DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Scheme of Instruction

and

Syllabus of

B.E. (ELECTRONICS AND COMMUNICATION ENGINEERING)

(I & II SEMESTER)

2022-23

UNIVERSITY COLLEGE OF ENGINEERING
(Autonomous)
Osmania University
Hyderabad – 500 007, TS, INDIA

INSTITUTION

Vision

The Vision of the institute is to generate and disseminate knowledge through harmonious blending of science, engineering and technology. To serve the society by developing a modern technology in students heightened intellectual, cultural, ethical and humane sensitivities, fostering a scientific temper and promoting professional and technological expertise.

Mission

- To achieve excellence in Teaching and Research
- To generate, disseminate and preserve knowledge
- To enable empowerment through knowledge and information
- Advancement of knowledge in Engineering, Science and Technology
- Promote learning in free thinking and innovative environment
- Cultivate skills, attitudes to promote knowledge creation
- Rendering socially relevant technical services to the community
- To impart new skills of technology development
- To inculcate entrepreneurial talents and technology appreciation programmes
- Technology transfer and incubation

DEPARTMENT

Vision

- To be in the forefront of advances in Electronics and Communication Engineering education and research to guide and motivate young engineers to face future technological challenges.

Mission

- To inculcate analysis and design for innovative problems in the field of Electronics and Communication Engineering with the help of state of art curricula.
- To impart practical training to face real life case studies and inter-disciplinary simple solutions to complex problems.
- To make engineering education an enjoyable learning experience through challenging tutorials, mini-projects, assignments and laboratory exercises.
- To build project team spirit for professional working environment with high ethical values
- To develop overall character that will care for the society and concerned for the nation through extra-curricular activities.

Programme Educational Objectives (PEO):

PEO1: To educate students with analytical and design skills in Electronics and Communication Engineering applicable to Industries, R&D labs and Institutions involving Space Communications and Defense Electronics etc.

PEO2: To strengthen the basic knowledge in mathematical science and applied science with orientation in engineering applications.

PEO3: To develop overall personality and character with team spirit, professionalism, integrity, moral and ethical values with the support of humanities, social sciences and physical educational courses.

PEO4: To equip the students with laboratory training leading to solving real life practical Problems and project analysis of Electronics and Communication Engineering through case-studies, seminars, Mini projects, internships and main projects.

PROGRAM OUTCOMES (POs)

POs	Engineering Graduates will be able to:
PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.
	PROGRAM SPECIFIC OUTCOMES (PSOs)
PSO1	**Analytical Skill:** Ability to plan, execute, manage and rehabilitate Electronics and Communication Engineering systems and processes
PSO2	**Entrepreneurial Skill:** Ability to become independent designers, consultant and entrepreneurs in the field of ECE.

SCHEME OF INSTRUCTION AND EXAMINATION
B. E. -ECE

I – Semester

SNo	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1		Induction Program	3 weeks							
2	BS 901 MT	Engineering Mathematics-I (BS)	3	0	-		3	40	60	3
3	BS 201 PH	Applied Physics (BS)	3	0	-		3	40	60	3
4	ES 201 CS	Programming for Problem Solving (ES)	3	0	-		3	40	60	3
5	ES 101 EE	Basic Electrical Engineering (ES)	3	0	-		3	40	60	3
6	PC 101 EC	Applied Python Programming (PC)	3	0	-		3	40	60	3
Practicals										
7	BS 251 PH	Applied Physics Lab (BS)	-	-	3		3	25	50	1.5
8	ES 251 CS	Programming for Problem Solving Lab (ES)	-	-	2		3	25	50	1
9	ES 151 EE	Basic Electrical Engineering Lab (ES)	-	-	2		3	25	50	1
		Total	**15**	**0**	**07**			**275**	**450**	**18.5**

SCHEME OF INSTRUCTION AND EVALUATION
B.E. (ECE)
SEMESTER – I

BS 901 MT	ENGINEERING MATHEMATICS-I					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To introduce the concept of functions
2	To introduce the concept of the trigonometric functions
3	To introduction the theory of equations
4	To introduce Partial Fractions
5	To study co-ordinate geometry and vectors

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Sketch the graph of given curves
CO-2	Know and apply identities involving the trigonometric functions
CO-3	To know when algebraic equation has an algebraic solution
CO-4	Partial fractions used to decompose rational expressions into simpler partial fractions
CO-5	Apply techniques from multivariable analysis to set up and solve mathematical models

Course outcome	**Program Outcome**					
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
CO-1						
CO-2						
CO-3						
CO-4						
CO-5						

Unit – I: Functions
Definition of set, domain, co-domain, range of function. Types of functions, some standard functions and their properties, graphical representation, [polynomial function, modulus function, signum function, Greatest integer functions, fractional past function, exponential, logarithmic, trigonometric function] With example problems, odd and even functions.

Unit - II: Trigonometry
Trigonometric ratios with their graphical representation,compound angles, multiple and sub multiple angles, transformations, periodicity, inverse trigonometricfunction's hyperbolic function with some example problems.

Unit – III: Theory of equations
Definition of roots/zeros of polynomial equations, relation between the roots and coefficients. Problems on quotients and remainders division algorithms formation of polynomial when roots are given transformation of equation. Some standard method to find the roots of equation.

Unit – IV: Partial Fractions
Partial fractions of rational functions, decomposition of partial fractions, partial fractions of improper functions, Optional Binomial theory.

