

1ST YEAR 2ND SEMESTER

Course Title : Physics I					
Course Code : PHYS1001					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcomes:

1. To develop basic understanding of the modern science to the technology related domain.
2. Analytical & logical skill development through solving problems.
3. To impart idea of concise notation for presenting equations arising from mathematical formulation of physical as well as geometrical problems percolating ability of forming mental pictures of them.
4. Imparting the essence and developing the knowledge of controlling distant object like satellite, data transfer through optical fiber, implication of laser technology, handling materials in terms of their electrical and magnetic properties etc.
5. To understand how the systems under force field work giving their trajectories which is the basic of classical Field theory
6. To impart basic knowledge of the electric and magnetic behavior of materials to increase the understanding of how and why electronic devices work

Module 1 : Mechanics (7+5)= 12L

Elementary concepts of grad, divergence and curl. Potential energy function; $F = -\text{grad } V$, Equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, Curl of a force field; Central forces ; conservation of angular momentum; Energy equation and energy diagrams; elliptical, parabolic and hyperbolic orbit; Kepler Problem; Application : Satellite manoeuvres .

Non-inertial frames of reference; rotating coordinate system; five term acceleration formula- centripetal and coriolis accelerations; applications: Weather system, Foucault pendulum.

Module 2: Optics =(4 +3+ 5) = 12L

Oscillatory Motion:

Damped harmonic motion – Over damped, critically damped and lightly damped oscillators; Forced oscillation and resonance. Electrical equivalent of mechanical oscillator, Wave equation, plane wave solution.

Optics:

Elementary features of polarization of light waves. Double refraction, Production and analysis of linearly, elliptic and Circularly polarized light, Polaroid and application of polarizations.: Polarimeter.

Laser & Fiber Optics:

Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

Fiber optics - principle of operation, numerical aperture, acceptance angle, Single mode , graded indexed fiber.

Module 3: Electrostatics (8+4) = 12

L L Electrostatics in free space

Calculation of electric field and electrostatic potential for a charge distribution, Divergence and curl of electrostatic

field, Laplace's and Poisson's equation for electrostatic potential. Boundary conditions of electric field and electrostatic potential. Method of images , energy of a charge distribution and its expression in terms of electric field.

Electrostatics in a linear dielectric medium

Electrostatic field and potential of a dipole, Bound charges due to electric polarization, Electric displacement, Boundary conditions on displacement, Solving simple electrostatic problem in presence of dielectric – point charge at the centre of a dielectric sphere, charge in front of dielectric slab, Dielectric slab and dielectric sphere in uniform electric field.

Module 4: (6+3+3) = 12L

Magnetostatics :

Biot-Savart law, divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; equation for vector potential and it's solutions for given current densities.

Magneto statics in a linear magnetic medium:

Magnetization and associated bound currents; Auxiliary magnetic field H ; boundary conditions on B and H . Solving for magnetic field due to simple magnet like a bar magnet; Magnetic susceptibility; ferromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.

Faraday's Law:

Differential form of Faraday's law expressing curl of electric field in terms of time derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi static approximation. Energy stored in a magnetic field.

Course Title: Physics I Laboratory					
Course Code: PHYS1051					
Contact hrs per week:	L	T	P	Total	Credit Points
	0	0	3	3	1.5

Course Outcomes:

1. To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
2. To learn the usage of electrical and optical systems for various measurements.
3. Apply the analytical techniques and graphical analysis to the experimental data.
4. Understand measurement technology, usage of new instruments and real time applications in engineering studies.
5. To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

Minimum of six experiments taking at least one from each of the following four groups:

Group 1 : Experiments in General Properties of matter

1. Determination of Young's modulus by Flexure Method
2. Determination of bending moment and shear force of a rectangular beam of uniform cross- section.
3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method.
5. Determination of coefficient of viscosity by Poiseuille's capillary flow method.

Group 2: Experiments in Optics

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of light by Newton's ring method.
3. Determination of wavelength of light by Fresnel's biprism method.
4. Determination of the wavelength of a given laser source by diffraction method

Group 3: Electricity & Magnetism experiments

1. Determination of dielectric constant of a given dielectric material.
2. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of
3. logarithmic decrement with series resistance.
4. Determination of the thermo-electric power at a certain temperature of the given thermocouple.
5. Determination of specific charge (e/m) of electron.

