



**VIGNANA BHARATHI**®  
Institute of Technology

(A UGC Autonomous Institution, Approved by AICTE, Accredited by NBA & NAAC-A Grade, Affiliated to JNTUH)

Aushapur (V), Ghatkesar (M), Medchal – Dist. Telangana State – 501 301.

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**DEPARTMENT  
OF  
ELECTRONICS AND COMMUNICATION ENGINEERING**

**R22 B.TECH. ECE**

**ACADEMIC YEAR: 2023-24**

**I B.TECH (ECE)  
COURSE STRUCTURE  
&  
SYLLABUS**



**B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING**  
**EFFECTIVE FROM ACADEMIC YEAR 2023 - 24 ADMITTED BATCH**  
**R22 COURSE STRUCTURE AND SYLLABUS**

**I YEAR I – SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	22BS1111	Matrices and Calculus	3	1	0	4
2.	22BS1113	Applied Physics	3	1	0	4
3.	22CS1115	C Programming for Engineers	3	0	0	3
4.	22ME1156	Engineering Workshop	0	1	3	2.5
5.	22HS1112	English for Skill Enhancement	2	0	0	2
6.	22EC1155	Elements of Electronics and Communication Engineering	0	0	2	1
7.	22BS1153	Applied Physics Laboratory	0	0	3	1.5
8.	22CS1155	C Programming for Engineers Laboratory	0	0	2	1
9.	22HS1152	English Language and Communication Skills Laboratory	0	0	2	1
10.	22MC0002	Environmental Science	3	0	0	0
11.	22MC0001	Induction Program				
		<b>Total</b>	<b>14</b>	<b>3</b>	<b>12</b>	<b>20</b>

**I YEAR II – SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	22BS1211	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2.	22BS1212	Engineering Chemistry	3	1	0	4
3.	22ME1255	Computer Aided Engineering Graphics	1	0	4	3
4.	22EE1214	Basic Electrical Engineering	2	0	0	2
5.	22EC1215	Electronic Devices and Circuits	2	0	0	2
6.	22CS1253	Applied Python Programming Laboratory	0	1	2	2
7.	22BS1252	Engineering Chemistry Laboratory	0	0	2	1
8.	22EE1254	Basic Electrical Engineering Laboratory	0	0	2	1
9.	22EC1255	Electronic Devices and Circuits Laboratory	0	0	2	1
		<b>Total</b>	<b>11</b>	<b>3</b>	<b>12</b>	<b>20</b>



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**R22 B.Tech**

**ECE**

**2023-2024**

**I Year – I Semester**



## 22BS1111-MATRICES AND CALCULUS

**I B Tech. I Semester**

**L T P C**  
**3 1 - 4**

**Prerequisite(s):** Mathematical knowledge at Pre university level.

**Course Objectives:** Develop ability to learn the concept of

1. Rank of the matrix and apply the same to know the consistency for the linear system of equations.
2. Eigen values and Eigen vectors to reduce the quadratic form to canonical form.
3. Geometrical approach to the mean value theorems and their application to the mathematical problems, Evaluation of surface areas and volumes of revolutions of curves and evaluation of improper integrals using Beta and Gamma functions.
4. Partial differentiation and Finding maxima and minima of function of two and three variables.
5. Evaluation of multiple integrals and their applications.

**Course Outcomes:** After successful completion of this course, the student should be able to

1. Write the matrix representation of a set of linear equations, find the rank and apply the same to analyse the solution of the system of equations.
2. Reduce the quadratic form to canonical form using orthogonal transformations by finding Eigenvalues and Eigen vectors.
3. Solve the applications on the mean value theorems, Evaluate the improper integrals using Beta and Gamma functions
4. Find the extreme values of functions of two variables with/ without constraints using partial differentiation.
5. Evaluate the multiple integrals and apply the concept to find areas and volumes.

### **UNIT - I: MATRICES**

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**

Linear Transformation and Orthogonal Transformation: Eigenvalues, 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**

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 (without proof). Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates for known curves (circle, parabola, ellipse), Definition of Improper Integral: Beta and Gamma functions and their applications.

