



KAMALA INSTITUTE OF TECHNOLOGY & SCIENCE, SINGAPUR

HUZURABAD-505468, KARIMNAGAR DIST., T.S. Sponsored by Kamala Education Society
AN AUTONOMOUS INSTITUTION UNDER JNTUH, HYDERABAD

B.Tech. in ELECTRONICS AND COMMUNICATION ENGINEERING

I YEAR COURSE STRUCTURE & SYLLABUS (R23 REGULATIONS)

Applicable from A.Y. 2023-24 Batch

I YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	23MA28BS101	Matrices and Calculus	3	1	0	4
2.	23PH28BS102	Applied Physics	3	1	0	4
3.	23EC28ES103	C Programming for Engineers	3	0	0	3
4.	23ME28ES104	Engineering Workshop	0	1	3	2.5
5.	23EN28HS105	English for Skill Enhancement	2	0	0	2
6.	23EC28ES106	Elements of Electronics and Communication Engineering	0	0	2	1
7.	23PH28BS107	Applied Physics Laboratory	0	0	3	1.5
8.	23EC28ES108	C Programming for Engineers Laboratory	0	0	2	1
9.	23EN28HS109	English Language and Communication Skills Laboratory	0	0	2	1
10.	*2328MC110	Environmental Science	3	0	0	0
		Induction Programme				
		Total	14	3	12	20



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Sponsored by Kamala Education Society, Huzurabad Mandal, Karimnagar Dist. T.S.

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Approved by AICTE, affiliated to JNTUH, Hyderabad, Accredited by NBA (EEE, ECE, CSE) and NAAC with A++ Grade

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I YEAR II SEMESTER

S. No.	CourseCode	Course Title	L	T	P	Credits
1.	23MA28BS201	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2.	23CH28BS202	Engineering Chemistry	3	1	0	4
3.	23ME28ES203	Computer Aided Engineering Graphics	1	0	4	3
4.	23EE28ES204	Basic Electrical Engineering	2	0	0	2
5.	23EC28ES205	Electronic Devices and Circuits	2	0	0	2
6.	23EC28ES206	Applied Python Programming Laboratory	0	1	2	2
7.	23CH28BS207	Engineering Chemistry Laboratory	0	0	2	1
8.	23EE28ES208	Basic Electrical Engineering Laboratory	0	0	2	1
9.	23EC28ES209	Electronic Devices and Circuits Laboratory	0	0	2	1
Total			11	3	12	20

23MA28BS101 : 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

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigenvalues 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
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- 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

- Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.
- 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, Orthogonal Matrix, Complex matrices: Hermitian, Unitary Matrices.

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

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. Definition of Improper Integral: Beta and Gamma functions and their properties. Evaluation of simple integrals using Beta and Gamma functions.

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) 8 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 integral.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS:

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

REFERENCE BOOKS:

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

23PH28BS102 : 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:

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 fabrication techniques.
5. Study the characteristics of lasers and optical fibres.

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 materials and energy 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 – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect – de Broglie Hypothesis - Davisson and Germer experiment – Heisenberg uncertainty principle – Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Classical and Quantum free electron theory (Qualitative) - 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 band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode,

LED, PIN diode, avalanche photodiode (APD) 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 – liquid crystal displays (LCD) and crystal oscillators.

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 supercapacitors.

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, CO₂ laser, Argon ion Laser, Nd:YAG laser - semiconductor laser - application 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.

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBSPublication, 2nd Edition 2012.
2. Fundamentals of Physics - Halliday, Resnick and Walker, John Wiley & Sons, 11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhyaya - Nano Materials, New Age International, 1st 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, 1st Edition, 2022

23EC28ES103 : C PROGRAMMING FOR ENGINEERS**B. Tech. I Year I Sem.**

L	T	P	C
3	0	0	3

Course Objectives:

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

Course Outcomes: The student will learn

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

UNIT – I:**Introduction to Programming:** Compilers, compiling and executing a program.**Representation of Algorithm:** Algorithms for finding roots of quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudo code with examples, Program design and structured programming**Introduction to C Programming Language:** variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code,**I/O:** Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments**UNIT – II: Operators, Conditional Branching, Loops and Functions****Operators:** expressions and precedence, Expression evaluation, type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators.**Conditional Branching and Loops:** Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, go to, Iteration with for, while, do-while loops**Functions:** Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Some C standard functions and libraries Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc.,**UNIT – III: Arrays, Strings and Structures:****Arrays:** one and two dimensional arrays, creating, accessing and manipulating elements of arrays

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings, Passing arrays to functions
Structures: Defining structures, initializing structures, unions, Array of structures

UNIT – IV: Pointers and Preprocessor:

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, passing pointers to functions, idea of call by reference, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type Limitations of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types. Storage classes (auto, extern, static and register)

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef.

