I characteristics of LED
   b) Solar Cell: To study the V-I characteristics of Solar cell
10. Study B-H curve of a magnetic material.
11. Determination of dielectric constant of a given material
12. Characteristics of series and parallel LCR circuits.
13. Determination of the resistivity of semiconductor by two probe method.

Text Books:
1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017
2. Laboratory manual of Engineering Physics, Dr. Y Aparna , Dr.K.Venkateswara Rao,VGS techno series, 2010.

Course Outcomes:
- CO1: Determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
- CO2: Analyse the V-I characteristics of semiconductor optoelectronic devices.
- CO3: Describe the variations in the magnetic field, the dielectric constant, and the hysteresis curve's behaviour.
- CO 4: Apply the concepts of optics for study the characteristics of laser & fiber optical devices

Course Outcomes (COs)	CO-PO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low											
	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3											1
CO2	3											1
CO3	3											1
CO4	3											1

		L	T	P	C
B. Tech I Year–II Sem					
Subject Code: 24BS2MT02		3	1	0	4

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to EEE/MECH/ECE/CSE/CSD/CSM)

Pre-requisite: Mathematics of 10+2 level

Course Objectives: To provide the student with

1. Methods of solving Ordinary Differential Equations of first & higher order and their applications.
2. Concept of Laplace Transforms, inverse Laplace Transforms and their properties.
3. Solving ordinary differential equations using Laplace transforms techniques.
4. The Physical quantities involved in engineering field related to vector valued function.
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals.

MODULE I
First Order ODE: Exact differential equations, Integrating factors, Linear and Bernoulli's equations.

Applications: Orthogonal trajectories, Newton's law of cooling, Law of natural growth/decay.

MODULE II

Higher Order Ordinary Differential Equations

Higher order homogeneous and non-homogeneous linear differential equations with constant coefficients. Non-homogeneous terms of the type e^{ax}, $\cos ax$, $\sin ax$, $x^k, e^{ax}V$ and xV. Method of variation of parameters. Cauchy-Euler's and Legendre's differential equations.

MODULE III

Laplace Transforms: Laplace Transform of standard functions; first and second shifting theorems; Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives and integrals of function; Laplace transforms of Unit step and Impulse functions; Laplace transform of periodic functions. Applications of Laplace transforms to integrals.

Inverse Laplace Transforms: Finding inverse Laplace transforms by different methods, convolution theorem (without proof), Solving Ordinary Differential Equations with constant coefficient with given conditions by Laplace Transform method.

MODULE IV
Vector Differentiation: Scalar and vector point functions, Concepts of gradient, divergence and curl of functions in Cartesian framework, Solenoidal fields, irrotational fields.

Vector Line Integral: Evaluation of the line integral, concept of work done by a force field, Conservative fields and Potentials.

MODULE V

Surface and Volume Integration: Evaluation of surface and volume integrals, flux across a surface.
Vector Integral Theorems: Green's, Gauss and Stokes theorems (without proofs) and their applications.

TEXT BOOKS:

1.Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2021
2. Advanced Engineering Mathematics, R.K. Jain and S.R.K.Iyengar, , Narosa publishing house, 5thedition 2017.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Engineering Mathematics, Srimanta Pal, Subodh C. Bhunia, Oxford University Press, 2015.

3. Advanced Modern Engineering Mathematics Glyn James, 5th edition, Prentice Hall, 2018.

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

CO1: Solve first, higher order ODE and appreciate their applications in engineering problems.

CO2: Apply Laplace Transforms techniques to solve Ordinary Differential Equations with constant coefficient with given conditions.

CO3: Calculate Divergence, Curl of vector point function and gradient of scalar point function.
CO4: Evaluate Line, Surface and Volume integrals and converting them from one to another.

Course Outcomes (COs)	Program Outcomes (POs)											
CO-PO/PSO Mapping Chart **(3/2/1 indicates strength of correlation)** **3 – High; 2 – Medium; 1 – Low**												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1										
CO2	3	1										
CO3	3	1										
CO4	3	1										

B.Tech I Year–II Sem	L	T	P	C
Subject Code: 24PC2ME01	**3**	**0**	**0**	**3**

Engineering Mechanics

Pre-requisite: Basics of Engineering Mathematics & Physics

Course Objectives:

1. Discuss resolution of forces of a given system and solve problems using equations of equilibrium.
2. Understand about centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections.
3. Discuss about kinetics and kinematics of particles, projectiles, curvilinear motion and planemotion of rigid bodies.
4. Explain the concepts of work-energy method and its applications to translation, rotation andplane motion.