Unit – V: Co-Ordinate Geometry and Vectors
Cartesian co-ordinate system, quadrants/octants, locus, distance between two points, section formal in two three-dimensional space. Definition of vector and scalar, types of vectors, additions, difference, dot or scalar product, cross product of vectors/vector product, and their properties, linear combination of vectors, linearly independent and dependent vectors angle between two vectors.

Suggested Reading:

1	H.K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", S.Chand.
2	B.S.Grewal , "Higher Engineering Mathematics", 44th edition, Khanna Publishers
3	B.V.Ramana, "Higher Engineering Mathematics", Mc Graw Hills Education.
4	Shanti Narayan, "Vector Calculus", S.Chand Publisher.
5	Joseph Edwards, "Differential Calculus For Beginners", Arihant publishers.

BS 202 PH	Applied Physics					
(Basic Science)						
Pre-requisites			L	T	P	C
			3	-	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	understand the basic concepts of Waves, Oscillations and Acoustics.
2	understand the different types Magnetic materials and Dielectric materials with their origin of evolution.
3	understand the formation of energy bands and classification of the solids based on the band theory. To understand the concept of semiconductors, ultrasonic and its wide applications.
4	understand implications of basic laws of electricity and magnetism to know the significance of techniques of Modern Optics.
5	sensitize towards nanomaterial and appraise the various characterization techniques.

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	enrich and understand concepts and real time applications of waves, acoustics and ultrasonic properties.
CO-2	apply the dielectric properties, magnetic properties, semiconducting properties of materials.
CO-3	analyze basics laws of electricity, magnetism and concepts of modern optics.
CO-4	evaluate the different material characterization techniques.
CO-5	appreciate significance of nanomaterials and create desired properties by using various methods of synthesis processes.

Course outcome	Program Outcome											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3		2		2	1						
CO-2	3	3	1	1	3	1						
CO-3	3	2	1	1	2	2						
CO-4	3		3	1	2	1	1					
CO-5	3	2	1	2	3	3						

Unit – I
Oscillations in Physical Systems: Simple harmonic oscillations – Damped harmonic oscillator – Heavy, critical and light damping – Energy decay in a damped harmonic oscillator – Quality factor – Forced oscillators – Resonance – forced oscillator and LCR circuit analogy.
Acoustics: Classification of sounds- Sound intensity level, Reverberation, Reverberation time- - Absorption coefficient – Sabine's formula for reverberation time – Factors effecting Acoustics of building and their remedies.

Unit – II
Dielectric Materials: Dielectrics - Types of polarizations – Electronic, Ionic, Orientational and Space charge polarizations – Expression for Electronic polarizability - Frequency and temperature dependence of dielectric polarizations - Determination of dielectric constant by capacitance Bridge method - Ferro electricity - Barium Titanate - Applications of Ferroelectrics.
Magnetic Materials: Origin of magnetism (Orbital and Spin magnetic moments) - Classification of magnetic materials: dia, para, ferro, antiferro and ferrimagnetic materials – Weiss molecular field theory of ferromagnetism - Magnetic domains - Hysteresis curve - Soft and hard magnetic materials – Ferrites: Applications of ferrites.

Unit – III
Semiconductor Physics: Classification of materials based on band theory. Kronig-Penney model (qualitative treatment) - Energy band formation in solids - Intrinsic and Extrinsic semiconductors - Concept of a hole - Carrier concentration and conductivity in intrinsic semiconductors – Formation of P-N junction diode, Zener diode, Light Emitting Diode and their I-V characteristics – Thermistor and its characteristics - Hall effect and its applications.
Ultrasonics: Introduction to Ultrasonic waves - Properties of Ultrasonics - Production of ultrasonic waves by converse Piezoelectric method – Detection of ultrasonic waves - Piezoelectric detector – – Wavelength of Ultrasonics by Debye-Sears method (Liquid grating) – Applications.

Unit – IV
Electromagnetic theory: Basic laws of electricity and magnetism - Maxwell's equations in integral and differential forms - Conduction and displacement current – Relation between Displacement current (**D),** Electric Intensity (**E)** and Polarization (**P)** - Electromagnetic waves: Equation of plane wave in free space – Poynting theorem.
Modern Optics: Interference – Newton's Rings by reflected light – Experimental arrangement – Types of diffraction – diffraction grating (Conditions of maxima and minima) – Resolving power of grating –Types of polarized light – Polarization by reflection – Malus law – Double refraction – Nicol's Prism. – Optical activity and polarimeter.

Unit – V
Nanomaterials: Introduction - Properties of materials at reduced size - Surface to volume ratio – Quantum confinement effect – Classification of nanomaterials - Preparation of nanomaterials: bottom–up methods (e.g., Sol Gel method and Chemical Vapor Diposition method), Top-down methods (e.g., Ball milling method) - Basic ideas of carbon nanotubes – Applications of nanomaterials and their health hazards.
Techniques for Characterization: Morphological studies of materials – X-ray Diffraction(XRD), Scanning Electron Microscopy (SEM). Spectroscopic studies of materials – Fourier Transform Infrared (FTIR), Beer's law, UV-Visible and Raman spectroscopy.

