SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) *(2023 Pattern)*

Sem-I

2301101: Engineering Mathematics -I

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 3 hrs/week	**Th:03**	**Theory**	**CIA: 50**
			End-Sem:50
		Pract:	--
		Oral:	--
		Termwork	--

Course Objectives: The student should be able to

1. Convert given complex number into polar form.
2. Understand and distinguish Mean Value Theorems, Define Taylor's and Maclaurin's series, know the indeterminate forms.
3. Define and understand functions of several variables.
4. Know the concept and properties of Jacobian.
5. Compare different forms of matrix.
6. Acquire the knowledge of Eigen values and Eigen vectors.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Solve Algebric equations using De-Moivre's theorem.

CO2: Apply Mean Value Theorems for solving examples and Taylor's and Maclaurin's series to find the expansions of functions.

CO3: Apply Euler's theorem on Homogeneous functions to find partial order derivatives .

CO4: Discuss maxima and minima of functions of two variables.

CO5: Solve examples of rank, nullity and inverse of a matrix.

CO6: Apply Cayley Hamilton theorem to find inverse of a matrix.

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) *(2023 Pattern)*

Sem-I

2301101: Engineering Mathematics- I

Unit 1:Complex Number **6 hrs**	**CO**
Complex numbers and their applications: Revision of complex numbers, Argand diagram, Polar form of complex number, Euler's theorem, De-Moiré's Theorem (without proof), Roots of algebraic equations.	CO1
Hyperbolic functions, Inverse hyperbolic functions, Separation into real and imaginary parts	
Unit 2: Differential Calculus **7 hrs**	CO2
Mean Value Theorems : Rolle's Theorem , Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorems	
Expansion of Functions: Taylor's series and Maclaurin's series, Expansion of functions using standard expansions.	
Indeterminate Forms: L Hospital's Rule, Evaluation of Limits.	
Unit 3:Partial Differentiation **8 hrs**	CO3
Introduction to functions of two and three variables, Partial Derivatives, Euler's Theorem on Homogeneous functions, Partial derivative of composite function.	
Unit 4: Applications of Partial Differentiation **6 hrs**	CO4
Jacobian , Errors and Approximations	
Maxima and Minima of functions of two variables.	
Unit 5: System of Linear Equations **8 hrs**	CO5
Rank of a Matrix, System of Linear equations, Linear Dependence and Independence.	
Linear and Orthogonal Transformations.	
Unit 6: Linear Algebra **7 hrs**	CO6
Eigen values and Eigen vectors, Cayley Hamilton Theorem, Diagonalization of a matrix.	

Recommended books

1. Basic Engineering Mathematics Volume 2 – H.K.Dass , Dr. Rama Verma.
2. Wiley C. R "Advanced Engineering Mathematics" Mc Graw Hill Inc.,New York Ed.1993.
3. Higher Engineering Mathematics by B. V.Ramana (Tata McGraw Hill).
4. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference books

1. B. S. Grewal, Higher Engineering Mathematics, 43rd edition, Khanna Publishers.
2. R. K. Jain, S. R. K. Iyengar, Advanced Engineering Mathematics, 2nd Edition, Narosa Publishing House
3. Amit Sharma, Vijay Kumar, Naveen Mani, Reeta Bhardwaj, A Text Book of Applied Mathematics I, Bharti Publication (P) Ltd., New Delhi
4. David E. Penney and C. Henry Edwards , Single variable calculus, Prentice Hall; 6th edition , 2002.

LIST OF ASSIGNMENTS (CIA-1)

1. Find the roots of Algebric equations using De- Moivre's theorem.
2. Verify Mean Value Theorms and to evaluate limits using L Hospital's rule.
3. Apply Euler's theorem on Homogeneous functions to find partial order derivatives.
4. Find approximate error and find maxima and minima of functions of two variables.
5. Solve the system of linear equations.
6. Find Eigen values and Eigen vectors.