Group 4: Quantum Physics Experiments

7. Determination of Planck's constant.
8. Determination of Stefan's radiation constant.
9. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
10. Determination of Rydberg constant by studying Hydrogen/ Helium spectrum.
11. Determination of Hall co-efficient of semiconductors.
12. Determination of band gap of semiconductors.
13. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.

Books of reference:

1. Optics – Eugene Hecht Pearson Education India Private Limited
2. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
3. Waves and Oscillations by N.K. Bajaj
4. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker , Wiley
5. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
6. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education
7. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
8. Optics, Ghatak, McGraw Hill Education India Private Limited
9. Refresher Course in B.Sc. Physics – Vol1 and Vol 2 – C.L.Arora

Course Title: Mathematics II					
Course Code: MATH1201					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcomes

1. MATH1201. 1. Demonstrate the knowledge of probabilistic approaches to solve wide range of engineering problem.
2. MATH1201. 2. Recognize probability distribution for discrete and continuous variables to quantify physical and engineering phenomenon.
3. MATH1201. 3. Develop numerical techniques to obtain approximate solutions to mathematical problems where analytical solutions are not possible to evaluate.
4. MATH1201. 4. Analyze certain physical problems that can be transformed in terms of graphs and trees and solving problems involving searching, sorting and such other algorithms.
5. MATH1201. 5. Apply techniques of Laplace Transform and its inverse in various advanced engineering problems.
6. MATH1201. 6. Interpret differential equations and reduce them to mere algebraic equations using Laplace Transform to solve easily.

The objective of this course is to familiarize the students with numerical techniques, integral transforms, graph theory and probability. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

Module-I Fundamentals of Probability [10L]

Random experiment, Sample space and events

Classical and Axiomatic definition of probability

Addition and Multiplication law of probability

Conditional probability

Bayes' Theorem

Random variables

General discussion on discrete and continuous distributions

Expectation and Variance

Examples of special distribution: Binomial and Normal Distribution

Module-II Numerical Methods [10L]

Solution of non-linear algebraic and transcendental equations: Bisection Method, Newton-Raphson Method, Regula-Falsi Method.

Solution of linear system of equations: Gauss elimination method, Gauss-Seidel Method, LU Factorization Method, Matrix Inversion Method.

Solution of Ordinary differential equations: Euler's and Modified Euler's Method, Runge-Kutta Method of

4th order.

Module-III Basic Graph Theory [10L]

Graphs: Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph

Walks, Paths, Circuits, Euler Graph, Cut sets and cut vertices

Matrix representation of a graph, Adjacency and incidence matrices of a graph

Graph isomorphism

Bipartite graph

Definition and properties of a tree

Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees

Algorithms: Dijkstra's Algorithm for shortest path problem, Determination of minimal spanning tree using DFS, BFS, Kruskal's and Prim's algorithms

Module-IV Laplace Transformation [10L]

Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations.

Introduction to integral transformation

Functions of exponential order, Definition and existence of Laplace Transform(LT) (statement of initial and final value theorem only)

LT of elementary functions, Properties of Laplace Transformations , Evaluation of sine , cosine and exponential integrals using LT

LT of periodic and step functions

Definition and properties of inverse LT

Convolution Theorem (statement only) and its application to the evaluation of inverse LT

Solution of linear ODEs with constant coefficients (initial value problem) using LT

Suggested Books:

1. Advanced Engineering Mathematics , E.Kreyszig, Wiley Publications
2. Introduction to Probability and Statistics for Engineers and Scientists, S.Ross, Elsevier
3. Introductory methods of Numerical Analysis, S.S. Sastry, PHI learning
4. Introduction to Graph Theory, D. B. West, Prentice-Hall of India
5. Engineering Mathematics, B.S. Grewal, S. Chand & Co.

