

Scheme of Instruction & Examination
B.E. FIRST YEAR
ELECTRONICS AND COMMUNICATION ENGINEERING

Semester - I									
S. No	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			Hours Per week			Duration in Hrs	Maximum Marks		
			L	T	P/D		CIE	SE E	
Theory Courses									
1	5BS101HS	Engineering Mathematics - I	3	1	0	4	40	60	4
2	5BS106HS	Chemistry	3	1	0	4	40	60	4
3	5HS101HS	English	2	0	0	2	40	60	2
4	5ES103ME	Elements of Mechanical Engineering	3	0	0	3	40	60	3
Laboratories									
5	5BS153HS	Chemistry Lab	0	0	3	3	40	60	1.5
6	5HS151HS	English Lab	0	0	2	2	40	60	1
7	5ES152ME	Engineering Workshop Practice	0	0	4	4	40	60	2
8	5MC151SP	Yoga/NSS/Sports	0	0	2	2	50	-	0
		Total	11	2	11	24	330	420	17.5

Semester - II									
S · N o	Course Code	Course Title	Scheme of Instruction			Scheme of Examination		Credit s	
			Hours Per week			D u r a t i o n i n H r s	Maximum Marks		
			L	T	P/D		CIE		SEE
Theory Courses									
1	5BS203HS	Engineering Mathematics - II	3	1	0	4	40	60	4
2	5BS204HS	Applied Physics	3	1	0	4	40	60	4
3	5ES201CS	Programming for Problem Solving	3	0	0	3	40	60	3
4	5ES202EE	Elements of Electrical Engineering	3	0	0	3	40	60	3
5	5MC201C E	Environmental Science	2	0	0	2	40	60	0
Laboratories									
6	5BS252HS	Applied Physics Lab	0	0	3	3	40	60	1.5
7	5ES251CS	Programming for Problem Solving Lab	0	0	2	2	40	60	1
8	5ES252EE	Elements of Electrical Engineering Lab	0	0	2	2	40	60	1
9	5ES252CE	Engineering Graphics Lab	1	0	4	5	40	60	3
		Total	15	2	9	26	320	480	20.5

BS: Basic Sciences

ES: Engineering Sciences

HS:

Humanities and Sciences

MC: Mandatory Courses

CIE: Continuous Internal Evaluation

SEE: Semester End Examination

L: Lectures T : Tutorials P: Practicals D : Drawing

Note: 1). Each Contact Hour is a Clock hour

Course code	Course Title	Core/ Elective					
		Core					
5BS101HS	Engineering Mathematics – 1	L	T	P/D	Credits	CIE	SEE
				3	1	0	4

Prerequisite: Basics of Matrices, Differentiation, Integration and Trigonometric results

Course Objectives: The objective of this course is to make the student

- Study matrix algebra and its use in solving system of linear equations and solving eigen value problems.
- study mean value theorems and their application to mathematical problems.
- introduce the concepts of functions of several variables and multiple integrals
- introduce the concepts of Multiple Integrals
- study vector differential and integral calculus.

Course Objectives: After completion of the course, the student will be able to

- Find the rank of matrix and its use to find solution of linear equations, eigen value problem, Quadratic forms..
- Explain the concepts of derivatives using mean value theorems and their generalization. Concepts of curvature, evolutes, involutes, envelopes of family of curves
- Find Partial derivatives of functions of two variables using concept of limits and continuity and study the concepts of maximum and minimum of functions of two variables.
- Identify the key concepts, theories and mathematical fundamentals to derive mathematical relations involved in evaluation of double integrals and triple integrals and solving Engineering problems.
- Evaluate gradient of a scalar field, divergence, curl of a vector field to find the values of line, surface and volume integrals and establish their relation using Green, Gauss and Stokes theorems.

Unit-I (10Hrs)

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

Unit-II (10Hrs)

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 family of curves, Evolutes and Involutives.

Unit-III (10Hrs)

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

Unit-IV (8Hrs)

Multivariable Calculus (Integration): Double Integrals, Change of order of integration, change of variables from cartesian to plane polar coordinates, Triple Integrals.

Unit-V (12Hrs)

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.

TEXT BOOKS :

- T1. Dr.B.S. Grewal, Higher. Engineering Mathematics, Khanna Publications, 43rd Edition,2014. (Unit 1-5)
- T2. Advance Engineering Mathematics by Jain and Iyengar,5th Edition, Narosa Publications (Unit 1-5)
- T3.B. V. Ramana, Higher Engineering Mathematics,3rd Edition 2015. (Unit 1-5)

REFERENCES/ SUGGESTED READING:

- R1. M.D Raisinghania, Ordinary Differential Equations, 11th Revised Edition
- R2. S.S. Sastry, Engineering mathematics, 3rd Edition, Paperback
- R3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9th Edition, 2012.
- R4. Peter. V. O' Neil, Advance Engineering Mathematics,' Publisher, Global Engineering 7th Edition, 2012

Course code	Course Title	Core/ Elective					
5BS106HS	Chemistry	Core					
		L	T	P/D	Credits	CIE	SEE
		3	1	0	4	40	60

Prerequisite: Electrochemistry & Batteries, Water & Corrosion, Polymers, Energy Sources, Inorganic Engineering Materials

Course Objectives: The objective of this course is to make the student

- Apply the principals of electrochemistry in storage of electrical energy in batteries.
- Rationalize bulk properties and processes using thermodynamic considerations.
- Gains knowledge in causes of corrosion and its prevention. Attains knowledge about the disadvantages of hard water and treatment of water for drinking purpose.
- Explain the influence of chemical structure on properties of materials and their choice in engineering applications.
- Exposed to qualitative and quantitative parameters of chemical fuels.

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

- **CO.1.** Apply concept of electrode potential in identifying feasibility of electrochemical reaction; illustrate electro analytical techniques and working of batteries
- **CO.2.** 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.
- **CO.3** Explain the influence of chemical structure on properties of materials and their choice in engineering applications.
- **CO.4** Classify chemical fuels and grade them through qualitative analysis.
- **CO.5** Relate the concept of green chemistry to modify engineering processes and materials. Understand the function of drugs.

Unit-I: (10 Hrs)

Electrochemistry and Batteries:

Electrochemistry: Electrochemical cells, Electrolytic and Galvanic cells- notation, cell notation, cell reaction and cell potentials. Electrodes:

Electrode potential and Standard Electrode Potential (SEP). Construction and function of Calomel Quinhydrone and Glass electrodes.