UNIT – V: File handling in C, Searching and Sorting:

Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions

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

TEXTBOOKS:

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

REFERENCEBOOKS:

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

23ME28ES104: ENGINEERING WORKSHOP

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.
- To provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- 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:

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

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. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
- VI. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:

2A) Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working,

2B) Introduction to microcontroller (Arduino)

2C) Welding Practice – (Arc Welding & Gas Welding)

Note: Demonstrate any 2 Trades out of the 3 Trades.

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

23EN28HS105 : 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:

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

Course Outcomes: Students will be able to:

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

UNIT-I

Chapter entitled '*Toasted English*' by R.K. Narayan from "*English: Language, Context 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.

TEXTBOOK:

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

REFERENCEBOOKS:

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

**23EC28ES106 : ELEMENTS OF ELECTRONICS AND COMMUNICATION
ENGINEERING**

B.Tech. I Year I Sem.

L T P C

0 0 2 1

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. Construct simple electronic circuits

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	1	-	-	1	-	-	1
CO2	3	2	3	2	1	2	-	-	1	-	-	1
CO3	3	3	2	1	1	2	-	-	1	-	-	1
CO4	3	2	1	1	1	2	-	-	-	-	-	-

List of Experiments:

1. Understand the significance of Electronics and communications subjects
2. Know the available Softwares for Electronics and communication applications
3. a. Identify the different passive and active components
b. 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. a. Study the CRO and measure the frequency and phase of given signal
b. Draw the various Lissajous figures using CRO
7. Study the function generator for various signal generations
8. Study of Spectrum analyzer and measure the spectrum
9. Operate Regulated power supply for different supply voltages
10. Study the various gates module and write down the truth table of them
11. IC testing and Identify various Digital and Analog ICs
12. Study of different waveforms.
13. Construction of simple electronic circuits on breadboard
14. Soldering practice on PCB

23PH28BS107 : 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, optical fiber and energy gap of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

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. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carry out data analysis.

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photo electric effect.
2. Determination of Hall coefficient 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 Wavelength of LASER-Diffraction grating.
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 8 experiments are to be performed.

REFERENCEBOOK:

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

23EC28ES108 : C PROGRAMMING FOR ENGINEERS LABORATORY**B. Tech. I Year I Sem.**

L	T	P	C
0	0	2	1

[Note: The programs may be executed using any available Open Source/ Freely available IDE

Some of the Tools available are:

Cod elite: <https://codelite.org/>

CodeBlocks: <http://www.codeblocks.org/>

DevCpp : <http://www.bloodshed.net/devcpp.html>

Eclipse: <http://www.eclipse.org>

This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:

- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:

- Formulate the algorithms for simple problems
- Translate given algorithms to a working and correct program
- Correct syntax errors as reported by the compilers
- Identify and correct logical errors encountered during execution
- Represent and manipulate data with arrays, strings and structures
- Use pointers of different types
- Create, read and write to and from simple text and binary files
- Modularize the code with functions so that they can be reused

Practice sessions:

- 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.
- Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.

Simple numeric problems:

- Write a program for finding the max and min from the three numbers.
- Write the program for the simple, compound interest.
- Write a program that declares Class awarded for a given percentage of marks, where mark <40% = Failed, 40% to <60% = Second class, 60% to <70% = First class, >=

70% = Distinction. Read percentage from standard input.

- d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
- ```
5 x 1 = 5
5 x 2 = 10
5 x 3 = 15
```
- e. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

### Expression Evaluation:

- a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula  $s = ut + \frac{1}{2}at^2$  where  $u$  and  $a$  are the initial velocity in m/sec ( $= 0$ ) and acceleration in  $m/sec^2$  ( $= 9.8 m/s^2$ )).
- 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 Statement)
- c. Write a program that finds if a given number is a prime number
- d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
- e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first  $n$  terms of the sequence.
- f. Write a C program to generate all the prime numbers between 1 and  $n$ , where  $n$  is a value supplied by the user.
- g. Write a C program to find the roots of a Quadratic equation.
- h. Write a C program to calculate the following, where  $x$  is a fractional value. i.  $1 - x/2 + x^2/4 - x^3/6$
- i. 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  $1 + 5 + 25 + 125$ .

