FACULTY OF ENGINEERING

Scheme of Instruction & Examination

and
Syllabi

B.E.I and II Semesters
of
Four Year Degree Programme
in

Civil Engineering
Electronics and Communication Engineering
Electrical and Electronics Engineering
Electronics and Instrumentation Engineering
(Group-B)

(With effect from the Academic Year2018 – 2019)
(As approved in the Faculty Meeting held on 26th June 2018)

Issued by
Dean, Faculty of Engineering
Osmania University, Hyderabad

July 2018

SCHEME OF IN STRUCTION & EXAMINATION
B.E. I - Semester

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course										
1	BS101MT	Mathematics-I	3	1	-	4	30	70	3	4
2	BS104CH	Chemistry	3	1	-	4	30	70	3	4
3	ES102CS	Programming for Problem Solving	3	-	-	3	30	70	3	3
Practical /Laboratory Course										
4	BS154CH	Chemistry Lab	-	-	3	3	25	50	3	1.5
5	ES152CS	Programming for Problem Solving Lab	-	-	4	4	25	50	3	2
6	ES154ME	Workshop/Manufacturing Process Lab	1	-	4	5	50	50	3	3
Total			**10**	**02**	**09**	**23**	**190**	**360**		**17.5**

BS: Basic Science   **ES:** Engineering Science
L: Lecture   **T**: Tutorial   **P**: Practical   **D**: Drawing
CIE: Continuous Internal Evaluation   **SEE:** Semester End Examination (Univ. Exam)

Note: Each contact hour is a Clock Hour.

Course Code	Course Title					Core/Elective
BS101MT	**Mathematics-I** **(Common to All Branches)**					**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	1	-	-	**30**	**70**	4

Course Objectives
- ➢ To introduce the concepts of sequences, series and their properties
- ➢ To introduce the concepts of functions of several variables and multiple integrals
- ➢ To study vector differential and integral calculus

Course Outcomes
The students will be able to
- ➢ find the nature of sequences and series
- ➢ evaluate multiple integrals
- ➢ apply this knowledge to solve the curriculum problems

Unit-I
Sequences and Series: Sequences, Series, General properties of series, Series of positive terms, Comparison tests, tests of Convergence D'Alembert's ratio test, Cauchy's n^{th}root test, Raabe's test, Logarithmic test, Alternating series, Series of positive and negative terms, Absolute convergence and Conditional convergence.

Unit-II:
Calculus of one variable: Rolle's theorem, Lagrange's, Cauchy's mean value theorems, Taylor's series, Curvature, Radius of curvature, Circle of curvature, Envelope of a family of curves, Evolutes and Involutes.

Unit-III
Multivariable Calculus (Differentiation): Functions of two variables, Limits and continuity, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions (Chainrule), Change of variables, Jacobian, Higher order partial derivatives, Taylor's series of functions of two variables, Maximum and minimum values of functions of two variables, Lagrange's method of undetermined multipliers.

Unit-IV
Multivariable Calculus (Integration): Double integrals, Change of order of integration, Change of Variables from Cartesian to plane polar coordinates, Triple integrals.

Unit-V
Vector Calculus: Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals, Green's theorem in a plane, Gauss's divergence theorem, Stoke's theorem (without proofs) and their verification.

Suggested Readings:

1. R.K. Jain & S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications, 2014.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley, 9th Edition, 2012.
3. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
4. G.B. Thomas, Maurice Weirand Joel Hass, *Thomas' Calculus*, Peterson, 12th Edition, 2010.
5. B.V. Ramana, *Higher Engineering Mathematics*, 23rd reprint, 2015.

Course Code	Course Title						Core/ Elective
BS104CH	**Chemistry** **(Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	1	-	-	**30**	**70**	4

Course Objectives
- Correlate the properties of materials with their internal structure and use the for Engineering applications
- Apply the principles of electrochemistry in storage of electrical energy in batteries.
- Gains knowledge in causes of corrosion and its prevention.
- Attains knowledge about the disadvantages of hard water for domestic and industrial purposes. Also learns the techniques of softening of hard water and treatment of water for drinking purpose.
- Exposed to qualitative and quantitative parameters of chemical fuels.
- Aware eco-friendly materials and processes.