Determination of pH of a solution by using Quinhydrone electrode.

Thermodynamics of emf, Nernst equation and its derivation. Applications

of Nernst equation to electrode potential and emf of cells. Numerical problems.

Batteries: Primary batteries: Zn - Carbon battery. Secondary batteries: Pb-Acid cell & battery and Li-Ion cell battery, Applications. Flow batteries (Fuel cells): Hydrogen-Oxygen fuel cells & functioning. Applications of batteries.

Unit-II: (10 Hrs)

Water Chemistry--its treatment 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 process and desalination of water by reverse osmosis method. Numerical problems. Specifications of potable water--Steps involved in treatment of water – Sterilization by Chlorination -Disinfection of water by chlorination and ozonization. Break Point Chlorination – advantages.

Corrosion: Causes and effects of corrosion. Types of Corrosion-Dry corrosion – its types or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism.

Concentration cell corrosion. Waterline, Pitting and galvanic corrosion.

Factors effecting rate of corrosion.

Unit-III: (10 Hrs)

Polymers: Basics of terms polymers: Monomer functionality, degree of polymerization. Types of Polymerization (i) Addition--Mechanism of free radical polymerization (ii) Condensation (iii) Co-Polymerization with examples.

Classification of polymers - Thermoplastics & Thermosetting resins. Plastics, Fibres and Elastomers and their characteristics. Preparation, Properties & Uses of the following polymers: Plastics - PVC and Bakelite, Fibres - Nylon 6:6, and Dacron. Elastomers - Buna-S, Butyl Rubbers.

Conducting polymers : Concept, Classification and Mechanism of conduction in Trans Poly-acetylene, Doped Conducting Polymers. Applications of conducting polymers.

Biodegradable polymers: Concept. preparation, properties and applications of polylactic acid

Unit-IV: (10 Hrs)

Chemical Fuels: Concept, definition and classification of fuels- Primary and secondary fuels. Solid, liquid and gaseous fuels. Characteristics of a good fuel. Calorific Value – High Calorific Value(HCV) and Low Calorific Value (LCV). Numerical problems.

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

analysis. Numerical Problems.

Liquid Fuels: Petroleum. Composition 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, characteristics and applications.

Unit-V: (10 Hrs)

Green Chemistry, Green Engineering Principles: Concept, Principles of green chemistry –.

Principles of Green Engineering.

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

Text Books:

T1. PC Jain, M Jain Engineering Chemistry, Dhanapathi Rai &sons, 16th edition, 2015, New Delhi. (Unit: 1,4,5)

T2. B.R. Puri, L.R. Sharma and M.S. Pathania, “Principles of Physical Chemistry”, S. S. Chand & Company Ltd., Revised edition (2013). (Unit 2)

T3. Sashi Chawla,—Engineering Chemistry, Dhanpat Rai & Sons, New Delhi, 2017 (1st January 2017) (Unit 3)

T4. O G Palanna, —Engineering Chemistry, Tata Mc Graw Hill, New Delhi, First Edition 2009.(Unit 2&4)

Reference Books :

R1. J D Lee, Concise inorganic chemistry, Blackwell science ltd, USA, Fifth edition

R2. P.W. Atkins,Physical Chemistry .

R3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, “Organic Chemistry”, Wiley, 12th edition (2017).

Course code	Course Title	Core/ Elective
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5HS101HS	English	Core					
		L	T	P/D	Credits	CIE	SEE
		2	0	0	1	40	60

Prerequisite: Know the basic functions of the Language

Course Objectives: The following are the Objectives of the Course:

To enable and enhance the English language abilities of engineering students, especially in reading and writing, by –

- Using authentic material for language learning and gaining proficiency in it (Knowledge) (Comprehension)
- Exposing them to a variety of content-rich text.
- Strengthening their grammar and vocabulary.
- Improving their reading and comprehension skill.
- Honing their writing skills.
- Encouraging them to think creatively and critically.

Course Outcomes:

After completion of the course, the student will be able to

- **CO.1.** Read, understand, interpret and comprehend a variety of written texts and develop positive attitude and commitment towards their (students’) goal and society.
- **CO.2** Remember and recognize the significance of vocabulary (roots and affixes, homonyms, one- word substitutes, etc.) and use language accurately for effective communication.
- **CO.3** Apply appropriate grammatical concepts (tenses, articles, prepositions, etc.) to spoken and written English in informal and formal ambience.
- **CO.4** Compile information of various aspects of English diction – Develop creativity in writing skills by framing Paragraphs, Essays, Letters, Emails and SOPs.
- **CO.5** Analyze different ways of life through reading prose and poetry, each symbolizing a particular virtue and the learners develop the ability to be creative.

Unit – I : (6 Hrs)

Reading : Amitav Ghosh “Coming Home”

Vocabulary : Word Formation – Prefixes, Suffixes , Root words

Grammar : Articles, Prepositions, Determiners

Writing : Types of Sentences; Guided Writing (Expanding the Outline / Writing from verbal cues)

Unit – II : (6 Hrs)

Reading : Rudyard Kipling, “If”

Vocabulary : Word Formation – Compounding and Blending, Contractions

Grammar : Transitions, Connectives, Question Tags

Writing : Précis & Paragraph Writing

Unit – III : (6 Hrs)

Reading : Martin Luther King Jr. “I have a Dream”

Vocabulary : Synonyms, Antonyms, One-Word Substitutes

Grammar : Voice

Writing : Letter Writing

Unit – IV : (6 Hrs)

Reading : Robert Frost, “Road Not Taken”

Vocabulary : Homophones, Homonyms, Homographs

Grammar : Narration (Direct – Indirect Speech)

Writing : Reporting Events (Swearing in, Poll-Address, News Events, Visit to Book Exhibition, Annual /Farewell Day)

Unit – V : (6 Hrs)

Reading : George Orwell’ “ The Sporting Spirit” (Excerpt)

Vocabulary : Inclusive Language, Euphemism

Grammar : Tense

Writing : SOP

Text Books :

T1. E. Suresh Kumar, *Engineering English*, Orient Black Swan, 2014.

References / Suggested Reading:

R1. **Modern English Grammar**

R2. “**Grammar in Use**” Raymond Murphey

R2. Sudharshana, NP and C Savitha, *English for Engineers*. Cambridge University Press 2018.