Course Title: Programming for Problem Solving					
Course Code: CSEN1001					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course outcome:

1. CO 1: Understand and remember functions of the different parts of a computer.
2. CO 2: Understand and remember how a high-level language (C programming language, in this course) works, different stages a program goes through.
3. CO 3: Understand and remember syntax and semantics of a high-level language (C programming language, in this course).
4. CO 4: Understand how code can be optimized in high-level languages.
5. CO 5: Apply high-level language to automate the solution to a problem.
6. CO 6: Apply high-level language to implement different solutions for the same problem and analyze why one solution is better than the other.

Learning Objectives: Introduction to the concept of computer and computation and solving of problems using C as a programming language. Coverage of C will include basic concepts, arithmetic and logic, flow control, and data handling using arrays, structures, pointers and files.

Total load – 40 hours

Module I: [10L] Fundamentals of Computer

History of Computers, Generations of Computers, Classification of Computers.

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices. Basic Concepts of Assembly language, High level language, Compiler and Assembler.

Binary & Allied number systems (decimal, octal and hexadecimal) with signed and unsigned numbers (using 1's and 2's complement) - their representation, conversion and arithmetic operations. Packed and unpacked BCD system, ASCII. IEEE-754 floating point representation (half- 16 bit, full- 32 bit, double- 64 bit).

Basic concepts of operating systems like MS WINDOWS, LINUX How to write algorithms & draw flow charts.

Module II: [10L] Basic Concepts of C

C Fundamentals:

The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements. Operators & Expressions:

Arithmetic operators, relational and logical operators, type, conversion, increment and decrement operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Standard input and output, formatted output -- printf, formatted input scanf.

Flow of Control:

Statement and blocks, if-else, switch-case, loops (while, for, do-while), break and continue, go to and labels.

Module III: [10L]

Program Structures in C

Basic of functions, function prototypes, functions returning values, functions not returning values. Storage classes -

auto, external, static and register variables – comparison between them. Scope, longevity and visibility of variables. C preprocessor (macro, header files), command line arguments.

Arrays and Pointers:

One dimensional arrays, pointers and functions – call by value and call by reference, array of arrays. Dynamic memory usage– using malloc(), calloc(), free(), realloc(). Array pointer duality.

String and character arrays; C library string functions and their use.

Module IV: [10L]

Data Handling in C

User defined data types and files:

Basic of structures; structures and functions; arrays of structures.

Files – text files only, modes of operation. File related functions – fopen(), fclose(), fscanf(), fprintf(), fgets(), fputs(), fseek(), ftell();

Text Books

1. Schaum's outline of Programming with C – Byron Gottfried
2. Teach Yourself C- Herbert Schildt
3. Programming in ANSI C – E Balagurusamy

Reference Books

1. C: The Complete Reference – Herbert Schildt
2. The C Programming Language- D.M.Ritchie, B.W. Kernighan

Course Title: Programming for Problem Solving Lab					
Course Code: CSEN1051					
Contact hrs per week:	L	T	P	Tot al	Credit Points
	0	0	4	4	2

Course Outcomes:

After completion of this course the students should be able:

1. To write simple programs relating to arithmetic and logical problems.
2. To be able to interpret, understand and debug syntax errors reported by the compiler.
3. To implement conditional branching, iteration (loops) and recursion.
4. To decompose a problem into modules (functions) and amalgamating the modules to generate a complete program.
5. To use arrays, pointers and structures effectively in writing programs.
6. To be able to create, read from and write into simple text files.

Software to be used: GNU C Compiler (GCC) with LINUX NB: Cygwin (Windows based) may be used in place of LINUX

Topic 1: LINUX commands and LINUX based editors

Topic 2: Basic Problem Solving

Topic 3: Control Statements (if, if-else, if-elseif-else, switch-case)

Topic 4: Loops - Part I (for, while, do-while)

Topic 5: Loops - Part II

Topic 6: One Dimensional Array

Topic 7: Array of Arrays

Topic 8: Character Arrays/ Strings Topic

9: Basics of C Functions

Topic 10: Recursive Functions

Topic 11: Pointers

Topic 12: Structures

Topic 13: File Handling

Text Books

1. Schaum's outline of Programming with C – Byron Gottfried
2. Teach Yourself C- Herbert Schildt
3. Programming in ANSI C – E Balagurusamy