Suggested Reading:

1	M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand & Co.
2	C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International.
3	R.K. Gour and S.L. Gupta – Engg. Physics, Dhanpat Rai Publications.
4	B.K. Pandey and S.Chaturvedi – Engineering Physics, Cengage Learning.
5	A.K Bhandhopadhya - Nano Materials, New Age International.
6	S.K. Sharma, et al., Hand book of Material Characterization – Springer.

ES 201 CS	PROGRAMMING FOR PROBLEM SOLVING					
	(Engineering Science)					
Pre-requisites			L	T	P	C
			3	-	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To introduce the basic concepts of Computing environment, number systems and flowcharts
2	To familiarize the basic constructs of C language – data types , operators and expressions
3	To learn the usage of structured data types and memory management using pointers
4	To learn the usage of structured data types and memory management using pointers
5	To learn the concepts of data handling using files

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Explain various functional components in computing environment
CO-2	Develop algorithmic solutions to problems and draw the flow charts
CO-3	Explain and use basic constructs of C in writing simple programs
CO-4	Use standard library functions in C and develop modular programs using user defined functions and structured data types
Unit – I	
Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. Number Systems: Binary, Octal, Decimal, Hexadecimal. Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.	

Unit – II
Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, IfElse, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Goto statements Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. Recursion- Recursive Functions. Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

Unit – III
Preprocessors: Preprocessor Commands Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, TwoDimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

Unit – IV
Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L -value and R-value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments. Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

Unit – IV
Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self-Referential Structures, Unions, Type Definition (typedef), Enumerated Types. Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Reading:

1	B.A. Forouzan and R.F. Gilberg, “A Structured Programming Approach in C” , Cengage Learning, 2007
2	Kernighan BW and Ritchie DM, “The C Programming Language”, 2nd Edition, Prentice Hall of India, 2006.
3	Rajaraman V, “The Fundamentals of Computer”, 4th Edition, Prentice-Hall of India, 2006
4	Dromey “ How to Solve it By Computer , Pearson education, 2006

ES 101 EE	BASIC ELECTRICAL ENGINEERING					
(Engineering Science)						
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:

1	To understand the fundamentals of DC and AC electrical circuits.
2	To understand the working principles of DC motor, DC generator, Transformers and single-phase induction motors.
3	To understand working principles of protection devices used in electrical circuits.

Course Outcomes:

The student will be able to:

1.	Analyze the performance of simple electrical circuits exciting with Dc and AC excitations.
2.	Apply different theorems to solve complicated electrical circuits to obtain the current, voltageand power.
3.	Understand the main components, Characteristics, applications of different DC and AC electrical machines used in industry.
4.	Understand the importance of protective devices and their rating used in electrical circuits.

UNIT-I DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoffcurrent and voltage laws, analysis of simple circuits with dc excitation.

Superposition, Thevenin and Norton Theorems.

UNIT-II AC 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, and RL, RC, RLC combinations (series only). Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III Transformers and 3-ph Induction Motors

Transformers: Electromagnetic induction, Faradays laws, statically induced emf, Lenz law, BH characteristics, ideal and practical transformer, losses and efficiency, Auto-transformer and three-phase transformer connections.

Three Phase Induction motor: Generation of rotating magnetic fields, Construction and workingof a three- phase induction motor, squirrel cage IM, slip-ring IM, Applications

UNIT-IV Single-phase induction motor & DC Machines

Single-phase induction motor: Construction and principle of operation, Capacitor start &capacitor run motor, applications

DC Generators: Dynamically induced emf, Flemming's Right hand and Left hand rules, Construction and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications

DC Motors: principle of operation of DC Motor, Types of DC motors, applications

UNIT-V: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristicsfor Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Reading:

1	J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2002.
2	J.B.Gupta, "Utilization of Electric Power and Electric Traction" S.K.Kataria & Sons Publications,2010
3	Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, " Basic Elactrical Engineering" Tata
4	Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc.,1995.

PC 101 EC	APPLIED PYTHON PROGRAMMING					
Pre-requisites	-		**L**	**T**	**P**	**C**
			3	**-**	**-**	**3**
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	Acquire programming skills in core Python.
2	Acquire Object-oriented programming skills in Python.
3	Develop the skill of designing graphical-user interfaces (GUI) in Python.
4	Develop the ability to write database applications in Python.
5	Acquire Python programming skills to work into various Specializations such as Data Science, Machine Learning, Artificial Intelligence etc.

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Develop Python programs with conditional statements and loops.
CO-2	Write programs using functions, strings and lists
CO-3	Construct Python data structures programs using tuples, dictionaries
CO-4	Write programs using files, OOPS concept, regular expressions
CO-5	To perform transactions using database

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										2
CO2		2	3		2							2
CO3				3	2							2
CO4			2		2							2
CO5			2		2							2

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

UNIT–I
INTRODUCTION TO PYTHON: Introduction to Python: Features of Python, History and Future of Python, Working with Python – interactive and script mode, Identifiers and Keywords, Comments, Indentation and Multi-lining, Data types – built-in data types, Operators and Expressions, Console Input/Output, Formatted printing, Built-in Functions, Library Functions.

UNIT–II
DECISION CONTROL STATEMENTS: Selection/Conditional Branching Statements: if, if-else, nested if, if-elif-else statement(s), Basic Loop Structures/ Iterative Statements – while and for loop, Nested loops, break and continue statement, pass Statement, else Statement used with loops.