Module I

Fundamentals of mechanics Introduction to Engineering Mechanics- Rigid body, Force andForce Systems; Coplanar Concurrent Forces - Resolution of forces, Resultant, Moment of Forceand its Application; Free body diagrams, Equilibrium of coplanar concurrent forces.

Spatial force system Forces in Space – Components of forces in space, Resultant; Moment offorces in space; Equilibrium of spatial system of forces.

Module II

Friction- Types of friction, limiting friction, laws of friction, static and dynamic friction, motionof bodies, screw jack and differential screw jack.

Centroid and Centre of Gravity- Centroid of lines and areas from first principle, centroid of composite sections, centre of gravity and its applications.

Module III

Area moment of inertia- Moment of inertia; parallel axis theorem and perpendicular axis theorem; Moment of Inertia of plane sections from first principles, moment of inertia of

composite sections.

Mass moment of inertia- Transfer formula for Mass moment of inertia, Mass moment of inertiaof standard bodies and composite bodies.

Module IV

 Kinematics of particles- Rectilinear motion of Particle - Displacement, velocity and acceleration; Curvilinear motion of Particle, General plane motion - introduction.

Kinematics of rigid bodies- Rotational motion about a fixed axis - Linear and angular velocity,Linear and angular acceleration in fixed axis rotation.

Module V

Kinetics of particles- D'Alembert's principle and its applications in connected bodies; Principleof impulse and momentum and its applications.; Impact of Elastic bodies Coefficient of restitution, direct central impact, oblique impact.

Kinetics of rigid bodies- Work- energy principle and its application in connected bodies and rigid body rotation.

Text Books:

1. Engineering Mechanics | 5th Edition – 1 July 2017by S.Timoshenko (Author), D.H. Young(Author), J.V. Rao (Author), Sukumar Pati (Author).
2. H. Shames, Engineering Mechanics—Statics and Dynamics, 4th Edition, Prentice Hall of India, 1996. 3. Engineering Mechanics – Statics and Dynamics by Ferdinand L Singer, 3rdEdition, Harper International Edition.

Reference Books:

1. A Nelson, Engineering Mechanics – Statics and Dynamics, Tata McGraw Hill, 2010.
2. F.P. Beer and E.R. Johnston, Vector Mechanics for Engineers – Statics, McGraw Hill BookCompany, 2000.
3. J. L. Meriam and L.G. Kraige, Engineering Mechanics – Statics, John Wiley & Sons, 2002.

Web Resources: https://youtu.be/nGfVTNfNwnk, https://youtu.be/TnWBAnkCDuc .

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

CO1 Define and solve problems on resolution of forces and find the resultant of a system of forces acting on a body.

CO2 Analyze and calculate centroid and moment of inertia for various cross sections of bodies.

CO3 Explain various types of motions of particles and solve problems related to motion of particles.

CO4 Outline the work-energy theorem and illustrate its applications using various examples.

CO-PO Mapping:

Course Outcomes (COs)	CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 –Low													
	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	1	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	1	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	1	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	1	-

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

Subject Code: **3**   **0**   **0**   **3**
24BS1CH01/24BS2CH01

CHEMISTRY FOR ENGINEERS

(Common to CSM/CSD/MECH)

Course Objectives:

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.

2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.

3. To imbibe the basic concepts of petroleum and its products.

4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

Course Outcomes:

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.

2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.

3. They can learn the fundamentals and general properties of polymers and other engineering materials.

4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT - I: Water and its treatment: [8]

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: 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 [8]

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.

UNIT - III: Polymeric materials: [8]

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 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.

UNIT - IV: Energy Sources: [8]

 Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. 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.

UNIT - V: Spectroscopy and its application [8]

UV-Visible -Introduction to spectroscopy, Lamberts- Beer's law, Principles of UV-Visible Spectroscopy, instrumentation, selection rules, types of electronic transitions, Franck-Condon principle, chromophore and auxochrome, bathochromic shift, hypochromic shift, hypsochromic shift, hyperchromic shift and applications of UV-Visible (electronic) spectroscopy
IR Spectroscopy- Principles of IR spectroscopy, types of vibrations (stretching & bending), selection rules, instrumentation, number of fundamental vibrations, functional group interpretation and applications of IR spectroscopy.
NMR Spectroscopy- Introduction and Principle to NMR, selection rules, Instrumentation, De-sheilding and shielding, Chemical shifts, Measurement of chemical shifts and applications, spin-spin coupling, coupling constant, Introduction to Magnetic resonance imaging (MRI) and its applications.