Course Title: Business English					
Course Code: HMTS1202					
Contact hrs per week:	L	T	P	Total	Credit Points
	2	0	0	2	2

Course Outcomes:

The learner will

1. Acquire competence in using English language to communicate.
2. Be aware of the four essential skills of language usage-listening, speaking, reading and writing.
3. Be adept at using various modes of written communication at work.
4. Attain the skills to face formal interview sessions.
5. Write reports according to various specifications.
6. Acquire the skill to express with brevity and clarity.

Module- I [6hrs.]

Grammar (Identifying Common Errors in Writing)

Subject-verb agreement

Noun-pronoun agreement

Misplaced Modifiers

Articles

Prepositions

Redundancies

Module- II [6hrs.]

Basic Writing Strategies Sentence Structures

Use of phrases and clauses in sentences

Creating coherence

Organizing principles –accuracy, clarity, brevity

Techniques for writing precisely

Different styles of writing: descriptive, narrative, expository

Importance of proper punctuation

Module- III (8hrs)

Business Communication- Scope & Importance

Writing Formal Business Letters: Form and Structure-Parts of a Business letter, Business Letter Formats, Style and Tone, Writing strategies.

Organizational Communication: Agenda & minutes of a meeting, Notice, Memo, Circular Organizing e-mail messages, E-mail etiquette

Job Application Letter: Responding to Advertisements and Forced Applications, Qualities of well-written

Application Letters: The You-Attitude, Length, Knowledge of Job Requirement, Reader-Benefit Information, Organization, Style, Mechanics – Letter Plan: Opening Section, Middle Section, Closing Section

Resume and CV: Difference, Content of the Resume – Formulating Career Plans: Self Analysis, Career Analysis, Job Analysis, Matching Personal Needs with Job Profile – Planning your Resume – Structuring the Resume: Chronological Resume, The Functional Resume, Combination of Chronological and Functional Resume, Content of the Resume: Heading, Career Goal or Objectives, Education, Work Experience, Summary of Job Skills/Key Qualifications, Activities, Honors and Achievements, Personal Profile, Special Interests, References

Module- IV [6hrs]

Writing skills

Comprehension: Identifying the central idea, inferring the lexical and contextual meaning, comprehension passage - practice

Paragraph Writing: Structure of a paragraph, Construction of a paragraph, Features of a paragraph, Writing techniques/developing a paragraph.

Précis: The Art of Condensation-some working principles and strategies. Practice sessions of writing précis of given passages.

Essay Writing: Characteristic features of an Essay, Stages in Essay writing, Components comprising an Essay, Types of Essays-Argumentative Essay, Analytical Essay, Descriptive Essays, Expository Essays, Reflective Essays

References:

1. Theories of Communication: A Short Introduction, Armand Matterlart and Michele Matterlart, Sage Publications Ltd.
2. Professional Writing Skills, Chan, Janis Fisher and Diane Lutovich. San Anselmo, CA: Advanced Communication Designs.
3. Hauppauge, Geffner, Andrew P. Business English, New York: Barron's Educational Series.
4. Kalia, S. & Agarwal, S. Business Communication, Wiley India Pvt. Ltd., New Delhi, 2015
5. Mukherjee, H.S., Business Communication- Connecting at work., , Oxford University Press.2nd Edition.2015
6. Raman, M. and Sharma, S., Technical Communication: Principles and Practice, 2nd Ed., 2011.

Course Title: Language Laboratory					
Course Code: HMTS1252					
Contact hrs per week:	L 3	T 1	P 0	Total 4	Credit Points 4

Course Outcomes:

The learner will

1. Acquire the techniques to become an effective listener.
2. Acquire the skill to become an effortless speaker.
3. Organize and present information for specific audience.
4. Communicate to make a positive impact in professional and personal environment.
5. Engage in research and prepare authentic, formal, official documents.
6. Acquire reading skills for specific purpose.