Course code	Course Title	Core/ Elective					
5ES103ME	ELEMENTS OF MECHANICAL ENGINEERING	Core					
		L	T	P/D	Credits	SEE	CIE
		3	0	0	3	40	60

Prerequisite: --**Course Objectives: The objective of this course is to make the student**

- To understand the basic concepts and applications of Thermodynamics
- To understand the basic concepts of Heat Transfer
- To understand the concept of Basic Machine Design
- To estimate the transmission of power by belts and application of various gear and gear trains.
- To understand the basic principles of major manufacturing Processes such as casting, welding, forming and machining of engineering materials

Course Outcomes

After completion of the course, the student will be able to

- CO.1. Define the fundamental concepts of thermodynamics.
- CO.2 Classify the modes of heat transfer and heat exchangers.
- CO.3. Distinguish various types of Power transmission elements
- CO.4. Differentiate the welding, brazing and soldering
- CO.5. Explain the different manufacturing techniques such casting, forming and machining.

UNIT-I

Sources of Energy : Introduction and application of energy sources like fossil fuels, hydal, solar, wind, nuclear fuels and bio-fuels; environmental issues like global warming and ozone depletion.

Basic concepts of Thermodynamics: Concept of system, Process & Properties, Laws of thermodynamics, Steady flow energy equation for an open system, Second law statements, concept of Heat Engine, Heat Pump & Refrigerator, Concept of entropy.

UNIT-II

Heat Transfer: Basic modes of heat transfer, Fourier's law of conduction, Newton's law of cooling, and Stefan Boltzmann law of radiation. Mechanism of heat transfer and governing equations.

Heat exchangers, Applications of heat exchangers in industry .Analysis of parallel flow and counter flow heat exchangers.

UNIT-III

Introduction to Design of machine elements: Definition, Classifications of Machine Design, General Considerations in Machine Design, simple stresses in machine parts, manufacturing considerations in Machine design, Design of Shafts & keys

Belt drives: Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive, ratio of tension in flat belt drives, advantages and disadvantages of V belts and timing belts, simple

numerical problems.

Gear drives Types–spur, helical, bevel, worm and rack & pinion, velocity ratio, advantages and disadvantages over belt drives, simple numerical problems on velocity ratio.

UNIT-IV

Basic Manufacturing Processes

Welding: Definition of Welding, Types of welding processes. Brief description of important welding processes like: Arc welding, GMAW, GTAW, Gas welding & Resistance welding.

Brazing: Definition, principle of operation, Advantages and Disadvantages and Applications

Soldering: Definition, principle of operation, Advantages and Disadvantages and Applications

UNIT-V

Casting: Basic concepts of casting process. Principle, process and applications of sand and die casting processes.

Forming: Basic concepts of metal forming processes: Extrusion, rod/wire drawing and rolling.

Machining: Working mechanism of Lathe, Milling and Grinding machines.

Text Books:

1. Thermal Engineering, RK. Rajput, Laxmi Publications Tenth Edition (2018)
2. Design of Machine Elements, V B Bandari, McGraw Hill Publications, Fourth Edition (2017)
3. Manufacturing Technology, Vol-1 by P. N. Rao, McGraw Hill Publications, Fifth Edition (2018)

References:

1. Thermal Engineering, Dr.Sadhu Singh & Sukumar Pati, Pearson Publication First Edition (2018)
2. Heat & Mass transfer by D.S.Kumar, SK Kataria & Sons, First Edition (2020)
3. Design of Machine Elements, Dr.Sadhu Singh, Khanna Publishers, Fifth Edition (2017)
4. Production Technology 4ED by Pakirappa First Edition (2015)

Course code	Course Title	Core/ Elective					
		Core					
		L	T	P/D	Credits	CIE	SEE
5BS153HS	Chemistry Lab	0	0	3	1.5	40	60

Prerequisite: Higher secondary level Chemistry

Course Objectives: The objective of this course is to make the student

- Conduct experiments, take measurements and analyze the data through 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 Objectives: After completion of the course, the student will be able to

- CO151.1. Apply the principles of volumetric analysis in quantitative estimations.
- CO151.2. Analyse the parameters of water by titration method.
- CO151.3. Understand the principle, concept, working and applications of Conductivity Meter to determine the concentration of chemicals.
- CO151.4. Understand the principle, concept, working and applications of Potentiometer to determine the concentration of chemicals.
- CO151.5. To apply the law for determining the concentration of a given chemical.

List of Experiments

1. Introduction to Chemical Analysis and Techniques of Weighing.

Volumetric Analysis:

2. Preparation of Standard Mohr's salt solution, Standardization of KMnO_4 and estimation ferrous ion.
3. Preparation of Standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution, Standardization of Mohr's Salt Solution and estimation of dichromate ion. ($\text{Cr}_2\text{O}_7^{2-}$)

Complexometry

4. Preparation of Standard Magnesium sulphate solution, standardization of EDTA and estimation of Total Hardness of water. Preparation of Standard Sodium Carbonate Solution, Standardization of HCl and Estimation of Carbonate and Bicarbonate Alkalinity of water sample.

Conductometry:

5. Estimation of HCl by conductometry.

Potentiometry

6. Estimation of HCl by potentiometry (acid base titration)
7. Estimation of Fe^{2+} by potentiometry (redox titration)

pH metry

8. Estimation of HCl by P^HMetry.
9. Colorimetry
10. Verification of Beers Law using potassium permanganate and estimation of amount KMnO₄ in the given sample solution.

List of Additional Experiments

1. Estimation of CH₃COOH by conductometry

References :

1. B.D. Khosla, A. Gulati and V. Garg , —Senior Practical Physical Chemistry, R. Chand & Co., Delhi, 2011.
2. K. K. Sharma and D.S. Sharma , —An Introduction to Practical Chemistry, Vikas publishers, New Delhi, 1982.