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) *(2023 Pattern)*

Sem -I/II

2301102: Engineering Physics

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 2 hrs/week	**Th:02**	**Theory**	**CIA : 25**
Practical: 02 hrs/week	**Practical: 01**		**End-Sem:50**
		Pract:	**25**
		Oral:	**--**
		Termwork	**--**

Course Objectives: To understand

1. To provide basic concepts to resolve many engineering and technological problems.
2. After completing this course student will be able to appreciate and use the methodologies to analyze and design a wide range of engineering systems.
3. To understand the recent trends and advances in technology, this requires precise control over dynamics of microscopic engineering systems.
4. Basic sciences like physics also invoke manipulation of processes over micro and even Nano scale level as there is a growing demand of solid understanding the principles of basic sciences.
5. Physics provides the basic ideas and gives the solution for developing mathematical and analytical abilities with higher precision.

Course Outcomes:

On completion of the course, learner will be able to–

CO1:- Apply the mathematical skill to resolve optical problems in the field of engineering.

CO2:- Examine the applications related with Laser and Optical Fibre, and Nanotechnology in engineering field.

CO3:- Analyze the behaviour of semiconductor & semiconducting devices regarding their conductivity.

CO4:- Apply the concepts of physics for Non Destructive Testing & examine its applications in various field

Unit I - Wave Optics **7 hrs**	**CO**
(A) Interference – Introduction to interference, Types of Interference, Interference due to thin film of uniform thickness(with derivation), applications: anti-reflection coating using interference of light, Numericals on uniform thin film. Interference due to wedge shaped film (qualitative discussion), band width derivation, Applications: Flatness of surface, Numericals on band width, wedge angle, etc.	CO1
(B) Diffraction – Definition, types of diffraction, Fraunhofer's diffraction at single slit, conditions for maxima and minima, intensity pattern, Fraunhofer diffraction from a diffraction grating, Conditions for Principal maxima, minima, Numericals on diffraction grating. Rayleigh's criterion, resolving power of grating, resolving power of telescope.	
Unit II - Laser and Optic Fibre **7hrs**	CO2
(A) Laser -Basics of laser and its mechanism, Metastable state, Population inversion, characteristics of laser, Ruby laser, Gas laser: CO2, Semiconductor laser, Applications of lasers: Holography, industrial, medical.	
(B) Optic Fiber - Introduction, parameters: Acceptance Angle, Acceptance Cone, Numerical Aperture, Types of optical fiber- step index and graded index, Attenuation and reasons for losses in optic fibers (qualitative), Communication system: basic building blocks Advantages of optical fiber communication over conventional methods. Numericals on Numerical Aperture	
Unit III – Semiconductor Physics **7 hrs**	CO3
Band theory, Classification of solid on the basis of band theory, Electrical conductivity of conductors and semiconductors, Numericals on conductivity of conductor and semiconductor. Fermi Dirac probability distribution function, Fermi energy and fermi level, position of Fermi level in intrinsic semiconductors (with derivation) & in extrinsic semiconductors, Energy band picture of p-n junction. Solar cell and its applications. Hall effect: Derivation for Hall voltage, Hall coefficient, applications of Hall effect, Numericals on Hall Effect.	
Unit IV: Non Destructive Testing and Nanotechnology **7 hrs**	CO4
(A) Non Destructive Testing – Classification of Non-destructive testing methods, Principles of physics in Non-destructive Testing, Advantages of Non-destructive testing methods, Acoustic Emission Testing, Ultrasonic (thickness measurement, flaw detection), Radiography testing	
(B) Nanotechnology - Introduction to nanotechnology - Quantum confinement and surface to volume ratio - Properties of nanoparticles: optical, electrical, mechanical, Applications of nanoparticles: Medical (targeted drug delivery), electronics, space and defense, automobile	

LIST OF PRACTICALS

Sr. No.	Title	CO
1	Experiment based on Newton's rings (determination of wavelength of monochromatic light, determine radius of curvature of plano-convex lens)	CO1
2	To find out Resolving power of Diffraction Grating/Telescope	CO1
3	Study of position of diffraction minima by studying diffraction at a single slit	CO1
4	To determine unknown wavelength by using plane diffraction grating	CO1, CO2
5	Any Experiment based on Laser (Thickness of wire, determination of number of lines on grating surface)	CO2
6	To determine band gap of given semiconductor	CO3
7	To determine Hall coefficient and charge carrier density	CO3
8	To study I-V characteristics and determine Fill factor of solar cell	CO3