Course Outcomes
On successful completion of this course, students will be able to:
- Apply concept of electrode potential in identifying feasibility of electrochemical reaction; illustrate electro analytical techniques and working of batteries.
- Identify the mechanism of corrosion of materials on basis of electrochemical approach and devise corrosion control methods.
- Estimate the physical & chemical parameters of quality of water and explain the process of water treatment.
- Explain the influence of chemical structure on properties of materials and their choice in engineering applications.
- Classify chemical fuels and grade them through qualitative analysis.
- Relate the concept of green chemistry to modify engineering processes and materials.

UNIT-I
Electrochemistry and Battery Chemistry: Electrochemistry: Electrochemical cells, Electrolytic and Galvanic cells - notation, cell reaction and cell potentials. Types of electrodes, Calomel, Quinhydrone and Glass electrodes. Determination of pH of a solution by using Quinhydrone electrode. Thermodynamics of emf of cells, Nernst equation and its derivation. Applications of Nernst equation to electrode potential and emf of cells. Numericalproblems. **Batteries: Primary batteries**: Zn-Carbon battery. **Secondary batteries**: Pb-Acid battery and Li-Ion battery, Applications. **Flow batteries (Fuel cells):** Methanol-Oxygen fuel cells, Construction, Applications.

UNIT-II
Water Chemistry and Corrosion: Water Chemistry: Hardness of water-Types and units of hardness, estimation of temporary and permanent hardness of water by EDTA method. Alkalinity of water and its determination. Water softening by Ion exchange and Reverse Osmosis methods. Numerical problems. Specifications of potable water. Sterilization by Chlorination. Break Point Chlorination.

Corrosion: Causes and its effects. Types of corrosion – Dry or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism. Electrochemical corrosion –Waterline and Pitting Corrosion. Factors influencing rate of corrosion.

Corrosion control methods: Cathodic protection methods- Sacrificial anodic and impressed current methods. Surface coating methods: Hotdipping - Galvanizing.

UNIT-III

Engineering Materials: Polymers: Basics of terms polymers: Monomer and its functionality, Polymers and degree of polymerization. Classification of polymers – Thermoplastics & Thermosetting resins. Types of Polymerization (i) Addition (ii) Condensation (iii) Co-Polymerization. Mechanism of free radical polymerization Preparation, Properties & Uses of the following polymers: Plastics – PVC and Bakelite, Fibres -Nylon6:6, and Kevlar, Elastomers – Buna - S, Butyl and Silicone Rubbers.

Conducting polymers: Introduction, Classification and Mechanism of conduction in Poly-acetylene, Applications of conducting polymers.

Biodegradable polymers: Introduction preparation, properties and applications of polylacticacid

UNIT-IV

Chemical Fuels: Classification of fuels: Introduction, definition and classification of chemical fuels –Primary and secondary fuels. Solid, liquid and gaseous fuels. Requirements of a good fuel. Calorific Value –HCV and LCV. Theoretical calculations of calorific value by Dulong's formula – Numerical problems.

Solid Fuels: Coal and its Ranking. Analysis of coal- Proximate and Ultimate analysis.

LiquidFuels: Fractionation of Petroleum. Composition and uses of Gasoline, Diesel and Kerosene. Cracking & its Significance – Catalytic cracking by moving bed method, Knocking. Fuel rating – Octane and Cetane numbers.

Gaseous Fuels: LPG, CNG – Composition and Uses.

Combustion: Ignition temperature of a fuel, calculation of air quantities by weight and volume required for combustion of a fuel- Numerical problems.

UNIT-V

Green Chemistry and Composites: Green Chemistry: Concept, Principles of green chemistry – Atom Economy, Catalysis. and examples of clean technology.

Biodiesel: Sources, Concept of Trans-esterification and carbon neutrality. Properties and significance

Composites: Introduction to composites, composition and characteristic properties of composites. Classification of composites based on matrix, reinforcement and ply. Applications of composites.

Suggested Readings:

1. Principles of Physical Chemistry by Puri, Sharma and Pathania S.N. Chand & Co. New Delhi (Latest edition).
2. Engineering Chemistry by PC Jain and M Jain Dhanpat Rai & Sons (15thEdn), NewDelhi.
3. Chemistry in Engineering and Technology by JC Kuriacose and J Rajaram, TMH, NewDelhi.
4. Engineering Chemistry by O G Palanna, TMH, and New Delhi.
5. Engineering Chemistry by S S Dara, S Chand & Sons, New Delhi.
6. Engineering Chemistry by Sashi Chawla. Dhanpat Rai & Sons, New Delhi.
7. Engineering Chemistry by Shikha Agrawal, Cambridge, NewDelhi.
8. Engineering Chemistry by Prasanta Rath, Cengage Learning India Pvt. Ltd.