Course code	Course Title	Core/ Elective					
		Core					
5HS151HS	English Lab	L	T	P/D	Credits	CIE	SEE
			0	2	1	40	60

Prerequisite: Understanding of the English Alphabet and the Corresponding Sounds

Course Objectives: The objective of this course is to enable the student to :

- Learn the Sound Systems, Word Stress, Intonation of English
- Gain the knowledge of the appropriate use of Language and Body Language
- Acquire the Techniques to Participate in Group Discussions
- Hone their Participation and Presentation Skills
- Comprehend how Interviews are conducted and faced

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

- Enhance Pronunciation, Stress, Intonation and Articulation Skills
- Speak the Language coherently, with a lesser MTI
- Employ Language and Body Language intelligibly
- Engage in Group Discussions efficiently
- Prepare and Produce Decent Presentations to Fare, Well in Interviews

LIST OF EXPERIMENTS

1. **Ice-Breaking Session**
2. **Introduction to English Phonetics :** Organs of Speech : Speech Mechanism
3. **Sounds of English :** Introduction to International Phonetic Alphabet, Classification and Description of English Phonetic Sounds – Vowel Sounds & Consonant Sounds; Minimal Pairs; The Syllable
4. **Word Stress :** Primary Stress, Secondary Stress, Functional Stress, Rules of Word Stress
5. **Intonation :** Major Patterns of Intonation in English
6. **Speaking Activity: JAM :** an impromptu speech where the speaker is supposed to express the idea (s) on the given topic, within the duration of a **minute**.
7. **Role Play:** Use of dialogues in a variety of situations and settings
8. **Group Discussion:** Initiating, continuing and concluding a GD, Components and Types of GDs,
9. **Power-Point Presentation: (General Topics)** Making effective presentations, Expressions which can be used in presentations, Use of non-verbal communication, Coping with stage fright, Handling questions and answer session

10. **Interview Skills:** Facing interviews confidently, Use of suitable expressions during interviews; Mock interviews

Text Books :

T1. E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD)*. Revised edition, Cambridge University Press India Pvt. Ltd. 2014

Reference / Suggested Reading :

- R1. T. Balasubramanian. *A Text book of English Phonetics for Indian Students*. Macmillan, 2008.
- R2. Edgar Thorpe. *Winning at Interviews*. Pearson Education, 2006.
- R3. J. Sethi et al., *A Practical Course in English*
- R4. Pronunciation (with CD). PrenticeHall of India, 2005.
- R5. Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews*. TataMcGraw Hill, 2006.

Course code	Course Title	Core/ Elective					
		Core					
		L	T	P/D	Credits	CIE	SEE
5ES152ME	Engineering Workshop Practice	0	0	4	2	40	60

Prerequisite: Practical skill

Course Objectives: The objective of this course is to make the student

- 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 basic knowledge on various manufacturing processes used for the production of various engineering products.
- To gain hands on exposure on computer hardware and working knowledge on computers and software.

Adopt safety practices while working with various tools.

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

- **CO.1.** Identify and demonstrate the usage of different tools to be used in various manufacturing trades with safety measures.
- **CO.2.** Apply the skills developed to undertake the jobs connected to various engineering workshop trades including fitting, carpentry, sheet metal, house wiring, welding, and foundry.
- **CO.3.** Demonstrate the knowledge of various machine tools and their operations such as machining, injection moulding, casting and 3D printing and basic electronics lab instruments.
- **CO.4.** Illustrate the advanced machining processes like CNC, rapid prototyping.
- **CO.5** Apply the basic knowledge of computers to assemble and disassemble various components of computer and able to install various operating systems such as windows or Linux.

LIST OF EXPERIMENTS

A. TRADES FOR EXERCISES:

At least two exercises to be done from each trade.

1. **CARPENTRY:** Sawing and Grooving, T-lap joint, Dove-tail Joint.
2. **FITTING:** Step Cutting & Filing, Drilling & Tapping, V-Fitting
3. **HOUSE WIRING:** Parallel & Series, Two-Way Switch, Tube light

Connections.

4. **SHEET METAL WORKING:** Open Scoop, Funnel, Rectangle Tray.
5. **BLACK SMITHY:** Upsetting, Fullering, S-Hook
6. **WELDING:** Lap joint, Single V-butt joint, Corner joint
7. **PLUMBING:** Practice of Internal & External Pipe Threading, Pipe Fitting, Tap and Shower connections.

B. TRADES FOR DEMONSTRATION AND EXPOSURE:

1. Machines (lathe and drilling)
2. Injection Molding
3. Mould making and Casting
4. Basic Electronics Lab Instruments
5. 3D Printing

C. PRESENTATIONS AND VIDEOS LECTURES:

1. Manufacturing Methods
2. Glass Cutting
3. 3D Printing
4. CNC Lathe

D. IT-WORKSHOP: Computer hardware, Identification of parts, disassembling and assembling of computer to working condition. Operating System Installation

Text Book:

1. P. Kannaiah, K.L.Narayana “Workshop Manual” Scitech Publications; 2nd Edition.

References:

1. Venugopal,K, “Workshop Manual”, Anuradha Publications; 2012th edition.
2. K.C.John, “Mechanical Workshop” 2nd Edition, PHI, 2010.
3. Hajra Choudhury, “Elements of Workshop Technology” Vol.1, Asian Publishers, Edu., 2010.

Course code	Course Title	Core/ Elective					
		Core					
		L	T	P/D	Credits	CIE	SEE
5BS202HS	Engineering Mathematics – II	3	1	0	4	40	60

Prerequisite: Basics of Differentiation, Integration and Trigonometric results.

Course Objectives: The objective of this course is to make the student

- Study the concepts of sequences, series, and their properties.
- Provide the over view of ordinary differential equations of first order and their application to mathematical problems.
- Solving higher order ordinary differentiation by various mathematical methods.
- Evaluate improper integrals using Beta and Gamma functions
- Study Laplace transforms and its applications to differential equations.

Course Outcomes:

After completion of the course, the student will be able to

- **CO1.** To Test for the convergence and divergence of infinite series using the comparison test, Ratio test, Cauchy's nth root test, Leibnitz's test, and also analyzing the nature of series.(PO1, PO2).
- **CO2.** Solve the ordinary differential equations of first order and their physical and geometrical applications. (PO1, PO2, PO3)
- **CO3** Solve the ordinary differential equations of second and higher with constant and variable coefficient by different methods. Solution of non-homogeneous equations, Euler-Cauchy equation. Method of variation of parameters.(PO1, PO2,PO3)
- **CO4** Evaluate the improper integrals using beta and gamma functions. Solution of Legendre polynomials.(PO1, PO2,PO3)
- **CO5** Evaluate Laplace Transforms, Inverse Laplace Transforms of functions and their applications to ordinary differential equations. (PO1, PO2,PO3)

Unit-I (10Hrs)

Sequence and series: Sequences—General properties of series, Series of positive terms, Comparison test, tests of convergence- D'Alembert's Ratio test, Cauchy's nth root test, Raabe's test, Logarithmic test, Alternating series, Series of positive and negative terms, Absolute convergence, and Conditional convergence.