### **UNIT - IV: MULTIVARIABLE CALCULUS (PARTIAL DIFFERENTIATION AND APPLICATIONS)**

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)**

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form for known curves (circle, parabola, ellipse), 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).

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44<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.



**22BS1113- APPLIED PHYSICS**

**I B Tech. I Semester**

**L T P C**  
**3 1 0 4**

**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. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibers.

**Course Outcomes:**

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

1. 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.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic and energy materials for their applications.
4. Appreciate the features and applications of Nanomaterials.
5. 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, Wein's and Rayleigh-Jean's law, Planck's radiation law (Qualitative) - photoelectric effect de-Broglie hypothesis and matter waves- Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

**Solids:** Free electron theory (Drude & Lorentz, Sommerfeld) (Qualitative) Bloch's theorem - Kronig-Penney model (Qualitative) origin of energy bands- classification of solids.

**UNIT - II: SEMICONDUCTORS AND DEVICES**

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.

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

**Dielectric Materials:** Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials.

**Magnetic Materials:** Basic definitions – classification of Magnetic materials – Domain theory of ferromagnetism in hysteresis - soft and hard magnetic materials - magnetostriction, magnetoresistance.



**Energy Materials:** Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors.

#### 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, CO<sub>2</sub> 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.



**22CS1115- C PROGRAMMING FOR ENGINEERS**

**I B Tech. I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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. To learn how to use arrays and pointers to solve problems.
5. To learn the usage of structured programming approach in solving problems.

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

1. Draw flowcharts for solving arithmetic and logical problems
2. Develop modular reusable code by understanding concepts of functions.
3. Formulate algorithms and programs using arrays, pointers, strings and structures.
4. Able to develop applications on Files
5. Write a programs using Searching and sorting algorithms

**UNIT- I: INTRODUCTION TO COMPUTER ALGORITHMS AND PROGRAMMING**

**Components of a computer system:** Memory, processor, I/O devices, storage, operating system, the concept of assembler, compiler, interpreter, loader, and linker.

**From algorithm to program:** Representation of an algorithm, flowchart, Pseudocode with examples, converting algorithms to programs.

**Programming Basics:** Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object, and executable code. Components of C language, standard I/O in C, data types, variables and constants, memory storage, and storage classes.

**UNIT – II: EXPRESSIONS AND STATEMENTS**

**Expressions and their evaluation:** Operands and Operators, formation of expressions using arithmetic, relational, logical, and bitwise operators, precedence and associativity rules, mixed operands, type conversion, and evaluation of expressions.

**Statements:** Simple and compound statements, Conditional Branching: if and switch statements, nested if-else, dangling else problem, use of break and default with switch. Iteration and loops: use of while, do-while and for loops, nested loops, use of break and continue statements.

**UNIT – III: FUNCTIONS AND ARRAYS**

**Designing Structured Programs:** Introduction to functions, advantages of modularizing a program into functions, types of functions, passing parameters to functions: call by value; call by reference, passing arrays to functions, recursion with example programs.

**Arrays:** Array notation and representation, manipulating array elements, using multi-dimensional arrays, character arrays.

**C strings:** string input/output functions, Array of strings, string manipulation functions with example programs.

**UNIT – IV: POINTERS AND FILE HANDLING**

**Pointers:** Introduction, declaration of pointer, pointer arithmetic, void pointer, applications, dynamic memory allocation (malloc(), calloc(), realloc(), free()), use of pointers in self-referential structures.

**File handling:** File I/O functions, standard C pre-processors, defining and calling macros, command-





line arguments.

**UNIT – V: DERIVED TYPES AND BASIC ALGORITHMS:**

**Structures, Union, Enums and Bit-fields:** Defining, declaring, and usage of structures, unions, and their arrays, passing structures, and unions to functions, introduction to enums and bit-fields.

**Basic Algorithms:** Searching ((linear and binary search techniques) and Sorting Algorithms (Bubble, Insertion, and Selection), finding roots of equations.