REFERENCE BOOKS:

1. Fundamentals of Physics, Resnick and Halliday (John Wiley and Sons)
2. Optics, Jenkins and White (Tata Mcgraw Hill)
3. Principles of Physics, Serway and Jewett (Saunders college publishing)
4. Introduction to Solid State Physics, C. Kittel (Wiley and Sons)
5. Principles of Solid State Physics, H. V. Keer, New Age International
6. Laser and Non-Linear Optics, B. B. Laud (Oscar publication)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni (Capital Publishing Company)

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) ***(2023 Pattern)***

Sem-I/II

2301103: Engineering Chemistry

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 02 hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical: 02 hrs/week	**Practical: 01**		**End-Sem:50**
		Pract:	**25**
		Oral:	**--**
		Termwork	**--**

Course Objectives:

1. To understand technology involved in analysis and improving quality of water as commodity.
2. To gain knowledge about fossil fuels used and future fuels.
3. To familiarize the students to various electro-analytical techniques that facilitates the study of materials.
4. To develop consciousness about corrosion and its prevention.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Utilize different methods for analysis of water and techniques used for purification of water.

CO2: Analyze the fuel and suggest an appropriate alternative fuels.

CO3: Choose appropriate instrumental method for analysis of materials.

CO4: Apply the different methods of corrosion control for preventing material destruction.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) *(2023 Pattern)*

Sem-I/II

2301103: Engineering Chemistry

Unit 1: Water Technology **7 hrs**	**CO**
Sources, conservation of water, impurities in water and their effects. WHO guideline and BIS guideline for drinking water,	CO1
Hardness of water: Types, Units and Numericals. Determination of hardness (by EDTA method using molarity concept) and alkalinity, numerical	
Boiler troubles – priming and foaming, boiler corrosion, caustic embrittlement, scale and sludge, causes and effects, methods of prevention.	
Water treatment: i) Zeolite method and numericals ii) Demineralization method, Softening of water, lime-soda, ion-exchange process and numerical	
Unit-2: Fuels & Combustion **7 hrs**	CO2
Introduction (definition, classification of fuel based on chemical reactions and characteristics of an ideal fuel), Calorific value (CV): Higher calorific value (HCV) and Lower calorific value (LCV), Solid fuel – Coal: Analysis of Coal-Proximate and Ultimate analysis, numerical, Liquid fuel: Petroleum: Refining of petroleum /crude oil and composition, boiling range and uses of various fractions Gaseous fuel: Composition, properties and applications of CNG, Hydrogen gas as a future fuel	
Unit 3: Battery Technology & Electro-analytical Techniques **6 hrs**	CO3
Battery Technology: Types of reference electrode (calomel electrode), indicator electrode (glass electrode), Basic requirements for commercial batteries. Construction, working and applications of: Zn-Ag_2O, Ni-Cd, Zn-air and Lithium ion battery.	
Conductometry: Introduction, conductivity cell, Conductometric titrations of acid versus base with titration curve.	
pH-metry: Introduction, standardization of pH meter, pH metric titration of strong acid versus strong base with titration curve.	
Unit 4: Corrosion & its prevention **8 hrs**	CO4
Types of corrosion – Dry and Wet corrosion, mechanism of dry corrosion, nature of oxide films, wet corrosion – mechanism: hydrogen evolution and oxygen absorption, galvanic cell corrosion, Factors influencing rate of corrosion. Methods of corrosion control and preventioni) Using inhibitors, ii) Cathodic protection-sacrificial anode and impressed current methods iii) Protective coatings-metal coatings-galvanizing and tinning.	

