

**Department  
of  
Mechanical Engineering**

**I B.Tech I Semester  
Course Structure & Syllabus  
(ACE-R22 Regulations)**



**ACE  
Engineering College**  
Ankushapur(V), Ghatkesar(M), Medchal Dist - 501 301  
*(An Autonomous Institution, Affiliated to JNTUH ,Hyderabad)*

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

**I Year I Semester**

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

**MA101BS MATRICES AND CALCULUS****B. Tech. I Year I Sem.****L T P C****3 1 0 4****Pre-requisites:** Mathematical Knowledge at pre-university level**Course Objectives:** To learn

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

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

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

**UNIT-I: Matrices****10 L**

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

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

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

**UNIT-III: Calculus****10 L**

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

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

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

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

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

**TEXTBOOKS:**

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

**REFERENCE BOOKS:**

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

**PH102BS APPLIED PHYSICS****B.Tech. I Year I Sem.****L T P C**  
**3 1 0 4****Pre-requisites:** 10 + 2 Physics**Course Objectives:** The objectives of this course for the student are to:

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

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

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

**UNIT - I: QUANTUM PHYSICS AND SOLIDS**

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

**UNIT - II: SEMICONDUCTORS AND DEVICES**

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

**UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS**

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

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

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

**UNIT - IV: NANOTECHNOLOGY**

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

**UNIT - V: LASER AND FIBER OPTICS**

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

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**ME103ES C PROGRAMMING AND DATA STRUCTURES****B.Tech. I Year I Sem.****L T P C**  
**3 0 0 3**

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

**Course Outcomes:**

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

**UNIT - I**

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

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

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

**UNIT - II**

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

**Designing Structured Programs** – Functions, basics, user defined functions, inter function communication, standard functions.

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

**UNIT - III**

**Pointers** – Introduction, Pointers for inter function communication, pointers to pointers, compatibility,

**Pointer Applications** – Passing an array to a function, Memory allocation functions, array of pointers

**Strings** – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion.

**UNIT - IV**

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

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

**UNIT - V**

**Sorting** – selection sort, bubble sort, insertion sort,

**Searching** – linear and binary search methods.

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

**TEXT BOOKS:**

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.

3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie PHI/Pearson Education

**REFERENCE BOOKS:**

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

**ME104ES ENGINEERING WORKSHOP****B.Tech. I Year I Sem.****L T P C**  
**0 1 3 2.5****Pre-requisites:** Practical skill**Course Objectives:**

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

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

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

**1. TRADES FOR EXERCISES:****At least two exercises from each trade:**

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

**2. TRADES FOR DEMONSTRATION & EXPOSURE:**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**EN105HS ENGLISH FOR SKILL ENHANCEMENT****B.Tech. I Year I Sem.****L T P C**  
**2 0 0 2****Course Objectives:** This course will enable the students to:

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

**Course Outcomes:** Students will be able to:

- Understand the importance of vocabulary and sentence structures.
- Choose appropriate vocabulary and sentence structures for their oral and written communication.
- Demonstrate their understanding of the rules of functional grammar.
- Develop comprehension skills from the known and unknown passages.
- Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
- Acquire basic proficiency in reading and writing modules of English.

**UNIT - I**Chapter entitled '**Toasted English**' by **R.K.Narayan** from "**English: Language, Context 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.**Reading:** Reading and Its Importance- Techniques for Effective Reading.**Writing:** Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.**UNIT - II**Chapter entitled '**Appro JRD**' by **Sudha Murthy** from "**English: Language, Context and Culture**" published by Orient BlackSwan, Hyderabad.**Vocabulary:** Words Often Misspelt - Homophones, Homonyms and Homographs**Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.**Reading:** Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice**Writing:** Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.**UNIT - III**Chapter entitled '**Lessons from Online Learning**' by **F.Haider Alvi, Deborah Hurst et al** from "**English: Language, Context and Culture**" published by Orient BlackSwan, Hyderabad.**Vocabulary:** Words Often Confused - Words from Foreign Languages and their Use in English.**Grammar:** Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.**Reading:** Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.**Writing:** Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.**UNIT - IV**

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

**Vocabulary:** Standard Abbreviations in English

**Grammar:** Redundancies and Clichés in Oral and Written Communication.

**Reading:** Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

**Writing:** Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

#### UNIT - V

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

**Vocabulary:** Technical Vocabulary and their Usage

**Grammar:** Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)

**Reading:** Reading Comprehension-Exercises for Practice

**Writing:** Technical Reports- Introduction – Characteristics of a Report – Categories of Reports  
Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

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

- **Note: 1.** As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is **Open-ended**, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.
- **Note: 2.** Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents. They are advised to teach 40 percent of each topic from the syllabus in blended mode.