Course Code	Course Title						Core/Elective
ES102CS	**Programming for Problem Solving** **(Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	**30**	**70**	3

Course Objectives
- To introduce the basic concepts of Computing environment, number systems and flow charts
- To familiarize the basic constructs of C language– data types, operators and expressions
- To understand modular and structured programming constructs in C
- To learn the usage of structured data types and memory management using pointers
- To learn the concepts of data handling using pointers

Course Outcomes
The students will be able to

- Formulate simple algorithms for arithmetic and logical problems.
- Translate the algorithms to programs (inc language).
- Test and execute the programs and correct syntax and logical errors.
- Implement conditional branching, iteration and recursion.
- Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- Use arrays, pointers and structures to formulate algorithms and programs.
- Apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- Apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

Unit-I
Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.).
Idea of Algorithm: steps to solve logical and numerical problems.
Representation of Algorithm: Flow chart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Unit-II
Control Structures: Arithmetic expressions and precedence, Conditional Branching and Loops**,** Writing and evaluation of conditionals and consequent branching.
Arrays: Arrays (1-D, 2-D), Character arrays and Strings

Unit-III
Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble and Selection), Finding roots of Equations. **Functions:** Functions (including using built in libraries), Parameter passing in functions, call by value. **Passing arrays to functions:** idea of call by reference

Unit-IV
Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series. **Structure:** Structures, Defining structures and Array of Structures

Unit-V
Pointers – Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation), **Introduction to File Handling.**

Suggested Readings:

1. Byron Gottfried, Schaum's Outline of Programming with C, Mc Graw-Hill
2. A.K. Sharma, Computer Fundamentals and Programming in C, Universities Press, 2nd Edition, 2018.
3. E. Balaguruswamy, Programming in ANSI C, Tata Mc Graw-Hill
4. Brian W.Kernighan and Dennis M. Ritchie, the C Programming Language, Prentice Hall of India

Course Code	Course Title						Core/ Elective
BS154CH	**Chemistry Lab** **(Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	3	**25**	**50**	1.5

Course Objectives
- ➢ Conduct experiments, take measurements and analyze the data though hands-on experience in order to demonstrate understanding of the theoretical concepts of quantitative Analysis while working in small group.
- ➢ Interpret the electro analytical principles with experimental results graphically
- ➢ Demonstrate writing skills through clear laboratory reports

Course Outcomes
On successful completion of this course, students will be able to:
- ➢ Apply the principles of Colorimetry and Electrochemistry in quantitative estimations.
- ➢ Estimate the rate constants of reactions from concentration of reactants /products as a function of time.
- ➢ Synthesize small drug molecules.

List of Experiments:
1. Introduction to Chemical Analysis.
2. Techniques of Weighing.
   Volumetric Analysis:
3. Preparation of Standard Mohr's salt solution, Standardization of $KMnO_4$ and estimation of ferrous ion.
4. Estimation Iron(II) by Dichromatometry
   Water Analysis:
5. Preparation of Standard Magnesium sulphate solution, standardization of EDTA and Estimation of Total Hardness.
6. Preparation of Standard Sodium Carbonate Solution, Standardization of HCl and Estimation of Carbonate and Bicarbonate Alkalinity.
   Conductometry:
7. Estimation of HCl
8. Estimation of CH_3COOH and mixture of acids
   Potentiometry
9. Estimation of HCl
10. Estimation of Iron
    pH Metry:
11. Estimation of HCl
    Colorimetry:
14. Verification of Beer-Lambert's law and estimation of Manganese.
    Chemical Kinetics:
15. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.
    Drug Synthesis
16. Preparation of Aspirin

Note: Minimum ten experiments should be conducted in the semester

Suggested Readings:

1. Senior Practical Physical Chemistry, B.D. Khosla, A.Gulati and V.Garg (R. Chand & Co., Delhi)
2. An Introduction to Practical Chemistry, K.K. Sharma and D.S.Sharma (Vikas publishing, N.Delhi)

Course Code	Course Title						Core/ Elective
ES152CS	**Programming for Problem Solving Lab (Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	4	**25**	**50**	2

Course Objectives
- Understand the fundamentals of programming in C Language.
- Write, compile and debug programs in C.
- Formulate solution to problems and implement in C.
- Effectively choose programming components to solve computing problems

Course Outcomes
The students will be able to

1. Choose appropriate data type for implementing programs in C language.
2. Design and implement modular programs involving input output operations, decision making and looping constructs.
3. Implement search and sort operations on arrays.
4. Apply the concept of pointers for implementing programs on dynamic memory management and string handling.
5. Design and implement programs to store data in structures and files.