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) *(2023 Pattern)*

Sem-I/II

2301103: Engineering Chemistry

LIST OF PRACTICALS

Sr. No.	Title	CO
1	To determine hardness of water by EDTA method	CO1
2	To determine alkalinity of water	CO1
3	Proximate analysis of coal.	CO2
4	To determine strength of strong acid using pH meter	CO3
5	Titration of a mixture of weak acid and strong acid with strong base using digital conductivity meter.	CO3
6	Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin	CO3
7	To coat copper and zinc on iron plate using electroplating.	CO4
8	To determine maximum wavelength of absorption of $CuSO_4$, verify Beer's law and find unknown concentration of given sample.	CO4

Textbooks

1. Engineering Chemistry, Dr.S.S.Dara,Dr.S.S.Umare,S.Chand Publications.
2. Engineering Chemistry by Jain & Jain, DhanpatRai Publishing, 15thEdn.

Reference books

1. Engineering Chemistry, Wiley India Pvt. Ltd.
2. Inorganic Chemistry, 5 Edn by Shriver and Atkins, Oxford University Press.
3. Basic Concept of Analytical Chemistry, 2ed , S. M. Khopkar, New Age-International Publisher
4. Instrumental Methods of Chemical Analysis, G. R. Chatwal& S. K. Anand, Himalaya Publishing House.

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) (2023 Pattern)

Sem-I

2312104: Elements of Mechanical Engineering

Teaching Scheme:	**Credits - 03**	**Examination Scheme**	
Theory: 02hrs/week	**Th: 02**	**Theory**	**CIA:25**
Practical: 02 hrs/week	**Practical: 01**		**End-Sem:50**
		Termwork:	**25**

Course Objectives:

1. To understand different power transmitting elements.
2. To explain the basic concept of engineering thermodynamics and its application. To identify the sources of energy and their conversions
3. To identify different power producing and absorbing devices as per applications.
4. To Classify different manufacturing processes.

Course Outcomes: On completion of the course, learner will be able to--

CO1: Illustrate and elaborate different power transmitting elements.
CO2: Interpret basic governing laws in thermal engineering. Compare different energy resources and their applications
CO3: Identify different power producing and absorbing devices as per applications.
CO4: Classify different manufacturing processes.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) (2023 Pattern)

Sem-I

2312104: Elements of Mechanical Engineering

Units		
Unit 1	**Elements of Power Transmission System (06 Hrs.)**	**CO**
Mechanical Elements: Function, sketch, description, use of - Shaft, axle, key, coupling(rigid flange coupling), bearing(ball bearing), clutch-single plate clutch, brake (disc brake and Drum Brake) ***Power transmission devices*** - construction, working, comparison and application of belt drive (flat and V belt), chain drive and spur gear drive arranged with simple gear train		**CO1**
Unit 2	**Introduction to Thermal Engineering (08 Hrs.)**	**CO2**
Laws of Thermodynamics, heat engine, heat pump, refrigerator *(simple numerical)* Modes of heat transfer: conduction, convection and radiation, Fourier's law, Newton's law of cooling, Stefan Boltzmann's law. *(Simple numerical)*, Two stroke and Four stroke engines (Petrol, Diesel and CNG engines) ***Energy Sources & its Conversion*** Thermal energy, Hydropower energy, Nuclear energy, Solar energy, Wind energy, Hydrogen energy.		
Unit 3	**Applied Thermal Engineering (6 Hrs.)**	**CO3**
Power producing devices: Boiler (water tube and fire tube), Turbines-impulse and reaction ***Power absorbing devices***: Pumps - reciprocating and centrifugal, compressors (single acting single stage reciprocation air compressor), refrigeration-vapour compression refrigeration process, household refrigerator, window air conditioner (working with block diagram)		
Unit 4	**Basic Manufacturing Processes (06 Hrs.)**	**CO4**
Introduction to Manufacturing Processes (Casting, Forging, Sheet Metal Working), Metal Joining Processes - Welding, Soldering and Brazing, Centre Lathe Machine Operations, Drilling Operations.		
Books & Other Resources		