**TEXT BOOKS:**

1. B. A. Forouzan and R. F. Gilberg -Programming & Data Structures, 3<sup>rd</sup> Ed., Cengage Learning`
2. Byron Gottfried - Schaum's Outline of Programming with C, McGraw-Hill

**REFERENCE BOOKS:**

1. Ajay Mittal - Programming in C: A practical approach, Pearson Education, 2010
2. Kernighan Brian W. and Ritchie Dennis M.- The C programming, Pearson Education.
3. J. R. Hanlyand, E. B. Koffman -Problem Solving and Program Design, 5<sup>th</sup> Ed., Pearson Education.
4. H. Cheng - C for Engineers and Scientists, McGraw-Hill International Edition
5. V. Rajaraman - Computer Basics and C Programming, PHI Learning, 2015.

R22-B.TECH  
ECE



**Pre-requisites:** Practical skill

**Course Objectives:**

1. To Study about different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at workplace.
5. It explains the construction, function, use and application of different working tools, equipment and machines.

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

1. CO1: Study and practice on machine tools and their operations
2. CO2: Practice on manufacturing of components using work shop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
3. CO3: Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
4. CO4: Apply basic electrical engineering knowledge for house wiring practice.
5. CO 5: Study and Practice of arc welding process

**1. TRADES FOR EXERCISES:**

**At least two exercises from each trade:**

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

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

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**22HS1112- ENGLISH FOR SKILL ENHANCEMENT**

**I B Tech. I Semester**

**L T P C**



**Course Objectives:** This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Learn remedial and functional grammar related to various grammar items.
4. Prepare the students for examinations such as IELTS and TOEFL by sharpening their reading and writing skills
5. 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:

1. Use a wide range of vocabulary and sentence structures and also acquire basic proficiency in reading and writing modules of English.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.

### UNIT-I

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

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

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

**Reading:** Reading and Its Importance – Techniques for Effective Reading.

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

### UNIT-II

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

#### TEXTBOOK:

1. “English: Language, Context and Culture” by Orient Black Swan Pvt. Ltd, Hyderabad.2022. Print.

#### REFERENCEBOOKS:

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.

R22-B.TECH-  
ECE



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

L	T	P	C
0	0	2	1

**Course Objectives:**

1. To introduce different active and passive components.
2. To familiarize various measuring instruments.
3. To be aware of the usage of electronic equipment.
4. To introduce the concepts of Analog and Digital ICs.
5. To have the knowledge of the supported software for various applications.

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

1. Identify the different components used for electronics applications
2. Measure different parameters using various measuring instruments
3. Distinguish various signal used for analog and digital communications.
4. Acquire the knowledge of various software tools for electronics and communication applications.
5. Know the functionality and importance of various generating and display equipments.

**List of Experiments:**

1. Understand the significance of Electronics and communications subjects
2. Identify the different passive and active components
3. Color code of resistors, finding the types and values of capacitors
4. Measure the voltage and current using voltmeter and ammeter
5. Measure the voltage, current with Multimeter and study the other measurements using Multimeter
6. Study the CRO and measure the frequency and phase of given signal
7. Draw the various Lissajous figures using CRO
8. Study the function generator for various signal generations
9. Study of Spectrum analyzer and measure the spectrum
10. Operate Regulated power supply for different supply voltages
11. Study the various gates module and write down the truth table of them
12. Identify various Digital and Analog ICs
13. Observe the various types of modulated signals.
14. Know the available Softwares for Electronics and communication applications



**22BS1153 - 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

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. Understand the method of least square fitting
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Study the behavior of passive components.

**Course Outcomes:**

The students will be able to:

1. 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.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Carried out data analysis
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Learn the characteristics of passive components like L, C and R and their applications.

**LIST OF EXPERIMENTS:**

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

*Note: Any 8 experiments are to be performed.*

**REFERENCE BOOK:**

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



**22CS1155 - C PROGRAMMING FOR ENGINEERS LABORATORY**

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

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

**Course Objectives:**

1. To learn C-language Programs using the data types, input/ output statements and control statements.
2. Describe the importance of modular programming and arrays using C-Language Program.
3. Understand the concept and use of pointers for memory management techniques
4. Understand structure, union, and enumerated types.
5. Understand the basic characteristics of text, binary files and C implementation of file I/O using streams.