Programming Exercise:

1. Finding maximum and minimum of given set of numbers, finding roots of quadratic equation.
2. Sin x and Cos x values using series expansion.
3. Conversion of binary to decimal, octal, hexadecimal and viceversa.
4. Generating Pascal triangle, pyramid of numbers.
5. Recursion: factorial, Fibonacci, GCD.
6. Matrix addition and multiplication using arrays, linear search and binary search using recursive and non-recursive procedures.
7. Bubble sort and selection sort.
8. Programs on pointers: pointer to arrays, pointer to functions.
9. Functions for string manipulations.
10. Programs on structures and unions.
11. Finding the number of characters, words and lines of given text file.
12. File handling programs

Suggested Readings:

1. Byron Gottfried, Schaum's Outline of Programming with C,Mc Graw-Hill
2. A.K. Sharma, Computer Fundamentals and Programming in C,Universities Press, 2018.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie, the C Programming Language, Prentice Hall of India.

Course Code	Course Title						Core/ Elective
ES154ME	**Workshop/Manufacturing Process (Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	1	-	-	4	**50**	**50**	3

Course Objectives
- ➢ Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
- ➢ To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- ➢ To gain a good basic working knowledge required for the production of various engineering products.
- ➢ To Study different hand operated power tools, uses and their demonstration.
- ➢ Adopt safety practices while working with various tools

Course Outcomes
The students will be able to

- ➢ Demonstrate an understanding of and comply with workshop safety regulations.
- ➢ Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- ➢ Study and practice on machine tools and their operations
- ➢ Undertake jobs connected with Engineering Workshop trades including fitting, carpentry, sheet metal, house wiring, welding, smithy and foundry.
- ➢ Apply basic electrical engineering knowledge for house wiring practice

A. TRADE FOR EXERCISES:
1. Carpentry
2. Fitting
3. House wiring
4. Sheet metal working
5. Smithy
6. Welding
7. Plumbing

B. TRADES FOR DEMONSTRATION AND EXPOSURE:
1. Machining (Lathe & Drilling)
2. Injection molding
3. Mould making and casting
4. Basic Electronics lab instruments

C. PRESENTATIONS AND VIDEO LECTURES
1. Manufacturing Methods
2. Rapid Prototyping
3. Glass Cutting
4. 3D printing
5. CNCLATHE

D. IT WORKSHOP: Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, operating system installation.

Suggested Reading:
1. Venugopal, K,"Workshop manual", Anuradha Publications, Kumbakonam,TN,2012
2. K.C. John, "Mechanical Workshop" 2nd Edn.,PHI, 2010.
3. Hajra Choudary, "Elements of Workshop Technology" Vol.1, Asian Publishers,Edn.,1993.
4. G.S. Sawhney, "Mechanical Experiments and Workshop Practice", I.K.International Publishing House, NewDelhi, 2009.

Note: At least two exercises from each trade.

SCHEME OF INSTRUCTION & EXAMINATION
B.E. II-Semester

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course										
1	HS101EG	English	2	-	-	2	30	70	3	2
2	BS102MT	Mathematics-II	3	1	-	4	30	70	3	4
3	BS103PH	Physics	3	1	-	4	30	70	3	4
4	ES101EE	Basic Electrical Engineering	3	1	-	4	30	70	3	4
Practical/Laboratory Course										
5	HS151EG	English Lab	-	-	2	2	25	50	3	1
6	BS153PH	Physics Lab	-	-	3	3	25	50	3	1.5
7	ES152EE	Basic Electrical Engineering Lab	-	-	2	2	25	50	3	1
8	ES153CE	Engineering Graphics & Design	1	-	4	5	50	50	3	3
		Total	**12**	**02**	**11**	**25**	**245**	**480**		**20.5**

HS: Humanities and Social Sciences   **BS**: Basic Science   **ES:** Engineering Science
L: Lectures   **T**:Tutorials   **P**:Practical   **D**:Drawing
CIE: Continuous Internal Evaluation   **SEE:** Semester End Examination (Univ. Exam)

Note:
1. Each contact hour is a Clock Hour
2. The students have to undergo a Summer Internship of 1 week duration after II-Semester.