UNIT–III
CONTAINER DATA TYPES: Lists: Accessing List elements, List operations, List methods, List comprehension; Tuples: Accessing Tuple elements, Tuple operations, Tuple methods, Tuple comprehension, Conversion of List comprehension to Tuple, Iterators and Iterables, zip() function. Sets: Accessing Set elements, Set operations, Set functions, Set comprehension; Dictionaries: Accessing Dictionary elements, Dictionary operations, Dictionary Functions, Nested Dictionary, Dictionary comprehension.

UNIT-IV
STRINGS AND FUNCTIONS: Strings: Accessing String elements, String properties, String operations. Functions: Communicating with functions, Variable Scope and lifetime, return statement, Types of arguments, Lambda functions, Recursive functions.

UNIT – V
CLASSES AND OBJECTS: Classes and Objects – Defining Classes, Creating Objects, Data Abstraction and Hiding through Classes, Class Method and self Argument, Class variables and Object variables, __init()__ and __del__() method, Public and private data members, Built-in Class Attributes, Garbage Collection. OOPs Features: Abstraction, Encapsulation, Inheritance, and Polymorphism.

SUGGESTED READING:

1	Reema Thareja, “Python Programming - Using Problem Solving Approach”, Oxford Press, 1st Edition, 2017.
2	Dusty Philips, “Python 3 Object Oriented Programming”, PACKT Publishing, 2nd Edition, 2015.
3	Yashavant Kanetkar, Aditya Kanetkar, “Let Us Python”, BPB Publications, 2nd Edition, 2019.
4	Martin C. Brown, “Python: The Complete Reference”, Mc. Graw Hill, Indian Edition, 2018.
5	R Nageswar Rao, “Core Python Programming”, Dreamtech Press, 2018.

BS 252 PH	Applied Physics Lab					
	(Basic Science)					
Pre-requisites			L	T	P	C
			-	-	3	1.5
Evaluation	SEE	50 Marks	CIE		25 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	Demonstrate an ability to make physical measurements and understand the limits of precision in measurements.
2	Demonstrate the ability to use experimental statistics to determine the precision of a series of measurements.
3	Demonstrate the ability to understand optical / Semiconducting / dielectric properties of materials.
4	Demonstrate the ability to understand the construction and working of different experiments.

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	recognize the transformation concepts into practicals. .
CO-2	use a best fit to create a graph from a series of data points. Students can extrapolate and interpolate.
CO-3	appreciate the mathematical abilities to meaningful physical conclusions.
CO-4	develop skills to impart practical knowledge in real time solution and learn to design new instruments with practical knowledge.
CO-5	understand the link between theory and practicals.

Course outcome	Program Outcome											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	3										
CO-2	3	3	1									
CO-3	3	3	3									
CO-4	3	3	2	1	3	1						
CO-5	3	1										

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

Experiment - I
To determine the Dielectric constant and Phase transition temperature of Lead Zirconium Titanate (PZT).

Experiment - II
Determination of Velocity of ultrasonic waves in a given liquid by Debye-Sears method.

Experiment - III
To draw the I-V Characteristics of P-N Junction diode and to evaluate the value of potential barrier of the diode.

Experiment - IV
To find the values of Electrical conductivity and energy gap of Ge crystal by Four probe method.

Experiment - V
Determination of rigidity of modulus of Torsion pendulum.

Experiment - VI
To study V-I characteristics of Light Emitting Diode.
Experiment - VII
Determination of carrier concentration, Mobility and Hall Coefficient of Ge Crystal using Hall Effect Experiment.

Experiment - VIII
Verification of Beer's law.

Experiment - IX
To Estimate Radius of curvature of given lens by forming Newton's rings.

Experiment – X
To determine resolving power of plane grating.

Experiment - XI
To determine the constants of A, B and α of given Thermistor.

Experiment - XII
To determine specific rotatory power of a given solution by using Laurent's Half shade polarimeter.

ES251CS

PROGRAMMING FOR PROBLEM SOLVING LABORATORY

Instruction	2 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1

Course Objectives:

- To use tools available under LINUX for C programming
- To gain hands-on experience on basic constructs of C programming
- To formulate problems and implement algorithmic solutions in C
- To write modular programs in C using structure programming techniques and data files.

Course Outcomes:

Student will be able to :

1. Write, compile and debug C programs in Linux environment
2. Write simple programs using control structures, user defined functions and data manipulation using arrays
3. Use standard C library functions to develop modular programs in C

1. Introducing to programming Environment(Linux commands, editing tools such as vi editor, sample program entry, compilation and execution)
2. Write programs using arithmetic, logical, bitwise and ternary operators.
3. Write programs simple control statements : Roots of a Quadratic Equation, extracting digits of integers, reversing digits ,finding sum of digit ,printing multiplication tables, Armstrongnumbers, checking for prime, magic number,
4. Sin x and Cos x values using series expansion
5. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
6. Generating a Pascal triangle and Pyramid of numbers
7. Recursion: Factorial, Fibonacci, GCD
8. Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
9. Reversing an array ,removal of duplicates from array
10. Matrix addition , multiplication and transpose of a square matrix .using functions
11. Bubble Sort, Selection Sort ,
12. Programs on Linear Search and Binary Search using recursion and iteration
13. Functions of string manipulation**:** inputting and outputting string , using string functions such as strlen( ),strcat( ),strcpy( )……etc
14. Writing simple programs for strings without using string functions.

15. Finding the No. of characters, words and lines of given text file
16. File handling programs : student memo printing
17. Create linked list, traverse a linked list, insert a node, delete a node, reversing list .