**Course Outcomes:**

1. Ability to design and test programs to solve mathematical and scientific problems.
2. Ability to write structured programs using control structures and functions.
3. Able to Implement C programs using arrays & pointers.
4. Able to Use the type definition, enumerated types, define and use structures, unions in programs using C language.
5. Able to execute programs that read and write text, binary files using the formatting and character I/O functions.

**List of Experiments:**

**WEEK-1:**

- a. Write a C program to find simple interest and compound interest.
- b. Write a C program to convert Celsius to Fahrenheit.
- c. Write a C Program to swap two numbers.
- d. Write a C program to perform all arithmetic operations (+, -, \*, /, %).
- e. Write a simple program that prints the results of all the operators available in C (Including pre/ post increment, bitwise and/or/not, etc.). Read required operand Values from standard input.

**WEEK-2:**

- a. Write a C program to find the sum of individual digits of a positive integer.
- b. 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.
- c. Write a C program to generate the first n terms of the sequence.

**WEEK-3:**

- a. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
- b. Write a C program to find the roots of a quadratic equation.

**WEEK-4:**

- a. Write a C program to find the factorial of a given integer.
- b. Write a C program to find the GCD (greatest common divisor) of two given integers.

**WEEK-5:**

- a. Write a C program to solve Towers of Hanoi problem.
- b. 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





**WEEK-6:**

- a. Write a C program to find both the largest and smallest number in a list of integers.
- b. Write a C program that uses functions to perform the following:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices

**WEEK-7:**

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.

**WEEK-8:**

- a. Write a C program to determine if the given string is a palindrome or not.
- b. 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.

**WEEK-9:**

- a. Write a C program to count the lines, words and characters in a given text.
- b. Write a C program to generate Pascal's triangle.
- c. Write a C program to construct a pyramid of numbers

**WEEK-10:**

- a. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:  $1+x+x^2+x^3+\dots+x^n$   
For example: if n is 3 and x is 5, then the program computes  $1+5+25+125$ . Print sum and Perform error checking.  
For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if  $n < 0$ , then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal ? If so, test for them too.
- b. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

**WEEK-11:**

- a. Write a C program to convert a Roman numeral to its decimal equivalent.
- b. 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.)

**WEEK-12:**

- a. Write a C program which copies one file to another.
- b. 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.)

**WEEK-13:**

- a. Write a C program to display the contents of a file.
- b. 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).

**WEEK-14:**

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

**WEEK-15:**

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

R22-B.TECH-  
ECE



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

**L T P C**  
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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:**

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

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

1. Make use of various online and web resources for independent language learning.
2. Understand the nuances of English language through audio-visual experience and group activities.
3. Neutralize their accent for intelligibility for enabling them to communicate with a global audience.
4. Speak with clarity and confidence which in turn improves their academic performance in the other courses.
5. Face and interact with various stakeholders leading to the enhancement of 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
  - Roleplay – Individual/Group activities
  - Just A Mine (JAM) Sessions

The following course contents 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 in sentences – 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-III CALL Lab:**

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

##### **ICS Lab:**

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

#### **Exercise–IV**

##### **CALL Lab:**

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



**ICS Lab:**

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

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

**Exercise–V CALL Lab:**

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests – Testing Exercises

**ICS Lab:**

Understand: Group Discussion

Practice: Group Discussion

**Minimum Requirement of infrastructural facilities for ELCSLab:**

**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 (Hardwarecomponent):**

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

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

**1. 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, Part1, 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 (Series1-4), 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.

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ECE



**Course Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

**Course Outcomes:**

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

**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.





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**22MC0001: INDUCTION PROGRAM**

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# R22 B.Tech

# ECE

## 2023-2024

# I Year – II Semester



**22BS1211- ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**

**I B.Tech. II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

**Pre-requisites:** Mathematical Knowledge at pre-university level

**Course Objectives:** Develop ability to learn

1. Methods of solving the Ordinary Differential Equations of first order.
2. Methods of solving the higher order Ordinary Differential Equations.
3. Concept, properties of Laplace transforms & using the same to solve ordinary differential equations.
4. The physical quantities involved in engineering field related to vector valued functions
5. The basic properties of vector valued functions and their applications to vector integration.