Course Code	Course Title						Core/ Elective
HS101EG	**English** **(Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	2	-	-	-	**30**	**70**	2

Course Objectives
- ➢ Communicate clearly, accurately and appropriately
- ➢ Learn different models of interpersonal communication
- ➢ Learn to communicate grammatically
- ➢ Learn to write essays, formal letters and technical reports
- ➢ Comprehend the different types of texts

Course Outcomes
The students will be able to

- ➢ Communicate clearly, accurately and appropriately
- ➢ Learn different models of interpersonal communication
- ➢ Learn to communicate grammatically
- ➢ Learn to write essays, formal letters and technical reports
- ➢ Comprehend the different types of texts

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

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 and Progress reports.

Unit–V
Reading Comprehension: Unseen Passages, A.P.J. AbdulKalam, AzimPremji, 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 Readings:

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 Mc Graw Hill, 2009.
5. Meenakshi Ramanand Sangeeta Sharma. *Technical Communication: Principles and Practice*. OUP, 2011.

Course Code	Course Title						Core/ Elective
BS102MT	**Mathematics–II** **(Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	1	-	-	**30**	**70**	4

Course Objectives
- ➢ To study matrix algebra and its use in solving system of linear equations and in solving eigen value problems
- ➢ To provide an overview of ordinary differential equations
- ➢ To study special functions like Legendre and Bessel functions
- ➢ To introduce the concept of functions of complex variable and their properties

Course Outcomes
The students will be able to

- ➢ Solve system of linear equations and eigen value problems
- ➢ Solve certain first order and higher order differential equations
- ➢ Determine the analyticity of complex functions and expand functions as Taylor and Laurent series
- ➢ Evaluate complex and real integrals using residue theorem

Unit-I
Matrices: Elementary row and column operations, Rank of a matrix, Echelon form, System of linear equations, Linearly dependence and independence of vectors, Linear transformation, Orthogonal transformation, Eigen values, Eigen vectors, Properties of eigen values, Cayley-Hamilton theorem, Quadratic forms, Diagonalization of Matrices, Reduction of quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms.

Unit-II
First Order Ordinary Differential Equations: Exact first order differential equations, Integrating factors, Linear first order equations, Bernoulli's, Riccati's and Clairaut's differential equations, Orthogonal trajectories of a given family of curves.

Unit-III
Differential Equations of Higher Orders: Linear independence and dependence, Solutions of second and higher order linear homogeneous equations with constants coefficients, Method of reduction of order for the linear homogeneous second order differential equations with variable coefficients, Solutions of non-homogeneous linear differential equations, Method of variation of parameters, solution of Euler-Cauchy equation, Simultaneous linear differential equations, Power Series solution, Legendre Polynomial of first kind, Bessel's function of first kind and their properties.

Unit-IV
Functions of a Complex Variable: Limits and continuity of a function, differentiability and analyticity, Elementary Analytic functions, Necessary and Sufficient conditions for a function to be analytic, Cauchy, Riemann equations in polar form, harmonic functions, complex integration, Cauchy's integral theorem, extension of Cauchy's integral theorem for multiple connected regions, Cauchy's integral formula, Cauchy's inequality, Cauchy's formula for derivatives, Liouville's theorem, Maximum Modulus principle (without proof) and its applications.

Unit-V
Residue Calculus: Power series, Taylor's series, Laurent's series, zeros and singularities, residues, residue theorem, evaluation of real integrals using residue theorem, Argument principle, Rouche's Theorem and their applications, conformal mapping Bilinear transformations. (All Theorems without Proof).

Suggested Readings:

1. R.K. Jain & S.R.K. lyengar, *Advanced Engineering Mathematics*, Narosa Publications, 4th Edition, 2014.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley,9th Edition, 2012.
3. Dr.B.S. Grewal*, Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
4. Dr.M.D. Raisinghania, *Ordinary and Partial differential equations*, S.CHAND, 2014.
5. James Brown, R.V Churchill, *Complex Variables and applications*, Mc Graw Hill, 2013.
6. B.V. Ramana, *Higher Engineering Mathematics*, 23rd reprint, 2015.
7. S.L Ross, *Differential Equations* 3rd Edition, Wiley India.
8. G.F. Simmons and S.G.Krantz*, Differential Equations*, Tata Mc Graw Hill, 2007.
9. N.Bali, M.Goyal, A text book of *Engineering Mathematics*, Laxmi publications,2010
10. H.K.Dass, Er.Rajnish Varma, *Higher Engineering Mathematics*, Schand Technical Third Edition.