Module- I (4hrs)

Listening Skills

1. Principles of Listening: Characteristics, Stages.
2. Types of Listening: Passive listening, Marginal or superficial listening, Projective Listening, Sensitive or Empathetic Listening, Active or Attentive listening.
3. Guidelines for Effective Listening
4. Barriers to Effective Listening
5. Listening Comprehension

Module- II [8hrs]

Interviewing

1. Types of Interviews, Format for Job Interviews: One-to-one and Panel Interviews, Telephonic Interviews, Interview through video conferencing.
2. Interview Preparation Techniques, Frequently Asked Questions, Answering Strategies, Dress Code, Etiquette, Questions for the Interviewer, Simulated Interviews.

Module- III [6hrs]

1. Public Speaking: The Speech Process: The Message, The Audience, The Speech Style, Encoding, Feedback.
2. Characteristics of a good speech : content and delivery, structure of a speech
3. Modes of delivery in public speaking: Impromptu, Extemporaneous, Prepared or Memorized, Manuscript.
4. Conversation: Types of conversation: formal and informal, Strategies for effective conversation, Improving fluency.
5. Situational conversation practice: Greetings and making introductions, Asking for information and giving instructions, agreeing and disagreeing.
6. Conversational skills in the business scenario: One-to-one and Group communication, Gender and Culture

7. Sensitivity, Etiquette, Sample Business Conversation, Telephonic Conversation

Module- IV [8hrs]

Presentation Skills

1. Speaking from a Manuscript, Speaking from Memory, Impromptu Delivery, Extemporaneous Delivery, Analyzing the Audience, Nonverbal Dimensions of Presentation
2. Organizing the Presentation: The Message Statement, Organizing the Presentation: Organizing the Speech to Inform, The Conclusion, Supporting Your Ideas – Visual Aids: Designing and Presenting Visual Aids, Selecting the Right Medium.
3. Project Team/Group Presentations

References:

1. Carter, R. And Nunan, D. (Eds), The Cambridge guide to Teaching English to Speakers of Other Languages, CUP, 2001
2. Edward P. Bailey, Writing and Speaking At Work: A Practical Guide for Business Communication, Prentice
3. Hall, 3rd Ed., 2004
4. Munter, M., Guide to Managerial Communication: Effective Business Writing and Speaking, Prentice Hall, 5th Ed., 1999
5. Sen, S., Mahendra, A. & Patnaik, P., Communication and Language Skills, Cambridge University Press, 2015
6. Locker, Kitty O. Business and Administrative Communication McGraw-Hill/ Irwin.
7. Chaney, L. and Martin, J., Intercultural Business Communication. Prentice Hall

Course Title : Workshop /Manufacturing Practices					
Course Code : MECH1051					
Contact Hours per week	L	T	P	Total	Credit Points
	1	0	4	5	3

Course Outcomes:

Upon completion of this course

1. The students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. The students will be able to fabricate components with their own hands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.
5. The students will be able to describe different components and processes of machine tools.
6. The students will be able to apply the knowledge of welding technology and they can perform arc and gas welding to join the material.

(i) Lectures & videos: (13 hours) detailed contents

1. Introduction on Workshop and Safety Precautions. (1 lecture)
2. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing
3. methods (3 lectures)
4. CNC machining, Additive manufacturing (1 lecture)
5. Fitting operations & power tools (1 lecture)
6. Electrical & Electronics (1 lecture)
7. Carpentry (1 lecture)
8. Plastic moulding, glass cutting (1 lecture)
9. Metal casting (1 lecture)
10. Welding (arc welding & gas welding), brazing (2 lecture)
11. Viva-voce (1 lecture)

(ii) Workshop Practice :(52 hours)[L : 0; T:0 ; P : 4 (2 credits)]

1. Machine shop (12 hours)
2. Fitting shop (8 hours)
3. Carpentry (4 hours)
4. Electrical & Electronics (4 hours)
5. Welding shop (Arc welding 4 hrs + gas welding 4 hrs) (8 hours)