ES 151 EE

BASIC ELECTRICAL ENGINEERING LABORATORY

Instruction	2 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1

Course Outcomes:

The student will be able to

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.
5. Get an exposure to the working of power electronic converters.

1st cycle Experiments

Dem 1. Basic safety and precautions - Introduction and use of measuring instruments
Exp 1. Verification of Kirchhoff's Laws

Exp 2. Verification of Thevenin's & Norton's Theorem

Exp 3. Steady- state and transient time-response of R-C circuit to a step change in voltage.

Exp 4. Sinusoidal steady state response of R-L and R-L-C circuits- impedance calculation and verification
Exp 5. Measurement of three-phase power in balanced three-phasecircuits usingTwo-Wattmeter method

2nd Cycle Experiments

Dem 2. Demonstration of cut-out sections of machines: DC machine, induction machine,

synchronous machine and single-phase machine

Exp 6. Load test on single phase transformer: measurement of primary and secondaryvoltages, currents and power

Exp 7. Three-phase Transformer: Star and Delta connections. Voltage and current relationship

Exp 8. Torque speed characteristics of separately excited DC motor

Exp 9. Synchronous speed of two- pole and four-pole, three-phase induction motor. Speed reversal

by change of phase-sequence

Exp 10. Magnetization curve of a separately excited DC Generator

Suggested Reading:

1. J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & SonsPublications, 2002.
2. J.B.Gupta, "Utilization of Electric Power and Electric Traction" S.K.Kataria & SonsPublications, 2010
3. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, " Basic Elactrical Engineering" Tata
4. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc.,1995.

SCHEME OF INSTRUCTION AND EXAMINATION
B. E. (ECE)
II – Semester

SNo	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	BS 902 MT	Engineering Mathematics-II (HS)	3	0	-		3	40	60	3
2	BS 101 CH	Engineering Chemistry (HS)	3	0	-		3	40	60	3
3	HS 101 EG	Communicative English (HS)	3	0	-		3	40	60	3
4	PC 201 EC	Electronic Devices (PC)	3	0	-		3	40	60	3
Practicals										
5	BS 151 CH	Engineering Chemistry Lab (HS)	-	-	3		3	25	50	1.5
6	HS 151 EG	Communicative English Lab (HS)	-	-	2		3	25	50	1
7	ES 151 CE	Engineering Graphics (ES)	2	-	4		3	25	50	4
8	ES 151 ME	Workshop (ES)	-	-	4		3	25	50	2
		Total	**14**	**0**	**13**			**260**	**440**	**20.5**

SEMESTER-II

BS 902 MT	ENGINEERING MATHEMATICS – II					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To study matrix algebra
2	To study about the complex numbers
3	To study about differentiation and integration
4	To introduce ordinary differential equations

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Solve systems of linear equations using multiple methods
CO-2	Recognize a unique complex number x+iy associated with the point p(x,y) in the argand plane and vice-versa
CO-3	To find maxima and minimum possible values of any function
CO-4	Solve certain first order ordinary differential equations

Course outcome	**Program Outcomes**					
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
CO-1						
CO-2						
CO-3						
CO-4						
CO-5						

Unit – I Matrices

Introduction of matrix theory, order matrix, types of matrices, [Row, Column, singleton, zero, Rectangular, square, Triangular, Diagonal, Scalar, identity matrices] definitions with example. Addition, difference, multiplication of matrices with example problems, determinant, trace, inverse of matrix, definition of special type matrices [symmetry, skew symmetry, hermitian, skew hermitian, idempotent, unitary, orthogonal] with example Applications: solution of linear equations, by matrix inverse method, Cramer's rule

Unit - II Complex numbers

Introduction of complex numbers, addition, difference, multiplication and division of complex numbers, conjugate modulus of complex numbers, principal argument of complex number, Argand plane and polar representation, Demoivre's theorem, n^{th} roots of unity.

Unit – III Differential Calculus
Definition of intervals, and neighborhoods, concept of limits, left and right-hand limits, existence of limit, indeterminate forms, standard limits, definition of continuity with examples and discontinuity, Geometrical Meaning of derivative of the addition, difference, product and division of two functions.

Unit – IV Integration
Definition standard integrals, integration by the method of substitution, integration by parts, integration of sum and difference, multiplication of two functions, geometrical interpretation of definite integration, general properties of definite integral, integration of even odd functions, integration of form of f (a-x) ,f(a+b-x), Leibnitz formula.

Unit – V Applications of differentiation, integration and Differential equations
Applications in differentiation: errors and approximations, increasing and decreasing functions, derivatives of a rate of change, maxima and minima, (single variable function) Application in integration: the area bounded by two curves, (standard curves) Differential equation: order and degree of a differential equation, formation of differential equation, various methods to find general solutions of first order and first degree differential equation [variable separable, homogeneous, non– homogeneous and Linear DE]

Suggested Reading:

1	H.K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand.
2	B.S.Grewal , "Higher Engineering Mathematics", 44th edition, Khanna Publishers.
3	B.V.Ramana, "Higher Engineering Mathematics", Mc Graw Hills Education.
4	A.R.Vasistha, "Matrices", Krishna Prakashan Media(p)Ltd.
5	Joseph Edwards, "Differential Calculus For Beginners", Arihant publishers.
6	N.P.Bali ,Manish Goyal, "A Text Book Of Engineering Mathematics", Laxmi Publications(p) Ltd.