**Course outcomes:** After successful completion of this course, student should be able to

1. Identify the type of first order Ordinary Differential Equation and solve them by appropriate method.
2. Apply the concept of higher order Ordinary Differential Equations to solve real world problems.
3. Solve ordinary differential equations by using Laplace transform techniques.
4. Calculate scalar potential for a vector and directional derivative of a scalar point function using vector differentiation.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

**UNIT-I: FIRST ORDER ODE**

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

**UNIT-II: ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER**

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

**UNIT-III: LAPLACE TRANSFORMS**

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

**UNIT-IV: VECTOR DIFFERENTIATION**

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives,



Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

### **UNIT-V: VECTOR INTEGRATION**

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

#### **TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44<sup>th</sup> Edition,
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. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.



**22BS1212- ENGINEERING CHEMISTRY**

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

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**3 1 0 4**

**Course Objectives:**

1. To acquire knowledge about desalination of brackish water and treatment of municipal water
2. To include the fundamental aspects of battery chemistry, significance of corrosion and its control to protect the structures.
3. To gain the knowledge of conducting polymers, bio-degradable polymers and fiber reinforced plastics.
4. To understand the significance of green chemistry and green synthesis and to imbibe the green chemistry principles.
5. To acquire required knowledge about engineering materials like smart materials, lubricants, and biodiesel.

**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 substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
4. The student can use real examples to illustrate how the principles of *green chemistry* can be applied to chemical process in engineering
5. They can predict potential applications of engineering materials and practical utility in order to become good engineers and entrepreneurs.

**UNIT - I: WATER AND ITS TREATMENT:**

Introduction to hardness of water – Estimation of hardness of water by 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 breakpoint chlorination. Defluoridation, Determination of F<sup>-</sup> 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**

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:**

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: GREEN CHEMISTRY AND ENGINEERING FOR SUSTAINABLE DEVELOPMENT**

Definition and history of Green chemistry, Concept and principles (Prevention, Atom Economy, Less Hazardous Chemical Syntheses, Designing Safer Chemicals, Safer Solvents and Auxiliaries, Design for Energy Efficiency, Use of Renewable Feedstock, Reduce, Derivatives, Catalysis, Design for Degradation, Real-time Analysis for Pollution Prevention, Inherently Safer Chemistry for Accident Prevention) of Green Chemistry with suitable examples.

#### **UNIT - V: ENGINEERING MATERIALS:**

##### **Smart materials and their engineering applications**

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

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

**Bio Diesel:** Sources and applications of Biodiesel

#### **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. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.
4. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
5. Engineering Chemistry by K Sesha Maheswaramma and Mridula Chugh, Pearson 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)



**22ME1255 - COMPUTER AIDED ENGINEERING GRAPHICS**

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

**L T P C**

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**Course Objectives:**

1. To develop the ability of visualization of different objects through technical drawings
2. To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products
3. To draw sectional views and pictorial views for various types of solids.
4. To develop the lateral surfaces of basic engineering objects
5. To impart knowledge about standard principles of orthographic projection and isometric views of different objects.

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

1. Apply computer aided drafting tools to create 2D and 3D objects
2. sketch conics and different types of solids
3. Appreciate the need of Sectional views of solids and Development of surfaces of solids
4. Read and interpret engineering drawings
5. Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

**UNIT – I: INTRODUCTION TO ENGINEERING GRAPHICS:**

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

**UNIT- II: ORTHOGRAPHIC PROJECTIONS:**

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

**UNIT – III:**

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

**UNIT – IV:**

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

**UNIT – V:**

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

**TEXT BOOKS:**

- 1 Engineering Drawing N.D. Bhatt / Charotar



2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S.Chand and company Ltd.

**REFERENCE BOOKS:**

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

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

R22-B.TECH-  
ECE





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

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

**Prerequisites:** Mathematics

**Course Objectives:**

1. To study and understand DC circuits.
2. To study and understand Single & Three phase AC circuits.
3. To study and understand the Single Phase Transformers.
4. To study and understand the different types of DC and AC machines.
5. To have the knowledge of various electrical installations and the concept of power factor improvement.