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)

 (3/2/1 indicates strength of correlation) 3-High; 2-Medium; 1-Low

Course Outcomes(COs)	Program Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3											
CO2	3											
CO3	3											
CO4	3											

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

Subject Code: 24ES2CS02   **3   0   2   4**

Python Programming

Course Objective:

1. Acquire programming skills in core Python.

2. Acquire Object-oriented programming skills in Python.

3. Develop the skill of designing graphical-user interfaces (GUI) in Python.

4. Develop the ability to handle files and exceptions in Python.

Course Outcomes:

1. Apply the concept of functions, class and objects to solve a given problem.

2. Perform operations on different types of sequences.

3. Develop GUI-based applications.

4. Explain the concept of exceptions, multithreading, files and regular expressions.

Module -I

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types, Python installation.

Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators

Programming:

Week 1:

a) Read the temperature in centigrade and convert it into Fahrenheit.

 b) Consider two numbers as input and swap those two values without using 3rd variable.

c) Read a list of numbers and write a program to check whether a particular element is present or not using membership operators.

Week 2:

a) Read name, address, email and phone number of a person through keyboard and print the details.

b) Read the year and check whether that year is a leap year.

c) Read 4 numbers and find maximum and minimum among those numbers

Module - II

Decision control Statements: Selection/Conditional branching statements, basic loop structures/iterative Statements, nested loops, break, continue, and pass Statements.

Sequences - String, List, Tuple, Dictionary and Set.

Programming:

Week 3:

a) Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)

b) Write a Python program to print even numbers from 2000 to 2100 in a given interval (use break).

Week 4:

a) Given a list of tuples. Write a program to find tuples which have all elements divisible by K from a list of tuples. test_list = [(6, 24, 12), (60, 12, 6), (12, 18, 21)], K = 6, Output : [(6, 24, 12), (60, 12, 6)]

 b) Write a program to perform union, intersection and difference using Set A and Set B.

Module- III

Functions: Communicating with functions, Variable Scope and lifetime, return statement, Types of arguments, modules, packages, Lambda functions.

Classes and Objects – Defining Classes, Creating Objects, Class variables and Object variables, __init()__ and __del__() method.

Programming:

Week 5:

a) 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.

b) 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.

Week 6:

a. Write a recursive function to compute gcd, factorial, fibonacci series

b. Write a function to compute gcd, factorial, fibonacci series

Week 7:

a) Write a program to create an employee class and store the employee name, id, age, and salary using the constructor. Display the employee details by invoking employee_info () method and also using dictionary(__dict__).

Module -IV

FILES: File Objects, File Built-in Function [open ()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments.

Exception Handling: Introduction to Errors and Exceptions, Handling Exceptions, Multiple Except Blocks, The Else Clause, Raising Exceptions, Handling the Exceptions in invoked functions, Built-in and user-defined exceptions, The Finally Block, Re raising Exception, Assertions

Programming:

Week 8:

a) Write a python program that defines a matrix and prints

b) Write a python program to perform addition of two square matrices

c) Write a python program to perform multiplication of two square matrices

Week 9:

a) Write a Python Program to find the roots of a quadratic equation and handle the appropriate exception.

 b) Write a python program to check a given phone number is valid or not.

Module- V

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python.

GUI Programming: Introduction, Tkinter Widgets and event handling.

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

Programming:

Week 10:

a) Write a Python program to create two threads where thread1 will print the value from 1-20 and thread2 prints from 21-40.

b) Write a Python program to multiply two n*n matrices using n threads.

Week 11:

a) Write a Python program to copy the content of given file to another a file.

 b) Write a Python program to compute the number of characters, words and lines in a file.