Unit-II (10Hrs)

Differential Equations of First Order: Exact Differential Equations, Integrating Factors, Linear differential Equations,

Bernoulli's Equation, Riccati's and Clairaut's differential equations, Orthogonal Trajectories of a Given Family of Curves, Applications of differential equations-L-C,L-R circuit.

Unit-III (12Hrs)

Differential Equations of Higher Order: Solutions of second and higher order linear Homogenous Equations with Constant Coefficients, Solutions of non-homogeneous linear differential equations, Method of Variation of Parameters, solution of Euler-Cauchy Equation, Applications of differential equations-L-CR circuit.

Unit-IV (8Hrs)

Special functions: Gamma Function, Beta Function, Relation between Gamma and Beta Functions, Error Function, Power Series Method, Legendre's Differential Equations and Legendre's Polynomial $P_n(x)$, Orthogonal property of Legendre's Polynomial Rodrigue's Formula (with proof).

Unit-V (10Hrs)

Laplace Transforms: Laplace Transforms, Inverse Laplace Transforms, Properties of Laplace Transforms and inverse Laplace Transforms, Convolution Theorem (without proof). Solution of ordinary differential Equations using Laplace Transforms.

TEXT BOOKS:

- T1. Dr.B.S. Grewal, Higher. Engineering Mathematics, Khanna Publications, 43rd Edition,2014. (Unit 1-5)
- T2. Advance Engineering Mathematics by Jain and Iyengar,5th Edition, Narosa Publications (Unit 1-5)
- T3.B. V. Ramana, Higher Engineering Mathematics,3rd Edition 2015. (Unit 1-5)

REFERENCES/ SUGGESTED READING:

- R1. M.D Raisinghania, Ordinary Differential Equations, 11th Revised Edition
- R2. S.S. Sastry, Engineering Mathematics, 3rd Edition, Paperback
- R3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9th Edition, 2012.
- R4. Peter. V. O' Neil, Advance Engineering Mathematics,' Publisher, Global Engineering 7th Edition, 2012

Course code	Course Title	Core/ Elective					
		Core					
5BS204HS	APPLIED PHYSICS	L	T	P/D	Credits	CIE	SEE
				3	1	0	4

Prerequisite: Basics of electron theory, Semiconductors, magnetic materials, basics of black body radiation.

Course Objectives: The objective of this course is to make the student

- Familiarize with classical and quantum electron theories and use band theory to classify solids.
- To explain various types of semiconductors and their applications.
- Understand the properties of dielectric and Magnetic materials.
- Understand the Superconductivity phenomena and explain the dual nature of the particles.
- Know the construction of lasers and optical fibers and apply their basic principles to various laser systems and optical fibers
- Acquire knowledge of preparation of thin films and basic concepts of Nano materials

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

- Classify solids based on their energy band structures. Identify semiconductors for engineering applications.
- Classify magnetic and dielectric materials
- Explain the fundamental concepts on superconductivity and Quantum behavior of matter waves.
- Explain the lasing action in lasers, propagation of light in optical fibers and compile their applications different fields.
- Knowledge about preparation of thin film and Nano material, this helps the students to prepare new materials.

Unit-I: (11 Hrs)

Band theory of solids: Classical free electron theory and its limitations, Band theory – Kronig penny model (qualitative treatment), Energy bands in solids, Classification of materials as conductors, semiconductors and insulators.

Semiconductors: Introduction, Intrinsic and extrinsic semiconductors, carrier concentration and conductivity in intrinsic semiconductors, formation of P-N junction diode and its I-V characteristics, Thermistor, Hall effect and its applications.

Unit-II: (11 Hrs)

Dielectric materials: Introduction, Types of dielectric polarizations – Expression for electronic polarizability, Frequency and temperature dependence of dielectric polarizations, Determination of dielectric constant by Capacitance bridge method, Ferroelectricity – Structure of Barium Titanate – Applications of ferroelectrics.

Magnetic materials: Introduction, Magnetization, Magnetic Flux, Magnetic Susceptibility, Classification of magnetic materials – Dia, para, ferro, antiferro and ferri magnetic materials. Ferrites - properties and its applications, Domain theory of

Ferromagnetism, Hysteresis curve, Soft and hard magnetic materials and their applications.

Unit-III: (10 Hrs)

Superconductivity: Introduction, General properties of superconductors- persistent current, critical current, critical magnetic field, critical temperature, Meissner effect, Type I and Type II superconductors, Applications of superconductor, BCS theory (qualitative), High Temperature superconductors and its applications.

Quantum Mechanics: Introduction to Planck's Theory, de-Broglie's concept – wave nature of particles (Debroglie wavelength), properties of wave function and its physical significance, Schrodinger's Time independent and Time dependent wave equations, Application of Schrodinger's Time independent - Particle in a 1D box.

Unit-IV: (9 Hrs)

Lasers: Characteristics of Lasers – monochromatic, directionality, coherence, divergence, Basic concepts of transitions - absorption, spontaneous and stimulated emissions, Einstein's theory of matter and radiation interaction (A & B coefficients), Concepts of meta stable states, population inversion and pumping, Components of lasers, Types of lasers- Ruby laser, He-Ne laser, Semiconductor laser and Applications of laser.

Fiber optics: Introduction to Optical fiber, structure of an optical fiber, Basic principle – total internal reflection, Concept of Numerical Aperture (NA) and acceptance angle, Derivation of Numerical Aperture, Types of optical fibers – Step Index and Graded Index fibers (w.r.t to refractive index and mode of propagation), Fiber drawing process (Double crucible method), Applications of optical fibers.

Unit-V: (9 Hrs)

Thin Films: Distinction between bulk and thin films – Thin films preparation Techniques- Thermal evaporation method, Electron beam evaporation method, Pulsed laser deposition, Solar cell- Construction, working – and its applications.