### Arrays, Pointers and Functions:

- a. Write a C program to find the minimum, maximum and average in an array of integers.
- b. Write a function to compute mean, variance, Standard Deviation, sorting of  $n$  elements in a single dimension array.
- c. Write a C program that uses functions to perform the following:
- Addition of Two Matrices
  - Multiplication of Two Matrices
  - Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be the same.
- d. Write C programs that use both recursive and non-recursive functions
- To find the factorial of a given integer.
  - To find the GCD (greatest common divisor) of two given integers.
  - To find  $x^n$
- e) Write a program for reading elements using a pointer into an array and display the values using the array.

- f) Write a program for display values reverse order from an array using a pointer.  
g) Write a program through a pointer variable to sum of n elements from an array.

**Files:**

- a. Write a C program to display the contents of a file to standard output device.  
b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.  
c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.  
d. Write a C program that does the following:  
It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function)  
Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)  
The program should then read all 10 values and print them back.  
e. 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).

**Strings:**

- a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.  
b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent  
c. Write a C program that uses functions to perform the following operations:  
i) To insert a sub-string into a given main string from a given position.  
ii) To delete n Characters from a given position in a given string.  
d. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)  
e. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.  
f. Write a C program to count the lines, words and characters in a given text.

**Miscellaneous:**

- a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.  
b. Write a C program to construct a pyramid of numbers as follows:

```

1 * 1 1 *
1 2 ** 2 3 2 2 **
1 2 3 *** 4 5 6 3 3 3 ***
 4 4 4 **
 *

```

**Sorting and Searching:**

- a. Write a C program that uses non recursive function to search for a Key value in a given list of integers using linear search method.
- b. Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using binary search method.
- c. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.
- d. Write a C program that sorts the given array of integers using selection sort in descending order
- e. Write a C program that sorts the given array of integers using insertion sort in ascending order
- f. Write a C program that sorts a given array of names

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**23EN28HS109 : ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB****B.Tech. I Year I Sem.**

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>0</b> | <b>0</b> | <b>2</b> | <b>1</b> |

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 discussions and interviews

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

- ✓ Understand the nuances of English language through audio- visual experience and group activities
- ✓ Neutralise their accent for intelligibility
- ✓ 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.

### **Exerc**

**ise –**

### **II**

**CAL**

**L**

#### **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.

### **Exerc**

**ise -**

### **III**

**CAL**

**L**

**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.

**Exerc**

**ise –**

**IV****CAL****L****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.

**Exerc**

**ise –**

**V****CAL****L****Lab:**

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests -*Testing Exercises*

**ICS Lab:**

*Understand:* Group Discussion

*Practice:* Group Discussion

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

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

**System Requirement (Hardware component):**

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

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

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

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

### Source of Material (Master Copy):

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

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



**2328MC110 : ENVIRONMENTAL SCIENCE****B.Tech. I Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 0 |

**UNIT - I**

**Ecosystems:** Definition, Scope and Importance ecosystem. Classification, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Energy flow in the ecosystem, Biogeochemical cycles, Bioaccumulation, ecosystem value, devices 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 problem, Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable energy source, and case studies.

**UNIT - III**

**Biodiversity and Biotic resource :** Introduction - Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a mega diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts; Conservation of biodiversity: In-situ and Exsitu conservation. National biodiversity act.

**UNIT - IV**

**Environmental Pollution and Control Technologies:** Environmental Pollution & Control: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, ambient air quality standards. Water pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, 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, Concept of bioremediation. Global Environmental Problems 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 Montreal Protocol.

**UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act,

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, 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:**

**T1.** Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

**T2.** Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCES:**

**R1.** Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.

**R2.** Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.

**R3.** Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt Ltd.

**R4.** Environmental Science by Daniel B. Botkin & Edwards A. Keller, Wiley INDIA edition.

**R5.** Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

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**I B.Tech.**

**II SEMESTER  
SYLLABUS**

## 23MA28BS201 : ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

R23 B.Tech. I Year II Sem.