TEXT BOOKS:

1. Reema Thareja, "Python Programming - Using Problem Solving Approach", Oxford Press, 1st Edition, 2017.

2. Philips, "Python 3 Object Oriented Programming", PACKT Publishing, 2nd Edition, 2015.

REFERENCE BOOKS:

1. Yashavant Kanetkar, Aditya Kanetkar, "Let Us Python", BPB Publications, 2nd Edition, 2019.

2. Martin C. Brown, "Python: The Complete Reference", McGraw Hill, Indian Edition, 2018.

3. Michael H.Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.

CO-PO/PSO Mapping:

CO-PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO-1	3												2		
CO-2	3												2		
CO-3	3	2			3								2		
CO-4	2												2		

B.Tech. I Year–I Sem/II Sem	**L**	**T**	**P**	**C**
Subject Code:	**0**	**0**	**2**	**1**
24BS1CH02/24BS2CH02				

CHEMISTRY FOR ENGINEERS LAB
(Common to MECH/CSM/CSD)

Pre-requisite: Concepts of Chemistry at 10+2 level

Course Objectives:

The student will be able to learn

- Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids, bases and ions using conductometry, potentiometric and colorimetric titrations.
- Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory and skills related to the lubricant properties of oils.
- Students will perform virtual experiments electrical vehicles and solar cells with its applications.

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA.
2. Determination of chloride content of water by Argentometry.
3. Estimation of the concentration of an acid by Conductometry.
4. **Determination of an acid concentration using pH meter.**
5. **Determination of copper by Colorimetric method.**
6. Estimation of the amount of Fe^{+2} by Potentiometry.
7. Preparation of Bakelite.
8. Preparation of Nylon – 6.
9. Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
10. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.
11. Batteries for electrical vehicles.
12. 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).

Course Outcomes: Students will be able to

CO1: Estimate the hardness and chloride content in given water sample.

CO2: Determine the strength of the given sample by appropriate instrumental method and viscometery techniques.

CO3: Synthesis of Bakelite and nylon-6 polymers.

CO4: Perform simulation experiments of electrical vehicles and solar cell with its applications

CO-PO Mapping Chart

(3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low

Course Outcomes(COs)	Program Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3											
CO3	3											
CO4	3				3							

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

Subject Code: 24ES1ME01   **0   2   2   3**

Engineering Workshop/IT Workshop Lab
(Common to All Branches)

Prerequisites: Practical skill

Course Objectives:

1. To provide the basic knowledge of fundamental tools used by engineers in a manufacturing environment, wiring in electrical circuits, design of electronic components on PCB and knowledge on computer peripherals.

2. To gain a basic working knowledge required for the production of various engineering products.

List of Experiments:

PART A: Engineering

Workshop Note: Any FIVE experiments should be conducted from all Trades

1. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)

2. Fitting – (V-Fit, Step Fit , Dovetail Fit & Semi-circular fit)

3. Tin-Smithy – (Open Scoop, Rectangular Tray & Conical Funnel)

4. Black Smithy – ('S' hook or Round rod to Ring)

5. House wiring-(One lamp control by using Two 2-way switches (staircase wiring), Wiring ofdistribution box with MCB, Wiring of three bulbs - Series & parallel connections).

PART B:

IT WorkshopNote: Any FIVE experiments should be conducted

1. Draw the block diagram of the PC and peripherals that can be assembled and disassembled.

2. Every student should individually install MS windows/ Linux/Duel Booting on thepersonal computer.

3. Installation of Application software in PC (Modelling/Simulation /Automation)

4. Hardware Troubleshooting: Students have to be given a Pthatch does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it toget the computer back to working condition.

5. Software Troubleshooting: Students have to be given a malfunctioning CPU due to systemsoftware problems. They should identify the problem and fix it to get the computer back toworking condition.

6. Internet & World Wide Web: Orientation & Connectivity Boot Camp: Students should getconnected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations.

TEXTBOOKS:

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

3. Experiments in Basic Electrical Engineering by S.K.Bhattacharya , Rastogi- NAI.
4. Industrial Safety management by Deshmukh –TMH

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP
3. Residential and Commercial Industrial Electrical systems Vol.2 by Joshi-TMH
4. Residential and Commercial Industrial Electrical systems Vol.3 by Joshi-TMH
5. Industrial Safety management by Deshmukh –TMH

Web resources:

1. https://www.electricaltechnology.org/2012/11/how-to-control-lamp-by-single-way- or.html
2. https://circuitdigest.com/electronic-circuits/5v-2a-smps-power-supply-circuit-diagram

Course Outcomes:

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

1. Fabrication of electrical circuit.

2. Identify and apply suitable tools for different trades of engineering processes.

3. Apply the learnt knowledge for installing operating system, presentations, documentation.

4. Make a prototype by applying domain knowledge.

CO-PO Mapping:

CO-PO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low												
Course Outcomes (COs)	**Program Outcomes (POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	L	L			H							
CO2	H		L									L
CO3	H		L									L
CO4	H			L								

B.Tech I Year–I/II Sem	**L**	**T**	**P**	**C**
Subject Code:	**0**	**1**	**2**	**2**
24ES1ME02/24ES2ME02				

Design Thinking

Pre-requisite:

Course Objectives:

1. Apply domain knowledge to the design of community based projects.
2. Identify and acquire new knowledge as a part of the problem solving / design process.
3. Design prototype on multidisciplinary concepts and an appreciation for the contributions from individuals from multiple disciplines.
4. Build a role that their discipline can play in social contexts.
5. Provide significant service to the community while learning; gain an understanding of the role that engineering (and their discipline) can play in society.

Module 1:

Problem Identification

Introduction to EPICS, Idea Generation, Brain storming

Societal Survey
Rural area Survey (societal issues), Idea Generation and Group Discussions.

Module 2:

Specification Development

Customer Requirement, Design Constraints, Engineering Specifications
Product Survey
Community Partner allotment, Design Thinking activity

Module 3:
Conceptual Design

Decision matrix, community partner interview, Brainstorming (possible solutions)

Poster Presentation
Documentation & Team wise presentation

Module 4:
Project Specification

Prototype Development, Testing, customer feedback

Project Specification

Prototype presentation, Feedback Report of customer & advisor, Action plan for the next prototype

Module 5:

Detailed Design

Report preparation on conceptual design, Prototype Development, Testing, customer feedback, Presentation

Detailed Design

Make progress on the project and appropriately engage project partners, Complete Design review feedback summary, and Individual and Project documentation

Text Books:
Dahir, M., "Educating Engineers for the Real World", Technology Review, Aug/Sept.
1993, pp. 14-16

Reference Books:
Govindarajan M, Natarajan S, Senthil Kumar V.S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

Web Resources:
https://engineering.purdue.edu/EPICS/Resources/Lectures.
https://unnatbharatabhiyan.gov.in:8443/new-website/
http://www.engineeringchallenges.org/GrandChallengeScholarsProgram.aspx
https://www.ewb-india.org/

Course Outcomes:
1. CO1 – Apply disciplinary knowledge to real and possibly ill-defined problems.
2. CO2 – Collaborate with people from other disciplines and develop an appreciation for multi-disciplinary contributions in design.
3. CO3 – Build the broad set of skills needed to be successful in the changing global workplace and world.
4. CO4 – Acquire knowledge regarding project management.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H	M	M	M		H		M	H	M	M	H	M	M
CO2	H	M	M	M		H		M	H	M	M	H	M	M
CO3	H	M	M	M		H		M	H	M	M	H	M	M
CO4	H	M	M	M		H		M	H	M	M	H	M	M

If more PSOs are there in a particular branch, required no of columns can be added.

B. Tech III Year-V Sem   **L   T   P   C**

Subject Code: 24MC5CHS02   **2   0   0   0**

ENVIRONMENTAL SCIENCE

(Common to CSE/EEE/ECE/MECH/CSM/CSD)

Course Objectives:

1. Understanding the importance of ecological balance for sustainable development.

2. To educate students about natural resources and their exploitation

3. Understanding the concepts of green chemistry and its applications.

UNIT I

ECOSYSTEMS AND ECOLOGY

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

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 SOLID WASTE

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. Municipal Solid Waste management, composition and characteristics of e- Waste and its management, Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification.

UNIT V

GREEN CHEMISTRY & HAZARDOUS CHEMICALS

Introduction & Principles, green solutions for chemical energy storage, green chemistry solutions will be discussed within the fields of Chemical production: choice of feedstock, solvents, catalysts, synthesis routes including microwave and ultrasonic assisted synthesis. Classification of hazardous chemicals, transportation of hazardous chemicals.

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

2. Environmental Studies by R. Rajagopalan, Oxford University Press.

3. Indu Tucker Sidhwani, Rakesh K. Sharma.

Course Outcomes:

CO-1: Understand the importance of ecosystem and ecological balance in conservation of

biodiversity.

CO-2: Understand the concepts of natural resources and its exploitation.

CO-3: Explain the control of pollution for sustainable environment.

CO-4: Explain the concepts green chemistry, its applications.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-PO/PSO Mapping Chart(3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low														
CO1	3						1							
CO2	3						1							
CO3	3						1							
CO4	3						1							