BS 101 CH	ENGINEERING CHEMISTRY					
Pre-requisites	-		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To study the various types of conductance, electrodes & cells
2	To study the classification, journal properties and importance of Carbohydrates, Amino acids & Proteins
3	To acquire the knowledge in organic reactions and commonly used drugs.

Course Outcomes :	
The concepts developed in this course will help in quantification of several concepts in chemistry that have been introduced at the 10+2 level. Technology is being increasingly based on the Electronic, Atomic and Molecular level modifications. The course will enable the student to:	
CO-1	It is possible to estimate the amounts of substances present in the given solution from the measurement of conductance, emf and PH of the solution.
CO-2	Gain knowledge in the concept and applications of various types of batteries.
CO-3	From the knowledge of permeability, the student can develop different membrane for different purposes.
CO-4	They learn the concept and applications of Dialysis, Electro dialysis, Plasmolysis and Ultrafilteration.

Course outcome	**Program Outcome**					
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
CO-1						
CO-2						
CO-3						
CO-4						
CO-5						

Correlation rating : Low / Medium / High : 1 / 2 / 3 respectively.

Unit - I: ELECTROCHEMISTRY:

Electrolytic conductors-conductance, specific conductance, equivalent conductance and molar conductance. Cell constant, measurement of electrolytic conductance. Effect of dilution on various conductivities. Kohlrausch law and its applications – determination of Λ_∞ of weak electrolytes, solubility product and degree of dissociation. Principle and applications of conductometric titrations. Numerical problems.

Electrolytic and galvanic cells, cell notation, concept of electrode potential, single electrode potential and its determination. Electrochemical series and emf calculations. Types of electrodes- Hydrogen ,Calomel, Quinhydrone and Glass electrode. Nernst equation and its applications. Determination of pH by using Quinhydrone and Glass electrodes. Principle and applications of Potentiometric titrations. Numerical problems.

Unit - II: ENGINEERING MATERIALS: (10)

Ceramics: Introduction and classification

i) Refractories: Definition, classification and properties: Refractoriness, RUL test, Porosity and thermal spalling. Engineering Applications of refractories.

ii) Glasses: General properties of glass, Types of glasses and their uses.

iii) Whitewares: Manufacture and uses of whitewares. Glazing-purpose and methods of glazing.

Polymers: Introduction. Classification of polymers based on their final usage-Plastics, Fibers and Elastomers. Preparation, properties and engineering applications of

Plastics: PVC and Bakelite

Fibers: Nylon 6:6, and Dacron.

Elastomers: Natural and artificial rubber, vulcanization of natural rubber.

Preparation, properties and uses of Buna-S and Buna-N rubbers.

Composites: Constituents and characteristics of composites. Types of composites-Reinforced, Particulate and Layered composites. Applications of composites.

Unit - III: Carbohydrates and Proteins:

Classification of carbohydrates – mono, oligo, poly saccharides. General properties of monosaccharides, aldoses and ketoses. Reactions of glucose and fructose. Establishment of open chain structure (Configuration not necessary)

Di-saccharides: Sucrose, Maltose and their reactions. Reducing/non reducing sugars. Polysaccharides: starch, cellulose, importance of cellulose citrate, acetate, xanthate.

Amino acids and Proteins: Classification of amino acids, neutral, acidic, basic and essential amino acids. Nomenclature, methods of preparation- Streckers synthesis, Gabriel pthalimide synthesis and properties. Zwitter ion and iso-electric point.

Peptide, peptide linkage, proteins, importance, classification, general properties and colour tests of proteins.

Unit - IV: Osmosis & Alloys:(6L)

Colligative properties, osmosis and osmotic pressure, Berkeley-Hartley method for determination of osmotic pressure, isotonic, hypotonic & hypertonic solutions. Plasmolysis, Dialysis, Electrodialysis and Ultrafiltration.

Alloys: Solid solution, interstitial alloys, intermetallic compounds.

Hume-Rothery rules. Composition, properties and uses of copper alloys, stainless steel, titanium and tantalum alloys.

Unit - V: Organic reactions and synthesis of drug molecules (8L)

Organic Reactions: Introduction to Addition, Substitution and Elimination reactions. Addition to C=C and C=O, Nucleophilic substitution in aliphatic system: SN1 and SN2 mechanism, Elimination reactions: E1 andE2 mechanism.

Drugs: Definition and classification. Preparation and uses of commonly used drugs- Paracetamol, Aspirin and Ibuprofen.

Suggested Reading:

1	PL Soni, OP Dhrmara, Text book of Physical Chemistry, Sultan Chand & Co, 22nd Edition(2001).
2	Debjyothi Das, Bio-physics and Bio-Physical Chemistry, Academic Publishers(1999).
3	Arun Bahl and BS Bahl, A text book of Organic Chemistry, S.Chand Co. Ltd., 16th Edison(2002).
4	David Krupadanam, Drugs, University Press.

HS 101 EG	COMMUNICATIVE ENGLISH					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	Communicate clearly, accurately and appropriately.
2	Learn different models of interpersonal communication.
3	Learn to communicate grammatically.
4	Learn to write essays, formal letters and technical reports.
5	Comprehend the different types of texts.