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

**Course Objectives:** To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

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

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

### UNIT-I: First Order ODE

8 L

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

### UNIT-II: Ordinary Differential Equations of Higher Order

10 L

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

### UNIT-III: Laplace transforms

10 L

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

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

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

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

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

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42<sup>nd</sup> Edition, 2019
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5<sup>th</sup> Edition, 2016.
3. Zafar Ahsan, Differential equations & their applications, PHI Publications, 2<sup>nd</sup> Edition.

**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. N.P. Bali and Manish Goyal A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

**23CH28BS202: ENGINEERING CHEMISTRY**

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |

**Course Objectives:**

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

**Course Outcomes:**

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

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

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water-Disinfection of potable water by chlorination and break-point chlorination. De-fluoridation

-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 [8]**

Introduction-Classification of batteries-primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells-Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

**Corrosion:** Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

**UNIT-III: Polymeric materials:[8]**

Definition–Classificationofpolymerswithexamples–Typesofpolymerization– addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene **Plastics:** Definitionandcharacteristics- thermoplasticandthermosettingplastics,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.

**Conductingpolymers:**CharacteristicsandClassificationwithexamples- mechanismofconductionin trans-polyacetylene and applications of conducting polymers.

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

**UNIT-IV: Energy Sources:[8]**

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

**UNIT -V:EngineeringMaterials:[8]**

**Cement:** Portl and cement, its composition, setting and hardening.

**Smart materials and their engineering applications**

Shapememorymaterials-PolyL-Lacticacid.Thermoreponsematerials- Polyacrylamides,Polyvinyl amides

**Lubricants:**Classificationoflubricantswithexamples-characteristicsofagoodlubricants- mechanism of lubrication(thickfilm, thinfilm and extreme pressure)- properties of lubricants: viscosity, cloudpoint, pour point, flash point and fire point.

**TEXTBOOKS:**

1. EngineeringChemistrybyP.C.JainandM.Jain,DhanpatraiPublishingCompany,2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. Atext book of Engineering Chemistry by M.Thirumala Chary, E.Laxminarayana and K. Shashikala, Pearson Publications, 2021.
4. TextbookofEngineeringChemistrybyJayaShreeAnireddy,WileyPublications.

**REFERENCEBOOKS:**

1. EngineeringChemistrybyShikhaAgarwal,CambridgeUniversityPress,Delhi(2015)
2. EngineeringChemistrybyShashiChawla,DhanpatraiandCompany(P)Ltd.Delhi(2011)

**23ME28ES203: COMPUTER AIDED ENGINEERING GRAPHICS**

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>1</b> | <b>0</b> | <b>4</b> | <b>3</b> |

**Course Objectives:**

- To develop the ability of visualization of different objects through technical drawings
- To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products

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

- Apply computer aided drafting tools to create 2D and 3D objects
- sketch conics and different types of solids
- Appreciate the need of Sectional views of solids and Development of surfaces of solids
- Read and interpret engineering drawings
- Conversion of orthographic projection into isometric view and vice versa manually and 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, Computer aided orthographic projections – points and lines.

**UNIT – III:**

Projections of Plane regular geometric figures - Auxiliary Planes. Computer aided orthographic projections – planes, Projections of Regular Solids – Prism, Cylinder, Pyramid, Cone, Computer aided projections of solids.

**UNIT – IV:**

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, 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 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.

**23EE28ES204: BASIC ELECTRICAL ENGINEERING**

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

**Prerequisites:** Mathematics

**Course Objectives:**

1. To understand DC and Single & Threephase AC circuits
2. To study and understand the different types of DC, AC machines and Transformers.
3. To impart the knowledge of various electrical installations and the concept of power, power factor and its improvement.