Reference Books:-

1. Khan, B. H., "Non-Conventional Energy Sources, Tata McGraw-Hill Publisher Co. Ltd.
2. Boyle, Godfrey, "Renewable Energy",2nd Ed., Oxford University Press
3. Khurmi, R.S. ,and Gupta, J. K.,"A Textbook of Thermal Engineering", S. Chand & Sons
4. Incropera, F. P. and Dewitt, D.P., (2007), "Fundamentals of Heat and Mass Transfer, 6th Ed., John Wiley and Sons, USA
5. Groover, Mikell P., (1996), "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", Prentice Hall, USA
6. Norton, Robert L., (2009), "Kinematics and Dynamics of Machinery", Tata McGrawHill
7. Cleghorn, W. L., (2005), "Mechanisms of Machines", Oxford University Press
8. Juvinal, R. C., (1994), "Fundamentals of Machine Component Design", John Wiley and Sons, USA
9. Ganeshan, V., (2018), "Internal Combustion Engines", McGraw Hill

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) (2023 Pattern)

Sem-I

2312104: Elements of Mechanical Engineering

Term Work:- **The student shall complete the following activity as a term work.**		
Group -A		
Expt. No. 1	Study of Different Mechanical Elements – Clutch, Brakes and Gear Drives	**CO1**
Expt. No. 2	Demonstration of Two Stroke and Four Stroke Engine	**CO2**
Expt. No. 3	Study of Any Power Plant	**CO2**
Expt. No. 4	Study of Domestic Refrigerator and Window AC	**CO2**
Expt. No. 5	Study of Water Tube and Fire Tube Boiler	**CO3**
Expt. No. 6	Study of Basic Operation on Centre Lathe Machine	**CO4**
Group -B		
Visit	The Visit of Students to Industry /Workshop is mandatory, to provide awareness and understanding of Course	**CO1,CO4**

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) *(2023 Pattern)*

Sem-I/II

2311105: Elements of Electrical Engineering

Teaching Scheme:	Credits	Examination Scheme	
Theory: 2 hrs/week	Th:02	Theory	CIA: 25
Practical: 02 hrs/week	Termwork: 01		End-Sem:50
		Pract:	--
		Oral:	--
		Termwork	25

Course Objectives: To understand

1. To introduce fundamental concepts, various laws-principles and theorems associated with electrical systems.
2. To impart basic knowledge of all electrical quantities such as current, voltage, power, energy, frequency along with different types of fields.
3. To provide knowledge about fundamental parameters such as resistance, inductance and capacitance and magnetic circuits, AC and DC circuits.
4. To provide knowledge of the concepts of transformer, different energy conversions techniques.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.

CO2: Apply and analyze the resistive circuits using KVL, KCL under DC supply, series, parallel capacitor as well as characteristics parameters of alternating quantity, suggest applications of various batteries, concept of charging and discharging and depth of charge.

CO3: Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.

CO4: Relate phase and line electrical quantities in poly phase networks.

Unit 1: Electromagnetism **(7 Hrs)**	**CO**
Resistance, Effect of temperature on resistance, resistance temperature coefficient, insulation resistance. Magnetic effect of an electric current, cross and dot conventions, right hand thumb rule, Concept of mmf, flux, flux density, reluctance, permeability and field strength, their units and relationships.	CO1
Simple series magnetic circuit, Introduction to parallel magnetic circuit(Only theoretical treatment), comparison of electric and magnetic circuit,	
Faradays laws of electromagnetic induction, Fleming's right hand rule, statically and dynamically induced e.m.f, self and mutual inductance, coefficient of couplings. Energy stored in magnetic field.	
Unit 2: Electrostatics and Batteries **(7 Hrs)**	CO2
A) Electrostatics: Electrostatic field, electric flux density, electric field strength, absolute permittivity, relative permittivity and capacitance. Capacitor, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors (no derivation) and time constant. B) Batteries :Kirchhoff's law (DC Circuit), Different types of batteries (Lead Acid and Lithium Ion), construction, working principle, applications, ratings, charging and discharging, maintenance of batteries, series -parallel connection of batteries	
Unit 3: AC Fundamentals and Single Phase AC Circuit **(06 Hrs)**	CO3
A) AC Fundamentals: Sinusoidal voltages and currents, their mathematical and graphical representation, Concept of cycle, Period, frequency, instantaneous, peak(maximum), average and r.m.s. values, peak factor and form factor. Phase difference, lagging, leading and in phase quantities and phasor representation. Rectangular and polar representation of phasor.	
B) Study of AC circuits consisting of pure resistance, pure inductance, pure capacitance, series R-L, R-C and R-L-C circuits, phasor diagrams, voltage, current and power waveforms, resonance in series RLC circuits, concept of impedance, concept of active, reactive, apparent, complex power and power factor, Parallel AC circuits (No numerical), concept of admittance.	
Unit 4: Polyphase A.C. Circuits and Electrical Installations: **(06 Hrs)**	
A) Polyphase A.C. Circuits: Concept of three-phase supply and phase sequence. Balanced and unbalanced load, Voltages, currents and power relations in three phase balanced star-connected loads and delta-connected loads along with phasor diagrams.	CO4
B) Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing. Elementary calculations for energy consumption:	