6. Casting (4 hours)
7. Smithy (4 hours)
8. Plastic moulding& Glass Cutting (4 hours)
9. Sheet metal Shop (4 hours)

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Suggested Text/Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,”Manufacturing Technology – I” Pearson Education, 2008.
4. Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.
5. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course Title : Basic Electronics					
Course Code : ECEN1011					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After going through this course, the students will be able to

1. Categorize different semiconductor materials based on their energy bands and analyze the characteristics of those materials for different doping concentrations based on previous knowledge on semiconductors acquired.
2. Describe energy band of P-N Junction devices and solve problems related to P-N Junction Diode both from device and circuit perspectives.
3. Design different application specific circuits associated with diodes operating both in forward and reverse bias.
4. Analyze various biasing configurations of Bipolar Junction Transistor and categorize different biasing circuits based on stability.
5. Categorize different field-effect transistors based on their constructions, physics and working principles and solve problems associated with analog circuits based on operational amplifiers.
6. Design and implement various practical purpose electronic circuits and systems meant for both special purpose and general purpose and analyze their performance depending on the type of required output and subsequently the applied input.

Module I [10 L]

Basic Semiconductor Physics:

Crystalline materials, Energy band theory, Conductors, Semiconductors and Insulators, Concept of Fermi Energy level, intrinsic and extrinsic semiconductors, drift and diffusion currents in semiconductor

Diodes and Diode Circuits:

Formation of p-n junction, Energy Band diagram, forward & reverse biased configurations, V-I characteristics, load line, breakdown mechanisms, Zener Diode and its Application.

Rectifier circuits: half wave & full wave rectifiers: ripple factor, rectification efficiency.

Module II [8 L]

Bipolar Junction Transistors (BJT):

PNP & NPN BJT structures, current components in BJT, CE, CB, CC configurations, V-I Characteristics of CB & CE modes, regions of operation, Base width modulation & Early effect, thermal runaway, Concept of Biasing: DC load line, Q-point, basics of BJT amplifier operation, current amplification factors, different biasing circuits: fixed bias, collector to base bias, voltage divider bias.

Module III [9 L]

Field Effect Transistors (FET):

N-channel Junction Field Effect Transistor (JFET) structure & V-I characteristics.

Metal Oxide Semiconductor Field Effect Transistor (MOSFET): enhancement & depletion type MOSFETs (for both n & p channel devices), drain & transfer characteristics.

MOSFET as a digital switch, CMOS inverter, voltage transfer characteristic (VTC), NAND & NOR gate realization using CMOS logic.

Moore's Law, evolution of process node, state of integration (SSI, MSI, LSI, VLSI, ULSI), Classification of Integrated circuits (IC) and their applications.

Module IV [9 L]

Feedback in amplifiers:

Concept of feedback, advantages of negative feedback (qualitative), Barkhausen criteria.

Operational Amplifier:

Ideal OPAMP characteristics, OPAMP circuits: inverting and non-inverting amplifiers, Adder, Subtractor, Integrator, Differentiator, Basic Comparator.

Special Semiconductor Devices:

Light Emitting Diode (LED), Silicon Controlled Rectifier (SCR), Photodiode: Operations, characteristics & applications.

References:

1. Boylestad & Nashelsky: Electronic Devices & Circuit Theory
2. R.A Gayakwad: Op Amps and Linear IC's, PHI
3. D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
4. Adel S. Sedra, Kenneth Carless Smith: Microelectronics Engineering
5. Millman & Halkias: Integrated Electronics.
6. Salivahanan: Electronics Devices & Circuits.
7. Albert Paul Malvino: Electronic Principle.

Course Title : Basic Electronics Laboratory					
Course Code : ECEN1061					
Contact Hours per week	L	T	P	Total	Credit Points
	0	0	2	2	1

Course Outcomes:

1. The students will correlate theory with diode behavior.
2. They will design and check rectifier operation with regulation etc.
3. Students will design different modes with BJT and FET and check the operations.
4. They will design and study adder, integrator etc. with OP-AMPs.

List of Experiments

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multi-meters etc.
2. Familiarization with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs in CB mode
7. Study of I-V characteristics of BJTs in CE mode
8. Study of I-V characteristics of Field Effect Transistors.
9. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
10. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
11. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.