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

4. Understand and analyze basic Electrical circuits
5. Study the working principles of Electrical Machines and Transformers
6. Introduce components of Low Voltage Electrical Installations.

| Course Objectives                                                                                                       | Program Outcomes |     |     |     |     |     |     |     |     |      |      |      |
|-------------------------------------------------------------------------------------------------------------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
|                                                                                                                         | PO1              | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| To understand DC and Single & Threephase AC circuits.                                                                   | 3                | 2   | 1   | -   | 2   | -   | -   | 1   | 2   | -    | 1    | 2    |
| To study and understand the different types of DC, AC machines and Transformers.                                        | 3                | 2   | 1   | 1   | 3   | -   | -   | -   | 2   | -    | 1    | 1    |
| To impart the knowledge of various electrical installations and the concept of power, power factor and its improvement. | 3                | 2   | -   | -   | 3   | -   | -   | -   | 1   | 2    | 1    | 1    |
| Course Outcomes                                                                                                         | Program Outcomes |     |     |     |     |     |     |     |     |      |      |      |
|                                                                                                                         | PO1              | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| Understand and analyse basic Electrical circuits                                                                        | 3                | 2   | 1   | -   | 1   | -   | -   | -   | 2   | -    | 2    | 2    |

|                                                                      |   |   |   |   |   |   |   |   |   |   |   |   |
|----------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Study the working principles of Electrical Machines and Transformers | 3 | 2 | 1 | - | 3 | 1 | - | 1 | 1 | 2 | 1 | 2 |
| Introduce components of Low Voltage Electrical Installations.        | 3 | 2 | 1 | 1 | 3 | 2 | - | - | 1 | - | 2 | 2 |

**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. Superposition, Thevenin and Norton 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 and parallel), resonance in series R-L-C circuit, resonant frequency, band width, quality factor. Three-phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT-III:**

**Transformers:** Working principle of a single transformer, EMF equation, theory of transformer on no-load and on-load, phasor diagrams (Ideal and practical transformer), equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and its Applications.

**UNIT-IV:**

**Electrical Machines:** Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Construction and working. 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. Types of Batteries, Elementary treatment of Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**TEXTBOOKS:**

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.

**REFERENCEBOOKS:**

1. P.Ramana,M.Suryakalavathi,G.T.Chandrasheker,“BasicElectricalEngineering”,S.Chand, 2<sup>nd</sup> Edition, 2019.
2. D.C.Kulshreshtha,“BasicElectricalEngineering”,McGrawHill,2009
3. M.S.Sukhija,T.K.Nagsarkar,“BasicElectricalandElectronicsEngineering”,Oxford,1<sup>st</sup> Edition, 2012.
4. AbhijitChakrabarthy,SudiptaDebnath,ChandanKumarChanda,“BasicElectricalEngineering”, 2<sup>nd</sup> Edition, McGraw Hill, 2021.
5. L.S.Bobrow,“FundamentalsofElectricalEngineering”,OxfordUniversityPress,2011.
6. E.Hughes,“ElectricalandElectronicsTechnology”,Pearson,2010.
7. V.D.Toro,“ElectricalEngineeringFundamentals”,PrenticeHallIndia,1989

**23EC28ES205: 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, BJTs and FETs.
2. To know the applications of devices.
3. To know the switching characteristics of devices.

**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.

| Course | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1    | 3   | 1   | 2   | -   | -   | 1   | 1   | -   | -   | -    | -    | 1    |
| CO2    | 3   | 2   | 3   | -   | -   | 2   | 1   | -   | -   | -    | -    | 1    |
| CO3    | 3   | 3   | 3   | -   | -   | 2   | 1   | -   | -   | -    | -    | 1    |

**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.

**UNIT - V**

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

**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

**23EC28ES206: APPLIED PYTHON PROGRAMMING LABORATORY****B. Tech. I Year II Sem.**

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>0</b> | <b>1</b> | <b>2</b> | <b>2</b> |

**Course Objectives:**

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

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

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

**1. Calculator Application**

Build a simple calculator program that can perform basic arithmetic operations

**2. Guess the Number Game**

Create a number guessing game where the computer randomly selects a number, and the user tries to guess it (“random” library may be used).

**3. To-Do List Application**

Develop a to-do list application where users can add, edit, and delete tasks (list, set, tuple and dictionary)

**4. Student Database**

Create a program to manage a student database with basic information like name, roll number, and grades (MySQL database connectivity)

**5. Personal Portfolio Website**

Use **Flask** library to build a simple personal portfolio website with a homepage, about me, and contact page

**6. Paint Application**

Develop a basic paint application where users can draw, create drawings using “tkinter” and “turtle” libraries

## 7. IoT

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 and Windows
- Booting up follow the instructions given in the URL <https://www.raspberrypi.com/documentation/computers/getting-started.html>

## 8. GPIO Pins and Collecting Sensor Data

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.