**Course Outcomes:** After completion of this course, students will be able to

1. Analyze DC circuits using various techniques
2. Analyze Single & Three phase AC circuits
3. Discuss the working principles and estimate the performance of Single Phase Transformers
4. Discuss the Construction and working principle of different types of DC and AC machines.
5. Classify various components of Low Voltage Electrical Installations and identify the importance of power factor improvement

**UNIT-I: D.C. CIRCUITS:** Electrical circuit elements (R, L and C), voltage and current sources, KVL & KCL, analysis of simple circuits with dc excitation (Series, Parallel, Series and Parallel circuits, Nodal Analysis and Mesh Analysis). Superposition, Thevenin's and Norton's Theorems. Time-domain analysis of first-order RL and RC circuits.

**UNIT-II: A.C. CIRCUITS:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series circuits only), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT-III: SINGLE PHASE TRANSFORMERS:** Working Principle and construction of Transformer, Types, Ideal and practical transformer, EMF Equation, equivalent circuit, losses in transformers, regulation and efficiency.

**UNIT-IV: ELECTRICAL MACHINES**

**D. C. Generator:** Constructional details of D C Machine, Working Principle of D C Generator, EMF Equation, Types, Numerical Problems.

**D. C. Motor:** Working Principle of D C Motor, Types, Torque Equation, Numerical Problems Performance Characteristics of dc shunt motor.

**Three Phase Induction Motor:** Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics.

**Synchronous Generator:** Construction and working of synchronous generator.



**UNIT-V: ELECTRICAL INSTALLATIONS:** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Elementary calculations for energy consumption, power factor improvement.

**TEXT BOOKS:**

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4<sup>th</sup> Edition, 2019.
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2<sup>nd</sup> Edition, 2008.

**REFERENCE BOOKS:**

- 1 P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, “Basic Electrical Engineering”, S. Chand, 2<sup>nd</sup> Edition, 2019.
- 2 D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
- 3 M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1<sup>st</sup> Edition, 2012.
- 4 Abhijit Chakrabarthy, Sudipta Debnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2<sup>nd</sup> Edition, McGraw Hill, 2021.
- 5 L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
- 6 E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
- 7 V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989



## 22EC1215 - ELECTRONIC DEVICES AND CIRCUITS

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

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

### **Course Objectives:**

1. To introduce components such as diodes, BJT's and FET's.
2. To know the applications of devices.
3. To know the switching characteristics of devices.
4. To know the special purpose devices such as SCR, UJT.
5. To know the MOSFET and its characteristics

*Course Outcomes: Upon completion of the Course, the students will be able to:*

1. Acquire the knowledge of various electronic devices and their use on real life.
2. Know the applications of various devices.
3. Acquire the knowledge about the role of special purpose devices and their applications.
4. Know the configurations of Transistors
5. Acquire the knowledge of various device characteristics.

### **UNIT - I**

**DIODES:** Diode - Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch- switching times.

### **UNIT - II**

Diode Applications: Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

### **UNIT - III**

**BIPOLAR JUNCTION TRANSISTOR (BJT):** Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times,

**UNIT – IV JUNCTION FIELD EFFECT TRANSISTOR (FET):** Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

**UNIT – V Special Purpose Devices:** Zener Diode - Characteristics, Zener diode as Voltage Regulator, Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode, Photo diode, Solar cell, LED, Schottky diode.

### **TEXT BOOKS:**

1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky- Electronic Devices and Circuits theory, 11<sup>th</sup> Edition, 2009, Pearson.

### **REFERENCE BOOKS:**

1. Horowitz -Electronic Devices and Circuits, David A. Bell – 5<sup>th</sup> Edition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly - Basic Electronics-Principles and Applications, Cambridge, 2018.



**22CS1253 - APPLIED PYTHON PROGRAMMING LABORATORY**

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

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

**Course Objectives:**

1. To learn python programming language using the data types, input/ output statements.
2. To install and run the Python interpreter
3. To learn control structures.
4. To Understand Lists, Dictionaries in python
5. To Handle Strings and Files in Python

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

1. Build basic programs using fundamental programming constructs
2. Write and execute python codes for different applications
3. Capable to implement on hardware boards
4. Able to Implement File Handling.
5. Able to deploy Small Projects using Predefined Libraries.