Course Code	Course Title						Core/ Elective
BS101PH	**Physics** **(Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	1	-	-	**30**	**70**	4

Course Objectives
- Aware of limits of classical free electron free theory and to apply band theory of solids
- Acquire knowledge on various properties of semiconductors.
- Grasp the intricacies in semiconductor – optical interaction

Course Outcomes
- distinguish materials based on band theory of solids
- classify semi conductors on the basis of doping and to estimate conductivity and learn transport phenomenon in semiconductors
- Appreciate use of optical absorption by semiconductors.

Unit–I

Crystallography: Introduction, Types of crystal systems , Bravais lattices, Lattice planes and Miller Indices (Cubic system), Inter planar spacing (Cubic system), Bragg's law, Powder diffraction method.

Crystal Defects: Classification of point defects, Concentration of Schottky defects in metals and ionic crystals, Concentration of Frankel defects, Line defects, Screw and Edge dislocations, Burger's vector

Unit– II

Band Theory of Solids & Semiconductors: Classical free electron theory(qualitative), 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 and its I–V characteristics, Thermistor and its characteristics, Hall effect and its applications.

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 Ferro electrics.

Unit– III

Wave Mechanics: Matter waves – de-Broglie wavelength, properties of wave function, Physical significance, Schrodinger time dependent and time in-dependent wave equation. Particle in a 1-D box.

Electromagnetic theory: Basic laws of electricity and magnetism, Maxwell's equations in integral and differential forms, Conduction and displacement current, Relation between D, E and P. **Electromagnetic waves:** Equation of plane wave in free space, Poynting theorem.

Unit–IV

Magnetic Materials: Classification of magnetic materials: dia, para, ferro, antiferro and ferromagnetic materials, Weiss molecular field theory of ferro magnetism, Magnetic domains, Hysteresis curve, soft and hard magnetic materials, Ferrites: Applications of ferrites.

Super conductivity: Introduction, General properties of superconductors, Meissner effect, Type I and Type II superconductors, BCS theory (qualitative), Introduction to High T_c superconductors, Applications of superconductors.

Unit–V
Lasers: Characteristics of Lasers, spontaneous and stimulated emission of radiation, Einstein's Coefficients, population in version, Ruby Laser, Helium Neon Laser, Semi Conductor Laser and applications of lasers.
Fiber Optics: Introduction, Propagation of light through an optical fiber, Acceptance angle, Numerical aperture (NA), Types of Optical fibers and Refractive index profiles, Fiber drawing process (double Crucible Method), Losses in optical fibers, applications of optical fibers.

Suggested Reading:

1. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2012
2. A.K. Bhandhopadhya, Nano Materials, New Age International, 1st Edition, 2007
3. M.S. Avadhanulu and P.G.Kshira Sagar, Engg.Physics, S.Chand & Co.1st Edition, 1992.
4. C.M. Srivastava and C. Srinivasan – Science of Engg. Materials, New Age International.
5. R.K Gaur and S.L Gupta - Engineering Physics, Dhanpath Rai Publications, New edition.
6. Sanjay D Jain & Girish G Sahasrabudhe - Engineering Physics, University Press.

Course Code	Course Title						Core/ Elective
ES101EE	**Basic Electrical Engineering (Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	1	-	-	**30**	**70**	4

Course Objectives
- ➢ To provide an understanding of basics in Electrical circuits.
- ➢ To explain the working principles of Electrical Machines and single phase transformers.

Course Outcomes
- ➢ To analyze Electrical circuits to compute and measure the parameters of Electrical Energy.
- ➢ To comprehend the working principles of Electrical DC Machines.
- ➢ To Identify and test various Electrical switch gear, single phase transformers and assess the ratings needed in given application.
- ➢ To comprehend the working principles of electrical AC machines.