Nano materials: Introduction, Properties of materials at reduced size, Surface to volume ratio at Nano scale, Classification of Nano materials, Preparation of Nano materials – Bottom-up methods (sol-gel & CVD) and Top-down method (ball milling), Basic ideas of carbon nanotubes, Applications of Nano materials and their health hazards

Text Books:

- T1. S.L.Gupta and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai publications, 2011 Edition, Reprint 2012.(Unit 1-4)
- T2. B.K.Pandey and S.Chaturvedi, Engineering physics, Cengage Publications, 2012, 1st Edition. (Unit 1-5)
- T3. M.N.Avadhanulu, P.G. Kshirsagar and TVS Arun Murthy, A Text Book Engineering Physics, 11th Edition, S.Chand, 2018.(Unit 1-4).

References/ Suggested Reading

- R1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition Paperback – 1 January 2019
- R2. V. Raghavan, Materials Science and Engineering, Prentice Hall India Learning Private Limited; 6th Revised Edition, 2015.
- R3. K.L. Chopra, Thin film Phenomena, New York, McGraw – Hill, 1969.

Course code	Course Title	Core/ Elective					
5ES203CS	Programming for Problem Solving	Core					
		L	T	P/D	Credits	SEE	CIE
		3	0	0	3	40	60

Prerequisite: Mathematical Knowledge, Logical and Analytical Thinking

Course Objectives: The objective of this course is to make the student

- To introduce the basic concepts of Computing environment, algorithms and flowcharts
- To acquire knowledge about the basic concept of writing a program
- To understand modular and structured programming constructs in C
- To learn the usage of structured data types, data handling and memory management using pointers

Course Outcomes:

After completion of the course, the student will be able to

1. Formulate algorithms and learn fundamental program methodologies of C programming.
2. Understand control statements and interpret derived data types with mathematical and engineering problems.
3. Develop modular programming techniques to solve searching, sorting and file system problems
4. Recognize pre-processor directives and user defined usage..

Unit I (11) Introduction to Computers: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Algorithm, Flowchart / Pseudo code with examples
 Introduction to C Language: History of C, Features, Structure of C program, Character set, Tokens, Variables, Data types, I/O statements, Type conversion Syntax and Logical Errors in compilation, object and executable code.

Unit – II (11)

Operators and Control Structures: Operators, Operator precedence, Arithmetic expressions, Conditional Branching and Loops, Writing and valuation of conditionals and consequent branching

Arrays: Arrays (1-D, 2-D), Strings and its library functions.

Unit – III (10)

Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble and Selection).

Functions: Functions, storage classes, Parameter passing techniques Passing arrays to functions, Recursion Concept, Command line arguments.

Unit – IV (10)

Pointers: Idea of pointers, Defining pointers, array of pointers, pointer arithmetic, dynamic memory allocation,

Structure: Structures, Defining structures and Array of Structures, self – referential structures, Unions concept, Functions and structures, Enum, Bitfields.

Unit – V (8)

Pre-processor Directives: File Inclusion, Macros Substitutions, Conditional Compilation.

File Handling: Introduction to File Handling, Types of files, File operations, File input/output statements.

Text Books:

- T1. Computer Science A structured programming approach using C, Behrouz A. Forouzan and Richard F. Gilberg , Cengage Learning , 2007 ,Third Edition (Unit 1-5)
- T2. Schaum's Outline of Programming with C, Byron Gottfried, McGraw-Hill 2019, Fourth Edition (Unit 1-5)
- T3. Data Structures and Program Design in C, Robert Kruse, Bruce Leung, Tondo, Pearson, II Edition

References/ Suggested Reading

- R1. C Programming Language, Brian W Kenningham, Dennis M Ritchie, Pearson, II Edition
- R2. How to solve it by Computer, R G Dromey, Pearson Edition

Course code	Course Title	Core/ Elective					
		Core					
		L	T	P/D	Credits	SEE	CIE
5ES203EE	ELEMENTS OF ELECTRICAL ENGINEERING	3	0	0	3	40	60

Prerequisite: Basic elements of networks and Physics.

Course Objectives: The objective of this course is to make the student

- Familiarize with electrical networks, circuits and different Laws used to solve electrical circuits.
- Understand various network reduction techniques to analyze electrical circuits.
- To explain the working principles of Electrical Machines and transformers.

Course Outcomes After completion of the course, the student will be able to

- CO.1 Analyze AC & DC electrical circuits to compute
- Various parameters of electrical energy.
- CO.2 Analyze complex electrical circuits with the help of different network theorems.
- CO.3 Analyze DC & AC Transients with the help of various networks and to understand the resonance concepts.
- CO.4 Understand the working principles of Electrical DC Machines.
- CO.5 Understand the working principles of electrical AC machines.

Unit-I: (07 Hrs.)

Introduction to Electrical Circuits: Circuit Concept, Electrical circuit elements (R, L and C), Voltage and Current Sources, Independent and Dependent Sources, Time, frequency domain and Phasor domain Representation, Power fundamentals (real power, reactive power, apparent power, power factor), Ohm's Law, Kirchhoff's Laws, Source Transformation, Nodal & Mesh Analysis, Duality, dot Convention, Magnetic Coupling, Numerical Problems.

Unit-II: (07 Hrs.)

Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, Milliman's, Tellegen's theorems, Numerical Problems on ac and dc circuits.

Unit-III: (08 Hrs.)

AC & DC Transients and Resonance: AC & DC Transients for R-L, R-C,

R-L-C Circuits, Series Resonance, Parallel Resonance, Numerical Problems.

Unit-IV: (8 Hrs)

DC Machines: DC Generators - Dynamically induced e.m.f, Fleming'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: (09 Hrs)

AC Machines: Transformers-Electromagnetic induction, Faradays laws, statically induced e.m.f, Lenz law, B-H 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.