**LIST OF EXPERIMENTS:**

**Cycle - 1**

1. Downloading and Installing Python and Modules
  - a. Python 3 on Linux  
Follow the instructions given in the URL <https://docs.python-guide.org/starting/install3/linux/>
  - b. Python 3 on Windows  
Follow the instructions given in the URL <https://docs.python.org/3/using/windows.html> (Please remember that Windows installation of Python is harder!)
  - c. pip3 on Windows and Linux  
Install the Python package installer by following the instructions given in the URL <https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/>
  - d. Installing numpy and scipy  
You can install any python3 package using the command `pip3 install <packagename>`
  - e. Installing jupyterlab  
Install from pip using the command `pip install jupyterlab`
2. Introduction to Python3
  - a. Printing your biodata on the screen
  - b. Printing all the primes less than a given number
  - c. Finding all the factors of a number and show whether it is a *perfect* number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself
3. Defining and Using Functions
  - a. Write a function to read data from a file and display it on the screen
  - b. Define a boolean function *is palindrome*(<input>)
  - c. Write a function *collatz*(*x*) which does the following: if *x* is odd,  $x = 3x + 1$ ; if *x* is even, then  $x = x/2$ . Return the number of steps it takes for  $x = 1$
  - d. Write a function  $N(m, s) = \exp(-(x-m)^2/(2s^2))/\text{sqrt}(2\pi)s$  that computes the Normal distribution
4. The package numpy
  - a. Creating a matrix of given order  $m \times n$  containing *random numbers* in the range 1 to 99999
  - b. Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed



- c. Write a program to solve a system of  $n$  linear equations in  $n$  variables using matrix inverse
5. The package `scipy` and `pyplot`
  - a. Finding if two sets of data have the same *mean* value
  - b. Plotting data read from a file
  - c. Fitting a function through a set of data points using *polyfit* function
  - d. Plotting a histogram of a given data set
6. The strings package
  - a. Read text from a file and print the number of lines, words and characters
  - b. Read text from a file and return a list of all  $n$  letter words beginning with a vowel
  - c. Finding a secret message hidden in a paragraph of text
  - d. Plot a histogram of words according to their length from text read from a file

### Cycle -2

7. Installing OS on Raspberry Pi
  - a. Installation using PiImager
  - b. Installation using image file

- Downloading an Image
- Writing the image to an SD card
  - using Linux
  - using Windows

- Booting up

Follow the instructions given in the URL

<https://www.raspberrypi.com/documentation/computers/getting-started.html>

8. Accessing GPIO pins using Python
  - a. Installing GPIO Zero library.  
First, update your repositories list:  
`sudo apt update`  
Then install the package for Python 3:  
`sudo apt install python3-gpiozero`
  - b. Blinking an LED connected to one of the GPIO pin
  - c. Adjusting the brightness of an LED
  - d. Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.
9. Collecting Sensor Data
  - a. DHT Sensor interface
    - Connect the terminals of DHT GPIO pins of Raspberry Pi.
    - Import the DHT library using `import Adafruit_DHT`
    - Read sensor data and display it on screen.



**22BS1252 - ENGINEERING CHEMISTRY LABORATORY**

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

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

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

1. Estimation of hardness of water to check its suitability for drinking purpose.
2. Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
3. Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
4. Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.
5. Students will be able to visualize the experiments virtually for better understanding

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

1. Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
2. Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
3. Students are able to prepare polymers like bakelite and nylon-6.
4. Estimations saponification value, surface tension and viscosity of lubricant oils.
5. Can perform the experiments making use of working models

**List of Experiments:**

- I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.
- II. **Conductometry:** Estimation of the concentration of an acid by Conductometry.
- III. **Potentiometry:** Estimation of the amount of  $\text{Fe}^{+2}$  by Potentiometry.
- IV. **pH Metry:** Determination of an acid concentration using pH meter.
- V. **Preparations:**
  - 1.Preparation of Bakelite.
  - 2.Preparation Nylon – 6.