#### TEXT BOOK:

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

#### REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2<sup>nd</sup> 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.

**ME106ES ELEMENTS OF MECHANICAL ENGINEERING****B.Tech. I Year I Sem.**

L	T	P	C
0	0	2	1

**Course Objectives:** The objectives of this course are to

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

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

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

**List of Experiments to be performed:**

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

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

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

**PH107BS APPLIED PHYSICS LABORATORY****B.Tech. I Year I Sem****L T P C**  
**0 0 3 1.5****Course Objectives:** The objectives of this course for the student to

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

**Course Outcomes:** The students will be able to:

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

**LIST OF EXPERIMENTS:**

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

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

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

**REFERENCE BOOKS**

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

## CS109ESC PROGRAMMING AND DATA STRUCTURES LABORATORY

**B.Tech. I Year I Sem.**

**L T P C**  
**0 0 2 1**

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

**Course Outcomes:**

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

**List of Experiments:**

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.
5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations:
  - i) To insert a sub-string in to a given main string from a given position.
  - ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or - 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.
15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program that uses functions to perform the following operations:
  - i) Reading a complex number
  - ii) Writing a complex number
  - iii) Addition of two complex numbers
  - iv) Multiplication of two complex numbers
 (Note: represent complex number using a structure.)
18.
  - i. Write a C program which copies one file to another.
  - ii. Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line.)
19.
  - i. Write a C program to display the contents of a file.

- ii. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)
20. Write a C program that uses functions to perform the following operations on singly linked list.:
- i) Creation                      ii) Insertion                      iii) Deletion                      iv) Traversal
21. Write C programs that implement stack (its operations) using
- i) Arrays                      ii) Pointers
22. Write C programs that implement Queue (its operations) using
- i) Arrays                      ii) Pointers
23. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order    i) Bubble sort    ii) Selection sort    iii) Insertion sort
24. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
- i) Linear search                      ii) Binary search

**TEXT BOOKS:**

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

**EN109HS ENGLISH LANGUAGE AND COMMUNICATION SKILLS  
LABORATORY**

**B.Tech. I Year I Sem.**

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

**Course Objectives:**

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

**Course Outcomes:** Students will be able to:

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

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

- a. Computer Assisted Language Learning (CALL) Lab**
- b. Interactive Communication Skills (ICS) Lab**

**Listening Skills:**

Objectives

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

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

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

**Speaking Skills:**

Objectives

1. To involve students in speaking activities in various contexts
  2. To enable students express themselves fluently and appropriately in social and professional contexts
- Oral practice
  - Describing objects/situations/people
  - Role play – Individual/Group activities
  - Just A Minute (JAM) Sessions

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

**Exercise – I****CALL Lab:**

*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.  
*Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

**ICS Lab:**

*Understand:* Spoken vs. Written language- Formal and Informal English.  
*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

**Exercise – II****CALL Lab:**

*Understand:* Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern insentences – Intonation.  
*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*

**ICS Lab:**

*Understand:* Features of Good Conversation – Strategies for Effective Communication.  
*Practice:* Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

**Exercise -****IIICALL Lab:**

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

**ICS Lab:**

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

**Exercise – IV****CALL Lab:**

*Understand:* Listening for General Details.  
*Practice:* Listening Comprehension Tests - *Testing Exercises*

**ICS Lab:**

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

**Exercise – V****CALL Lab:**

*Understand:* Listening for Specific Details.  
*Practice:* Listening Comprehension Tests -*Testing Exercises*

**ICS Lab:**

*Understand:* Introduction to Group Discussion  
*Practice:* Group Discussion

**Minimum Requirement of infrastructural facilities for ELCS Lab:****1. Computer Assisted Language Learning (CALL) Lab:**

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

**System Requirement (Hardware component):**

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

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

**2. Interactive Communication Skills (ICS) Lab :**

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

**Source of Material (Master Copy):**

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

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

**Suggested Software:**

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

**REFERENCE BOOKS:**

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press

**\*MC110 ENVIRONMENTAL SCIENCE****B.Tech. I Year I Sem.**

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**Course Objectives:**

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

**Course Outcomes:**

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

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

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

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

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

**UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-

economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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