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	communicate effectively
CO-2	use effective body language
CO-3	infer information from texts with workable ease
CO-4	apply basic grammar of English in their communication
CO-5	use appropriate and idiomatic expressions

Course outcome	**Program Outcome**					
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
CO-1						
CO-2						
CO-3						
CO-4						
CO-5						

Unit - I Effective Communication:

Role and importance of communication; Features of human communication; Process of communication; Barriers to communication; Oral and Written Communication; Importance of listening, speaking, reading, and writing; Types of communication: Verbal – formal versus informal communication, one-way versus two-way communication, Non-verbal communication.

Unit - II Personality Development and Interpersonal Communication:

Time management; Emotional Quotient; Teamwork; Persuasion techniques. Models of interpersonal development: Johari window, Knapp's model; Styles of communication.

Unit - III Remedial English:

Tenses, Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés. (**Note**: *The focus is on appropriate usage*)

Unit - IV Vocabulary Building and Written Communication:
Roots and affixes; Words often confused: Homonyms, Homophones, Homographs; One-word substitutes; Idiomatic usage: Idioms, Phrases, Phrasal Verbs; Synonyms; Antonyms; Paragraph writing; Précis writing; Essay writing; Official letters; E-mail etiquette; Technical report writing: Feasibility, Progress and Evaluation reports.

Unit - V Reading Comprehension:
Unseen Passages, A.P.J. Abdul Kalam, Azim Premji, SachinTendulkar, Sathya Nadella, Sam Pitroda (**Note**: No descriptive questions to be set from this unit and only Reading Comprehension/s from unseen passages should be set in the Examination Question Papers).

Suggested Reading:

1	E. Suresh Kumar, *Engineering English*, Orient Black Swan, 2014
2	*Language and Life A Skills Approach*, Orient Black Swan, 2018
3	Michael Swan, *Practical English Usage*. OUP, 1995
4	Ashraf Rizvi, M, *Effective Technical Communication*, Tata McGraw Hill, 2009.
5	Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice*. OUP, 2011.

PC 201 EC	ELECTRONIC DEVICES					
Pre-requisites	-		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	Study and analyze the behavior of Semiconductor diodes in Forward and Reverse bias.
2	Develop half wave and Full wave rectifiers with L, C, LC & CLC Filters
3	Explain V-I characteristics of Bipolar Junction Transistor in CB, CE & CC configurations and study DC Biasing techniques using BJT
4	Explore V-I characteristics of FETs, MOSFETs
5	Study the characteristics various diodes (Tunnel Diode, Varactor Diode, Schottky Diode, Light Emitting Diode, Photo Diode), UJT & SCR

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Interpret the characteristics and apply diode models to analyze various applications of diodes.
CO-2	Identify the merits and demerits of various filters, formulate and design rectifier circuits with filters Calculate ripple factor, efficiency and % regulation of rectifier circuits.
CO-3	Discriminate the BJT configurations to recognize appropriate transistor configuration for any given application and design the biasing circuits with good stability
CO-4	Distinguish the working principles of BJT and FET also between FET & MOSFET
CO-5	Interpret the characteristics various diodes(Tunnel Diode, Varactor Diode, Schottky Diode, Light Emitting Diode, Photo Diode) and analyze various applications of these diodes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2		2	1							2
CO2	2	2		2	1							2
CO3	2	2		2	1							2
CO4	2	2		2	1							2
CO5	1	1		1	1							2

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

Unit – I
Semiconductor Diodes: Qualitative Theory of P-N Junction, P-N Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of V-I characteristic, Ideal versus Practical – Resistance levels (Static and Dynamic), Transition and Diffusion Capacitances, Diode Equivalent Circuits, Load Line Analysis, Breakdown Mechanisms in Semiconductor Diodes, Zener Diode Characteristics and Applications

Unit – II
Semiconductor Diode Applications: Half wave, Full wave and Bridge rectifiers – their operation, performance characteristics and analysis. Filters (L, C, LC and CLC filters) used in Power supplies and their ripple factor calculations, Design of Rectifiers with and without Filters

Unit – III
Bipolar Junction Transistor: Transistor Junction formation (collector-base, base-emitter Junctions), Transistor biasing – band diagram for NPN and PNP transistors, current components and current flow in BJT, BJT V-I characteristics in CB, CE, CC configurations, BJT biasing techniques for operating point stabilization against temperature and device variations, Bias stabilization and Compensation techniques, Biasing circuits design.

Unit – IV
Junction Field Effect Transistors (JFET): JFET (Construction, principal of Operation and Volt – Ampere characteristics). Pinch- off voltage of JFET. FET as Voltage variable resistor, Comparison of BJT and FET
MOSFETs: Device Structure and Operation of MOSFETs, Current-Voltage Characteristics, MOSFET Circuits at DC, Enhancement & Depletion mode MOSFETs, DC- biasing

Unit –V
Special Diodes (Qualitative Treatment only): Tunnel Diode, Varactor Diode, Schottky Diode, Light Emitting Diode, Photo Diode, UJT construction-working, V-I characteristics of UJT & Structure and working of SCR, Characteristics of SCR

Suggested Reading:

1	Jacob Millman, Christos C. Halkias, and Satyabrata Jit, "Electronic Devices and Circuits", 3rd ed., Mc-Graw Hill Education, 2010.
2	Robert Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 11th ed., Pearson India Publications, 2015.
3	Salivahanan.S, Suresh Kumar.N "Electronic Devices and circuits", 3rd edition, Tata McGraw-Hill, 2012.