Unit-I
DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

Unit-II
AC Circuits: Representation of sinusoidal wave forms, 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 working of 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 Switch gear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Reading:

1. N.K. De, "Basic Electrical Engineering", Universities Press, 2015.

2. J.B. Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K. Kataria & Sons Publications, 2002.

3. J.B. Gupta, "Utilization of Electric Power and Electric Traction" S.K. Kataria & Sons Publications, 2010

4. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "Basic Elactrical Engineering" Tata McGraw Hill, Publications, 2009

5. Hughes, "Electrical Technology", VII Edition, International Student-on, Addison Welsey Longman Inc., 1995.

Course Code	Course Title						Core/ Elective
HS151EG	**English Lab** **(Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	**25**	**50**	1

Course Objectives
- ➢ Learn IPA
- ➢ Learn minimal pairs and types of syllables
- ➢ Overcome the difficulties with sounds of English
- ➢ Learn to participate well in gds, Debates and Presentations
- ➢ Communicate with appropriate body language and expressions

Course Outcomes
The students will be able to
- ➢ Learn IPA
- ➢ Learn minimal pairs and types of syllables
- ➢ Overcome the difficulties with sounds of English
- ➢ Learn to participate well in GDs, Debates and Presentations
- ➢ Communicate with appropriate body language, expressions

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 into nation; Difficulties of Indians speakers with stress and into nation.
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 Readings:

2. E. Suresh Kumar, a Hand book for English Language Laboratories (with CD).
3. Revised edition, Cambridge University Press India Pvt.Ltd.2014
4. T. Balasubramanian. A Text book of English Phonetics for Indian Students. Macmillan,2008.
5. J. Sethietal., A Practical Course in English Pronunciation (with CD).Prentice Hall of India, 2005.
6. Hari Mohan Prasad. How to Prepare for Group Discussions and Interviews. Tata Mc Graw Hill, 2006.

Course Code	Course Title						Core/ Elective
BS151PH	**Physics Lab** **(Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	3	**25**	**50**	1.5

Course Objectives
> Make precise measurements using basic physical principles and acquire skills to handle the instruments
> Relates the theoretical Knowledge to the behavior of Practical Physical world.
> Analyze errors in the experimental data.
> Plot graphs between various physical parameters.

Course Outcomes
> Conduct experiments, take measurements independently.
> Write appropriate laboratory reports.
> Compute and compare the experimental results and draw relevant conclusions.
> Use the graphical representation of data and estimate results from graphs

List of Experiments:

1. To determine the Dielectric constant and Phase transition temperature of Lead Zirconium Titanate (PZT).
2. To draw the I-V Characteristics of P-N Junction diode and to evaluate the resistance.
3. To find the values of Electrical conductivity and energy gap of Ge crystal.
4. Determination of rigidity of modulus of Torsion pendulum.
5. Determination of carrier concentration, Mobility and Hall Coefficient of Ge crystal using Hall Effect Experiment.
6. To determine the constants of A, B and **α** using Thermistor characteristics.
   i) To draw the curve between the magnetizing field and the intensity of magnetization of the specimen (soft iron rod) and to find out i) Coercivity ii) Retentivity and iii) Hysteresis loss.
7. To draw the I-V Characteristics of a solar cell and to calculate the
   i) Fill factor Efficiency and ii) Series resistance.
8. To Determine the Numerical aperture (NA) of Optical fiber.
9. To determine the wavelength of the given Laser source.

Note: Minimum eight experiments should be conducted in the semester

Suggested Reading:

1. N.K. De, "Basic Electrical Engineering", Universities Press, 2015.
2. J.B. Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K. Kataria & Sons Publications, 2002.
3. J.B. Gupta, "Utilization of Electric Power and Electric Traction" S.K. Kataria & Sons Publications, 2010

Course Code	Course Title						Core/Elective
ES152EE	**Basic Electrical Engineering Lab** **(Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	**25**	**50**	1

Course Objectives
> To impart the practical knowledge on testing of DC and AC Machines and the usage of common electrical measuring instruments

Course Outcomes
> Get an exposure to common electrical components and their ratings.
> Analyze the performance of DC and AC Machines.
> Comprehend the usage of common electrical measuring instruments.
> Test the basic characteristics of transformers and electrical machines.

Suggested List of Laboratory Experiments/Demonstrations:

Dem1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.

Exp1. Verification of KVL and KCL, super position theorem (with DC excitation)

Exp2. Verfication of Thevinens and Nortons theorems (with DC excitation)

Exp3.Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Power factor calculation

Exp4.Transformers: Observation of the no-load current wave form on an oscilloscope (non sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics).