Text Books:

- T1. Fundamentals of Electric Circuits, Charles k. Alexander and Matthew N. O. Sadiku, Tata McGraw Hills Education, Edition 3, 2013 .(Unit 1-3)
- T2. J.B. Gupta, Fundamentals of Electrical Engineering and Electronicsl S.K. Kataria& Sons Publications, 2002.Unit (1-5)

References/ Suggested Reading:

- R1. "Electrical Technology", B.L. Theraja, A.K. Theraja, Volume-II,S. Chand & Co. Ltd.
- R2. "Fundamentals of Electrical Engineering and Electronics", J.B. Gupta, S. K. Kataria. & Sons Publications, 2002.
- R3. Electrical Circuit Analysis, William H Hayt and Jack Kemmerly , 8th Edition, 2014 (Unit 1-3)
- R4. Circuit Theory Analysis and Synthesis by Abhijit Chakrabarti,Dhanpat Raj & Co., 2018.(Unit 1-3)
- R5. N.K. De, Basic Electrical Engineeringl, Universities Press, 2015. (Unit 1-5)
- R6. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, - Basic Electrical Engineering,Tata McGraw Hill, Publications, 2009. (1-5)

Course code	Course Title	Core/ Elective					
		Core					
		L	T	P/D	Credits	SEE	CIE
5MC201CE	Environmental Science	2	0	0	0	40	60

Prerequisite:

Course Objectives: The objective of this course is to make the student

- Describe various types of natural resources available on the earth surface.
- Explain the concepts of an ecosystem and the biotic and abiotic components of various aquatic ecosystems.
- Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity.
- Explain the causes, effects and control measures of various types of environmental pollutions.
- Describe the methods for water conservation, the causes, effects of global warming, climate change, acid rain, ozone layer depletion, population explosion.

Course Outcomes After completion of the course, the student will be able to

- **CO.1.** Describe the various types of natural resources.
- **CO.2** Differentiate between various biotic and abiotic components of ecosystem.
- **CO.3** Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India.
- **CO.4** Illustrate causes, effects, control measures of various types of environmental pollutions.
- **CO.5** Explain the methods of water conservation, causes, effects of climate change, global warming, acid rain and ozone layer depletion, population explosion.

Unit-I: (08 Hrs)

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, need for public awareness.

Natural Resources: Water Resources – Use and over utilization of surface and ground water, flood, drought, conflicts over water, Dams: Benefits and Problems. Food Resources – World Food Problems, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, Forest Resources – Use and over exploitation, deforestation & its effect on tribal people. Land Resources – Land Degradation, environmental effect of mining, man induced landslides, soil erosion and desertification. Energy Resources – Growing energy needs, Renewable and Non-renewable energy resources.

Unit-II: (06 Hrs)

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in ecosystem, food chains,

ecological pyramids, ecological succession, types of ecosystems (marine, pond, river, forest, grassland, desert)

Unit-III: (06 Hrs)

Biodiversity: Levels of Biodiversity, Bio-geographical classification of India, Value of biodiversity, Threats to biodiversity, endangered and endemic species of India, Conservation of biodiversity, global and national efforts.

Unit-IV: (07 Hrs)

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, solid waste management.

Environment Protection Act: Air, water, forest and wildlife Acts, issues in the enforcement of environmental legislation

Unit-V: (06 Hrs)

Social Issues and the Environment: Watershed management and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle and disaster management in India.

Field Work:

- Visit to local area to document environmental issues
- Visit to a local polluted area- market/slum area/Industrial area/traffic area

Text Books:

- T1. Deswal S. and Deswal A., A Basic Course on Environmental studies, Dhanpat Rai & Co Pvt. Ltd. 2018. (Unit 1-5)
- T2. Perspectives In Environmental Studies, Anubha Kaushik & C.P Kaushik, New Age International Publishers, 6th Edition 2018). (Unit 1-5).

References/ Suggested Reading

- R1. Benny Joseph, —Environmental Studies”, Tata McGraw Hill (3rd Edition, 2017).
- R2. Suresh K. Dhameja, Environmental Studies, S.K. Kataria & Sons, 2010.
- R3. Rajagopalan R., Environmental Studies, Second Edition, Oxford University Press, 2013.
- R4. V.K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE, 1999.
- R5. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

Course code	Course Title	Core/ Elective					
		Core					
		L	T	P/D	Credits	CIE	SEE
5BS251HS	Applied Physics Lab	0	0	3	1.5	40	60

Prerequisite: Higher secondary level Physics

Course Objectives: The objective of this course is to make the student

- Apply the theoretical knowledge in doing practical experiments.
- Acquire skills to handle instruments.
- Understand the behavior of semiconductors and opto-electronic devices.
- Analyze errors in experimental data.
- Plot graphs between different physical parameters.

Course Objectives: After completion of the course, the student will be able to

- **CO.1.** Develop analytical/experimental skills and impart prerequisite hands-on experience for engineering laboratories.
- **CO.2.** Understand the need for precise measurement practices for data recording.
- **CO.3.** Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations.
- **CO.4.** Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics
- **CO.5** Acquire knowledge in communication skills through working in groups in performing the laboratory experiments and by interpreting the results

LIST OF EXPERIMENTS

1. Determination of wavelength of laser using diffraction grating.
2. Determination of Numerical Aperture (NA) and Acceptance angle of an optical fiber
3. To find the dielectric constant of a given material
4. To draw the I-V characteristics of solar cell and to calculate fill factor.
5. To draw the I-V characteristics of P-N junction diode and to evaluate series resistance in forward and reverse bias conditions.
6. To determine the rigidity modulus of the material of the given wire using Torsional Pendulum.
7. To study the Thermistor characteristics, determine the constants A and B.
8. To find the value of energy gap of a given semiconductor.
9. To draw the curve between the magnetic field and Intensity of magnetization for a given specimen and to find out Coercivity and Retentivity of the specimen.
10. Determination of carrier concentration, mobility and Hall co-efficient in a semiconductor using Hall Effect experiment.

Note: A minimum of eight experiments to be done.

References:

- R1. S.L.Gupta and Dr.V.Kumar, "Practical physics with viva voice", Pragati Prakashan Publishers, Revised Edition, 2009
- R2.M.N.Avadhanulu, A.A.Dani and Pokely P.M, "Experiments in Engineering Physics", S.Chand &Co,2008

Course code	Course Title	Core/ Elective					
		Core					
		L	T	P/D	Credits	CIE	SEE
5ES251CS	Programming for Problem Solving Lab	0	0	2	1	40	60

Prerequisite: Mathematical Knowledge, Logical and Analytical Thinking

Course Objectives: The objective of this course is to make the student

- 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: After completion of the course, the student will be able to

- Choose appropriate data type for implementing programs in C language
- Design and implement modular programs involving input output operations, decision making and looping constructs
- Apply derived data types and implement programs to store data in structures and files
- Develop confidence for self-education and ability towards lifelong learning need of computer languages