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

### TEXTBOOKS:

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

### REFERENCE BOOKS:

1. Fundamentals of Python Programming, D. Prashanth Kumar, Dr. K. Praveen Kumar Rao, Reyaan Publishers
2. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications-1<sup>st</sup>Ed.2021.
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
4. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
5. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
6. Think Python, Allen Downey, Green Tea Press
7. Introduction to Python, Kenneth A. Lambert, Cengage



**23CH28BS207:ENGINEERING CHEMISTRY LABORATORY**

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
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**Course Objectives:** The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimation of acids and bases using conductometry, potentiometry and pH metry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

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

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

**List of Experiments:**

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

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

**III. Potentiometry:** Estimation of the amount of  $\text{Fe}^{+2}$  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 to 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 textbook of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

**23EE28ES208: BASIC ELECTRICAL ENGINEERING LABORATORY**

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

**Prerequisites:** Basic Electrical Engineering

**Course Objectives:**

- To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
- To study the transient response of various R, L and C circuits using different excitations.
- To determine the performance of different types of DC, AC machines and Transformers.

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

- Verify the basic Electrical circuits through different experiments.
- Evaluate the performance calculations of Electrical Machines and Transformer through various testing methods.
- Analyze the transient responses of R, L and C circuits for different input conditions.

| Course Objectives                                                                                                       | Program Outcomes |     |     |     |     |     |     |     |     |      |      |      |
|-------------------------------------------------------------------------------------------------------------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
|                                                                                                                         | PO1              | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach | 3                | 2   | 1   | -   | 2   | -   | -   | 1   | 2   | -    | 1    | 2    |
| To study the transient response of various R, L and C circuits using different excitations                              | 3                | 2   | 1   | 1   | 3   | -   | -   | -   | 2   | -    | 1    | 1    |
| To determine the performance of different types of DC, AC machines and Transformers                                     | 3                | 2   | -   | -   | 3   | -   | -   | -   | 1   | 2    | 1    | 1    |

| Course Outcomes                                                                                               | Program Outcomes |     |     |     |     |     |     |     |     |      |      |      |  |
|---------------------------------------------------------------------------------------------------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
|                                                                                                               | PO1              | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |  |
| Verify the basic Electrical circuits through different experiments                                            | 3                | 2   | 1   | -   | 1   | -   | -   | -   | 2   | -    | 2    | 2    |  |
| Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods | 3                | 2   | 1   | -   | 3   | 1   | -   | 1   | 1   | 2    | 1    | 2    |  |

|                                                                                        |   |   |   |   |   |   |   |   |   |   |   |   |
|----------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Analyse the transient responses of R, L and C circuits for different input conditions. | 3 | 2 | 1 | 1 | 3 | 2 | - | - | 1 | - | 2 | 2 |
|----------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|

### List of experiments/demonstrations:

#### PART-A(compulsory)

1. Verification of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series R, L and RC circuits for DC excitation
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. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
5. No-Load Characteristics of a Three-phase Alternator

#### TEXTBOOKS:

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 Chakrabarti, 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.

**23EC28ES209: ELECTRONIC DEVICES AND CIRCUITS LABORATORY****B.Tech. I Year II Sem.**

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>0</b> | <b>0</b> | <b>2</b> | <b>1</b> |

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

1. Acquire the knowledge of various semiconductor devices and their use in real life.
2. Design aspects of biasing and keep them in active region of the device for functional circuits.
3. Acquire the knowledge about the role of special purpose devices and their applications.

| Course | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1    | 1   | -   | 2   | -   | 3   | -   | -   | 3   | 3   | -    | -    | 1    |
| CO2    | 1   | -   | 2   | -   | 3   | -   | -   | 3   | 3   | -    | -    | 1    |
| CO3    | 1   | -   | 2   | -   | 3   | -   | -   | 3   | 3   | -    | -    | 1    |

**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 CE Configuration
7. Input and output characteristics of MOS FET in CS Configuration
8. Input and output characteristics of JFET in CD Configuration
9. Switching characteristics of a transistor
10. Zener diode characteristics and Zener as voltage Regulator
11. UJT Characteristics and identify negative region
12. Photo diode characteristics
13. Solar cell characteristics
14. 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
2. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
3. Functions Generators-Sine and Square wave signals
4. Multimeters, voltmeters and Ammeters
5. Electronic Components and devices