Exp5. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.

Exp6.Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).

Exp7.Measurement of phase voltage/current, line voltage/current and power in a balanced three-phase circuit connected in star and delta

Dem2.Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging –slip ring arrangement) and single-phase induction machine.

Exp8.OCC characteristics of DC Generator

Exp9.Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase –sequence of connections.

Exp10. Power factor improvement of Induction Motor using static capacitors

Exp11. Load Test of DC Motor

Note-1:

(i)   List of Experiments and Demonstrations suggested above are already available in the Laboratory of the electrical department. No need to purchase any extra equipment except Demonstration2 equipments

(ii)   Procurement of Demonstration2 equipments can be done during the course work of that semester. It can be included in the laboratory.

Note-2:

(i)   Experiments 9, 10 and Demonstration3 can be incorporated in the Lab syllabus if the topics concerned to the above experiments are considered in new BEE syllabus.

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 &S ons Publications, 2010

3. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "Basic Elactrical Engineering" Tata Mc Graw Hill, Publications, 2009

4. Hughes, "Electrical Technology", VII Edition, International Student-on, Addison Welsey Longman Inc., 1995.

Course Code	Course Title						Core/Elective
ES153CE	**Engineering Graphics & Design** **(Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	1	-	4	-	**50**	**50**	3

Course Objectives
- To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare you to communicate effectively
- To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Outcomes
The students will be able to
- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modeling
- Exposure to computer-aided geometric design
- Exposure to creating working drawings
- Exposure to engineering communication

Sheet No	Description of the Topic	Contact Hours	
		Lecture	Drawing
1	Principles of Engineering Graphics and their significance, usage of drawing instruments.	1	
2	**Conic Sections–I** Construction of ellipse, parabola and hyperbola given focus and eccentricity.	1	2
3	**Conic Sections–II** Construction of ellipse (given major and minor axis), parabola (given base and height), rectangular hyperbola.		2
4	**Cycloids** (cycloid & epicycloid)	1	2
5	**Involutes** (involute of triangle, square &circle)		2
6	**Scales** (plain & diagonal scales)	1	2+2
7	**Introduction to Auto CAD** Basic commands and simple drawings.		2+2
8	**Ortho graphic Projection** Projections of points situated in different quadrants.	1	2
9	**Projections of straight lines–I** Line parallel to both the reference planes, line perpendicular or inclined to one reference plane.	1	2
10	**Projections of straight lines–II** Line inclined to both the reference planes.	1	2

11	**Projections of planes–I** Perpendicular planes	1	2
12	**Projections of planes–II** Oblique planes		2
13	**Projections of solids–I** Polyhedra and solids of revolution, Projections of solids in simple position.	1	2
14	**Projection of solids–II** Projections of solids when the axes inclined to one or both the reference planes.	1	2+2
15	**Section of solids–I** When the sectional plane is parallel or perpendicular to one reference plane.	1	2
16	**Section of solids–II** When the sectional plane is inclined to one reference plane.		2
17	**Development of surfaces–I** Prisms and Cylinders	1	2
18	**Development of surfaces–II** Pyramids and Cones		2
19	**Intersection of surfaces–I** Intersection of cylinder and cylinder	1	2
20	**Intersection of surfaces–II** Intersection of cylinder and cone		2
21	**Isometric projection–I** Planes and simple solids	1	2
22	**Isometric projection–II** Combination of two or three solids		2
23	Conversion of Isometric Views to Orthographic Views	1	2
24	**Floor plans** of 2 or 3 rooms including windows, doors, and fixtures such as WC, bath, sink, shower, etc.	1	2

Suggested Text:

1. Bhatt N.D., Panchal V.M. & Ingle P.R.,(2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C.(2008), Engineering Drawing and Computer Graphics, Pearson Education
3. S.N Lal, Engineering Drawing with Introduction to Auto CAD, Cengage Learning India Pvt Lid, New Delhi, 2018.
4. Agrawal B. & Agrawal C. M.(2012), Engineering Graphics, TMH Publication
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6. (Corresponding set of) CAD Software Theory and User Manuals

NOTE:
1. At least 20 sheets must be covered.
2. Sheet number 1 to 6 (Graph sheets/drawing sheets)
3. Sheet number 7 to 24 (Auto CAD drawings)