**VI. Lubricants:**

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

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

**VIII. Virtual lab experiments**

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

**REFERENCE BOOKS:**

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



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3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

R22-B.TECH-  
ECE



**22EE1254- BASIC ELECTRICAL ENGINEERING LABORATORY**

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

**L T P C**

**0 0 2 1**

**Prerequisites:** Basic Electrical Engineering

**Course Objectives:**

1. To measure the electrical parameters for different types of DC circuits using conventional and theorems approach.
2. To measure the electrical parameters for different types of AC circuits
3. To study the transient response of various R, L and C circuits using different excitations.
4. To determine the performance of Single Phase Transformers.
5. To determine the performance of different types of DC and AC machines.

**Course Outcomes: After completion of this course, students will be able to**

1. Verify the basic conventional approach and theorems for Electrical circuits through different experiments.
2. Calculate the electrical parameters for different types of AC circuits
3. Analyze the transient responses of R, L and C circuits for different input conditions.
4. Evaluate the performance calculations of Single Phase Transformers through various testing methods.
5. Evaluate the performance calculations of DC and AC machines through various testing methods.

**List of experiments/demonstrations:**

**PART- A (compulsory)**

1. Verification of KVL and KCL
2. Verification of Thevenin's theorem
3. Verification of Norton's theorem
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series Circuits.
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque-Speed Characteristics of a Three-phase Induction Motor.

**PART-B (any two experiments from the given list)**

1. Verification of Superposition theorem
2. Transient Response of Series RL and RC circuits for DC excitation
3. Load Test on Single Phase Transformer (Calculate Efficiency)
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
5. No-Load Characteristics of a Three-phase Alternator

**TEXT BOOKS:**

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4<sup>th</sup> Edition, 2019.
2. MS Naidu and S Kamakshiah, "Basic Electrical Engineering", Tata McGraw Hill, 2<sup>nd</sup> Edition, 2008.





**REFERENCE BOOKS:**

1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker, "Basic Electrical Engineering", S. Chand, 2<sup>nd</sup> Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1<sup>st</sup> Edition, 2012.
4. Abhijit Chakrabarthy, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2<sup>nd</sup> Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

R22-B.TECH-  
ECE



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

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

**Course Objectives:**

**The main objectives of the course is to**

1. Study basic electronic components.
2. Observe characteristics of electronic devices.
3. Study rectifier characteristics and other diode circuits.
4. Observe BJT and MOSFET amplifiers in different configurations.
5. Gain knowledge of SCR,UJT, Photodiode, Solar Cell & LED.

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

1. Understand the P-N diode and Zener diode characteristics
2. Acquire knowledge about various configurations of transistor like CE, CB and CC.
3. Understand & Analyze Fullwave rectifier, clippers and clampers.
4. Acquire the knowledge about MOSFET in CS and CD configuration
5. Understand and Analyze SCR,UJT, Photodiode, solar cells and LED

**List of Experiments (Twelve experiments to be done):**

Verify any twelve experiments in H/W Laboratory

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.
  2. Full Wave Rectifier with & without filters
  3. Types of Clippers at different reference voltages
  4. Types of Clampers at different reference voltages
  5. The steady state output waveform of clampers for a square wave input
  6. Input and output characteristics of BJT in CB Configuration
  7. Input and output characteristics of BJT in CE Configuration
  8. Input and output characteristics of BJT in CC Configuration
  9. Input and output characteristics of MOS FET in CS Configuration
  10. Input and output characteristics of MOS FET in CD Configuration
  11. Switching characteristics of a transistor
  12. Zener diode characteristics and Zener as voltage Regulator
  13. SCR Characteristics.
  14. UJT Characteristics and identify negative region
  15. Photo diode characteristics
  16. Solar cell characteristics
  17. LED Characteristics
- \*Design a circuit to switch on and off LED using diode/BJT/FET as a switch.

**Major Equipment required for Laboratories:**

1. Regulated Power Suppliers, 0-30V
1. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
2. Functions Generators-Sine and Square wave signals
3. Multimeters, voltmeters and Ammeters
4. Electronic Components and devices