Guidelines for Instructor's Manual

The Instructor's Manual should contain following related to every experiment –

1. Brief theory related to the experiment.
2. Apparatus with their detailed specifications.
3. Connection diagram /circuit diagram.
4. Observation table/ simulation waveforms.
5. Sample calculations for one/two reading.
6. Result table.
7. Graph and Conclusions.
8. Few questions related to the experiment.
9. Relevance of practical in real life /industry

Guidelines for Student's Lab Journal

The Student's Lab Journal should contain following related to every experiment –

1. Theory related to the experiment.
2. Apparatus with their detailed specifications.
3. Connection diagram /circuit diagram.
4. Observation table/ simulation waveforms.
5. Sample calculations for one/two reading.
6. Result table.
7. Graph and Conclusions.
8. Few short questions related to the experiment

Guidelines for Lab /TW Assessment

1. There should be continuous assessment for the TW.
2. Assessment must be based on understanding of theory, attentiveness during practical, understanding.
3. Session, how efficiently the student is able to do connections and get the results.
4. Timely submission of journal.

LIST OF PRACTICALS (min 08)

Sr. No.	Title
1	To study safety precautions while working on electrical systems, handling of various equipment's such as multimeter, ammeters, voltmeters, wattmeter's, real life resistors, inductors and capacitors
2	To demonstrate Faradays laws of Electromagnetic Induction Principle
3	To measure steady state response of series RL and RC circuits on AC supply and observations of voltage and current.
4	To Verify KVL and KCL.
5	To Study the different types of batteries, their rating and Testing.
6	To verify the relation between phase and line quantities in three phase balanced star and delta connections of load.

7	To demonstrate different types of electrical protection equipments such as fuses, MCB, MCCB, and ELCB.
8	To study pipe, plate and strip Earthing
9	To study calculation of LT electricity bill.

Textbooks

1. V.D. Toro, Principles of Electrical Engineering, Prentice Hall India, 1989
2. D. P. Kothari, I.J. Nagrath, Theory and Problems of Basic Electrical Engineering, PHI Publication
3. V.K. Mehta, Rohit Mehata Basic Electrical Engineering, S Chand Publications
4. B.L. Theraja, A text book on electrical technology Vol-I

Reference books

1. H Cotton, Electrical technology, CBS Publications
2. L. S. Bobrow, ―Fundamentals of Electrical Engineering‖, Oxford University Press, 2011.
3. E. Hughes, ―Electrical and Electronics Technology‖, Pearson, 2010.
4. D. C. Kulshreshtha, ―Basic Electrical Engineering‖, McGraw Hill, 2009.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) ***(2023 Pattern)***

Sem-I/II

2317106: Elements of Electronics Engineering

Teaching Scheme:	**Credits - 03**	**Examination Scheme**	
Theory: 02hrs/week	**Th: 02**	**Theory**	**CIA:25**
Practical: 02 hrs/week	**Practical: 01**		**End-Sem:50**
		Termwork:	**25**

Course Objectives:

1. To explain the working principle of P-N junction diode and special purpose diodes.
2. To explain the working principle of BJTand OP-AMP as an amplifier.
3. To outlinenumber systems, logic gates, digital circuits and its applications.
4. To explore the working principle of wired and wireless communication system.