LIST OF EXPERIMENTS

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. Generating Pascal triangle, pyramid of numbers.
4. Factorial, Fibonacci, GCD recursive and non-recursive procedures
5. Linear search and binary search using recursive and non-recursive procedures.
6. Bubble sort and selection sort.
7. Matrix addition and multiplication using arrays,
8. Programs on pointers: pointer to arrays, pointer to functions.
9. Programs on structures, union, enum and string manipulations.
10. File handling programs (Reading, Writing, Copying files)
11. Program illustrating using Command Line Arguments

Course code	Course Title	Core/ Elective					
5ES252EE	Elements of Electrical and Electronics Engineering Lab	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	2	1	40	60
<p>Prerequisite: Basics of networks, circuits, and Semiconductors devices.</p> <p>Course Objectives: The objective of this course is to make the student</p> <ul style="list-style-type: none"> ➤ Impart the practical knowledge and analysis of on electrical circuits, theorems and transformers. ➤ Impart the practical knowledge on testing of DC and AC Machines and the usage of common electrical measuring instruments. <p>Course Outcomes:</p> <p>After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> ➤ CO.1. Justify the statements of basic electrical circuits. ➤ CO.2. Examine the performance of different electrical machines. ➤ CO.3. Identify the electrical machines requirements. ➤ CO.4. Find the response of different electrical circuits. ➤ CO.5. Determine parameters and testing of electrical machines and equipment 							
<ol style="list-style-type: none"> 1. Verification of KVL and KCL. 2. Verification of Thevenin's and Norton's theorems. 3. Verification of superposition and Maximum Power transfer theorems. 4. Verification of Milliman's and Tellegen's theorems. 5. Series and Parallel Resonance- calculation of Bandwidth and Q-factor. 6. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification of phase differences between current and voltage and Power factor calculation. 7. OCC characteristics of DC Generator. 8. Load Test of DC Motor. 9. Loading of a transformer: measurement of primary and secondary voltages and currents, and power. 10. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line- line voltage, phase-to-neutral voltage, line and phase currents). 11. Measurement of phase voltage/current, line voltage/current and power in a balanced three-phase circuit connected in star and delta. 							

11. Polarity test on transformer.
12. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal
By change of phase-sequence of connections.
12. Transformers: Observation of the no-load current waveform on an oscilloscope (non- Sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics).

Note: A minimum of ten experiments to be done.

References:

- R1. J.B.Gupta, - Fundamentals of Electrical Engineering and Electronics, S.K. Kataria & Sons. Publications, 2002.
- R2. J.B. Gupta, - Utilization of Electric Power and Electric Traction, S.K. Kataria & Sons Publications, 2010.
- R3. Satish Kumar Peddapelli, G. Sridhar, - Electrical Machines – A Practical Approach, De Gruyter Publications, 2020.
- R4. Hughes, - Electrical Technology", 7th Edition, International Student -on, Addison Welsey Longman Inc, 1995.

Course code	Course Title	Core/ Elective					
5ES252CE	Engineering Graphics Lab	Core					
		L	T	P/D	Credits	CIE	SEE
		1	0	4	3	40	60

Prerequisite:**Course Objectives: The objective of this course is to make the student**

- To inculcate a good understanding of engineering drawing conventions & their significance.
- To impart skills to make technical drawings.
- To impart capability to identify and draw engineering curves to scale.
- To develop skills of drafting projections of standard geometric entities (points, lines, planes, solids with section).
- To develop 3D visualization skills to understand 2D drawings in 3D space & vice versa

Course Outcomes:

- After completion of the course, the student will be able to
- **CO-1.** Use appropriate instruments and apply the engineering conventions to draw engineering objects to scale on a drawing sheet. (PO1, PO5)
- **CO-2.** Make use of AutoCAD software to draft engineering curves like conics, involutes & cycloids. (PO1, PO5)
- **CO-3.** Make use of AutoCAD software to draft projections of lines, planes, solids and determine unknown lengths & angles in lines. (PO1, PO5)
- **CO-4.** Make use of AutoCAD software to draft sections of solids and development of surfaces. (PO1, PO5)
- **CO-5.** Convert isometric views to orthographic & vice versa. (PO1, PO5)

Sheet No	Description of the Topic	Contact Hours	
		Lecture	Drawing
1.	Principles of Engineering Graphics and their significance, Usage of drawing instruments. Lettering	1	2
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.	1	2
4.	Cycloids (cycloid & epicycloid) and	1	2

	Involutes (involute of triangle, square & circle)		
5.	Scales (plain & diagonal scales)	1	2
6.	Introduction to AutoCAD Basic commands and simple drawings.	1	2 + 2
7.	Orthographic Projections - Projections of points placed in different quadrants.	1	2
8.	Projections of straight lines. Lines parallel to both the planes, line perpendicular to or inclined to one reference plane, Line inclined to both the reference planes.	1	2+2
9.	Projections of planes – I: Orthographic projection of planes in different positions	1	2+2
10.	Projections of solids – I: Regular Prism/Pyramids, cylinders & cones, Projections of solids in simple positions.	1	2
11.	Projection of solids – II: Projections of solids when the axes inclined to one or both the reference planes.	1	2
12.	Section of solids – I: When the sectional plane is parallel or perpendicular to one reference plane.	1	2
13.	Section of solids – II: When the sectional plane is inclined to one reference plane.	1	2
14.	Development of surfaces-I Prism and Cylinders	1	2
15.	Development of Surfaces-II Pyramids and Cones	1	2
16.	Isometric projection – I: Conversion of 3D Isometric/oblique views of compound solids to 2D Orthographic views	1	2

17.	Isometric projection – II: Isometric projection of Stacked regular solids" regular solids being prisms, pyramids, spheres & their frustum	1	2
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Note: A minimum of Fourteen Drawing Work Sheets to be completed.

Text Books:

- T1. Engineering Drawing, ND Bhatt, Charotar Publication, 53rd Edition, 2014 (All sheets)
- T2. Engineering Drawing, KL Narayana & P Kannaya, Scitech publications, 3rd Edition, 2013 (All sheets)

References:

- R1 Engineering Drawing and Graphic Technology, T.E French et al, Mc Graw Hill International, 14th Edition, 2012
- R2. Engineering Drawing Graphics & AutoCAD, K Venugopal, New Age International, 5th Edition, 2009
- R3: Engineering Drawing with a primer on AutoCAD, AN Siddique et al, Prentice Hall of India Ltd., Eastern Economy Edition, 2004
- R4: Engineering Drawing, Basant Agrawal & C M Agrawal, McGraw Hill Publications, Third edition 2019