BS 151 CH	ENGINEERING CHEMISTRY LAB					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	3	1.5
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
2	To determine the rate constant of reactions from concentrations as an function of time.
3	The measurement of physical properties like surface tension and viscosity.
4	Estimation of HCl and CH3COOH by conduct metric technique

Course Outcomes:	
The chemistry laboratory course use consists of experiments illustrating the principle of chemistry relevant to the study of science and engineering. The students will learn to:	
CO-1	Estimate rate constants of reactions from concentration of reactants / products as a function of time.
CO-2	Measure molecular /system properties such as surface tension, viscosity, conductance of solutions, redox potentials and chloride content of water
CO-3	Synthesize a small drug molecule

Course outcome	**Program Outcome**					
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
CO-1						
CO-2						
CO-3						
CO-4						
CO-5						

1. Identification of the functional group in the given organic compound by qualitative test:

i) Carboxylic acids
ii) Phenols
iii) Amines
iv) Aldehydes and ketones
v) Carbohydrates

2. Preparation of the following Organic Compounds:

i) Acetanilide
ii) Aspirin
iii) Azo-dye
iv) Benzyalidene aniline

Acid-base titrations using the following instruments:
i) Conductivity meter ii) pH meter iii) Potentiometer

Estimation of Glucose by Colorimetry.

Suggested Reading:

1	*PG Mann, BC Saunder ,Practical Organic Chemistry, Orient Longman Ltd, 4th Edition. (1999).*
2	BD Khosla, A. Gulati, Senior Practicla Physical Chemistry,VC Garg, Chand & Co, 10th Edition(2001).

HS 151 EG	COMMUNICATIVE ENGLISH LAB					
Pre-requisites	-		**L**	**T**	**P**	**C**
			-	-	2	1
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	Learn IPA
2	Learn minimal pairs and types of syllables
3	Overcome the difficulties with sounds of English
4	Learn to participate well in GDs, Debates and Presentations
5	Communicate with appropriate body language and expressions

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Produce the sounds of English effectively
CO-2	Use the word stress appropriately
CO-3	Apply the rhythm and intonation of English in their communication
CO-4	Articulate well in their communication
CO-5	Participate effectively in communication

Course outcome	**Program Outcome**					
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
CO-1						
CO-2						
CO-3						
CO-4						
CO-5						

1	Introduction to English Phonetics: Organs of Speech: respiratory, articulatory and phonatory systems; Sounds of English: Introduction to International Phonetic Alphabet; Minimal pairs; Syllable; Word Stress; Introduction of rhythm and intonation; Difficulties of Indians speakers with stress and intonation.
2	Speaking Activities: Self Introduction, Picture perception, JAM.
3	Group discussion, Debate, Presentation skills
4	Listening Activities: Listening to different types of materials for effective comprehension
5	Role play: Use of dialogues in a variety of situations and settings

Suggested Reading:

1	E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD)*. Revised edition, Cambridge University Press India Pvt. Ltd. 2014
3	T. Balasubramanian. *A Textbook of English Phonetics for Indian Students.* Macmillan, 2008.
4	J. Sethi et al., *A Practical Course in English Pronunciation (with CD).* Prentice Hall of India, 2005.
5	Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews*. Tata McGraw Hill, 2006.

ES 151 CE

ENGINEERING GRAPHICS

Instruction	6 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evalaution	25 Marks
Credits	4

Course Objectives

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design
3. Exposure to engineering graphics standards
4. Exposure to solid modelling

Course Outcomes:

Student will be able to:

1. Create working drawings
2. Communicate through drawings
3. Create standard solid sections by drawing

UNIT - I Overview of Computer Graphics: listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

UNIT-II Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command.

UNIT-III Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute.

UNIT-IV Scales : Reduced and Enlarged scales, representative fraction, Plain, Diagonal and Vernier Scales, Projections of Points – placed in different quadrants, Projection of straight lines parallel to one plane, perpendicular to one plane, inclined to one plane and lines inclined to both planes.

UNIT-V Projections of planes : inclined Planes - Auxiliary Planes, Projections of Regular Solids covering, those inclined to both the Planes.

Sections and Sectional Views of Right Angular Solids: Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.

Suggested Reading:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar PublishingHouse
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. S.N. Lal., Engineering Drawing (2018), M/S. Cengage Learning India Pvt. Ltd., Pratap Gunj,Delhi

ES 151 ME	WORKSHOP					
Pre-requisites	-		**L**	**T**	**P**	**C**
			-	-	6	3
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To learn about different tools used in workshop.
2	To understand the different manufacturing processes.
3	To learn about fabrication of components using different materials

Course Outcomes:	
CO-1	Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
CO-2	They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
CO-3	By assembling different components, they will be able to produce small devices of their interest

Course outcome	**Program Outcome**					
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
CO-1						
CO-2						
CO-3						
CO-4						
CO-5						

1	Machine shop	**(10 hours)**
2	Fitting shop	**(08 hours)**
3	Carpentry	**(06 hours)**
4	Electrical & Electronics	**(08 hours)**
5	Welding shop	**(08 hours (Arc welding 4 hrs + gas welding 4 hrs)**
6	Casting	**(08 hours)**
7	Smithy	**(06 hours)**
8	Plastic moulding& Glass Cutting	**(06 hours)**

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

Suggested Reading:

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.