Course Outcomes: On completion of the course, learner will be able to--

CO1: Select appropriate diodes as per applications.

CO2: Design a circuit using BJTand OP-AMP as an amplifier.

CO3: Develop and verify the truth table for combinational and sequential circuits.

CO4: Compareand contrast the wired and wireless communication system.

Unit 1: Diodes and Circuits **6 hrs**	**CO**
Introduction to Semiconductor: Intrinsic, Extrinsic, N-type and P-type Semiconductors, P-N Junction Diode: Construction, working principle in forward and reverse biasing, V-I Characteristics. Rectifier: Circuit diagram, modes of operation and input-output waveform of Half Wave Rectifier (HWR) and Full Wave Rectifier (FWR), Rectifier: Circuit diagram, modes of operation and input-output waveform of Bridge configuration, Comparison among HWR, FWR and Bridge configuration rectifier. Zener Diode: symbol, working principle in forward and reverse biasing with circuit diagram, V-I Characteristics and specifications. Light Emitting Diode (LED): symbol, construction, working principle in forward and reverse biasing with circuit diagram, V-I Characteristics.	CO1
Unit 2: Bipolar Junction Transistor and Operational Amplifier **8 hrs**	
Working principle of transistor and its types (NPN, PNP), Bipolar Junction Transistor (BJT): symbol, construction, operation of NPN type transistor, Types of configuration (CE, CB and CC), BJT (NPN type) Common Emitter Circuit diagram and its working, input and output V-I characteristics, Modes of operation of BJT CE configuration on output characteristics with its applications. Performance parameters of BJT: α_{dc} and β_{dc}, Relation between α_{dc} & β_{dc} and numerical on it, Applications of Amplifier: Voltage divider biased single stage BJT (NPN) CE Amplifier: Circuit diagram and function of each component used in circuit. Operational Amplifier (OP-AMP): symbol, block diagram and its working, OP-AMP performance parameters (ideal and practical for IC 741): input offset voltage, input offset current, input bias current, slew rate, Common Mode Rejection Ratio (CMRR), Applications of OP-AMP: (i) Inverting Amplifier, (ii) Non-inverting Amplifier: Circuit diagram, derivation of output voltage, input-output voltage waveform.	CO2
Unit 3: Digital Electronics **7 hrs**	
Number Systems: Binary, Octal Decimal, Hexadecimal and its Conversion, Logic Gates: Symbols, Boolean expressions, Truth Table of NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR Gates, De-Morgan's Theorem and implementation using Logic Gates, Introduction to	CO3

Combinational Circuits and Sequential Circuits. Half Adder and Full Adder: Block schematic, Truth Table, K-map and implementation using Logic gates. Concept of Flip flop, Logic Symbol and Truth Table of D, T, S-R and J-K Flip Flop, Application of Flip Flops	
Unit 4: Communication System 7 **hrs**	
Typical Electronic Communication System and its Block Diagram and its Functional block diagram. Types of Communication media: Wired and Wireless, Twisted Pair, Co-axial Cable and Fiber Optic Cable: working, advantages, limitation and applications, Compare and Contrast wired and wireless communication system. Wireless Media: IEEE Electromagnetic Frequency Spectrum: enlist applications as per frequency and wavelength. Concept of Cellular System, Block diagram of basic cellular system, Global System for Mobile (GSM): Block Diagram, Elements of Architecture, Features. Evolution of Wireless Network: Introduction to 2G, 3G, 4G and 5G wireless network.	CO4

List of Practical: ***(Perform any 4 practical)***	**CO**
1. Implement the Bridge configuration rectifier circuit using 1N4007 diodes on breadboard and observe the input-output voltage waveform.	CO1
2. Build and test and simulate single stage BJT CE amplifier on breadboard and observe the output voltage waveform. Determine the value of voltage gain.	CO2
3. Build and test and simulate) the inverting and non-inverting amplifier using OP-AMP and determine the value of voltage gain. Compare the practical value with theoretical one.	CO2
4. Design, build and test Half Adder and Full Adder Circuits using logic gates on breadboard and verify its truth table.	CO3
5. Study the use cases of ***any two*** 4G / 5G Wireless Networks (viz. Healthcare, Education, Entertainment, Smart Cities, Autonomous Vehicles, Agriculture, Internet of Things etc.)	CO4
6. Perform the experiments using Virtual Lab: V-I characteristics of diode. Link: http://vlabs.iitkgp.ernet.in/be/	CO1

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a hands-on resource and reference.
The Copy of Curriculum, Conduction & Assessment guidelines, List of Experiments are to be attached.

Guidelines for Student's Lab Journal

The laboratory assignments/experiments are to be submitted by student in the form of journal.
Journal consists of Certificate, table of contents, and handwritten write-up for each experiment.
Each experiment should consist of:

1. Title.
2. Objectives.
3. Problem Statement, Outcomes
4. Hardware / Software (If any) requirements.
5. Concept.
6. Experimental procedure / Setup.
7. Observation table
8. Conclusion.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance. Each lab assignment/ experiment assessment will assign grade / marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment / experiment assessment include:

a) Timely completion.
b) Performance.
c) Punctuality and neatness.

The parameters for assessment are to be known to the students at the beginning of the course.

Textbooks

1) Thomas. L. Floyd, "Electronics Devices", 9th Edition, Pearson (Unit I, II).
2) R.P. Jain, "Modern Digital Electronics", 4th Edition, Tata McGraw Hill (Unit III).
3) Kennedy & Davis, "Electronic Communication Systems", 4th Edition, Tata McGraw Hill (Unit IV).
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MOOC / NPTEL Courses:

1) NPTEL Course on "Basic Electronics" by Prof. Mahesh B. Patil, IIT Bombay
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2) NPTEL Course on "Basic Electronics" by Dr. Pramod Agarwal, IIT Roorkee
   Link: https://nptel.ac.in/courses/117107095
3) NPTEL Course on "Basic Electronics" by Prof. Chitralekha Mahanta, IIT Guwahati
   Link: https://nptel.ac.in/courses/117103063

Virtual Lab Links:

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2) Digital Electronics Virtual Lab developed by IIT Roorkee:
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3) Digital Electronics Virtual Lab developed by IIT Guwahati:
   Link: https://www.iitg.ac.in/cseweb/vlab/Digital-System-Lab/index.php
4) Electronic Circuits Simulation using Virtual Lab developed by IIT Kharagpur:
   Link: https://be-iitkgp.vlabs.ac.in/List%20of%20experiments.html

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) ***(2023 Pattern)***

Sem-I

2314107: Elements of Civil Engineering

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 2hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical: 2hrs/week	**Practical: 01**		**End-Sem:50**
		Pract:	**--**
		Oral:	**--**
		Termwork	**25**

Course Objectives: The student should be able to

1. Impart knowledge about the branches of civil engineering and utilize the knowledge of civil engineer in the construction of various infrastructures.
2. Impart knowledge of the basic materials and planning of building construction.
3. Impart knowledge to uses of maps and modern survey equipment for field surveys.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Use the knowledge of civil engineering to construct infrastructure projects for 21st century.

CO2: Use different civil Engineering materials and building planning in the construction as per the requirement, and the properties of materials.

CO3: Use modern survey methods.

CO4:Use different building planning principles and rules as per the requirement.

Unit 1: Introduction to civil engineering 7 hrs	CO
a) Introduction to structural engineering, geotechnical engineering, Construction technology, hydraulics, water resources and irrigation engineering, transportation engineering, environmental and sanitary engineering, GIS, earthquake engineering.	CO1
b) Role of Civil Engineers in the development of the nation. Role of Civil Engineer in the construction of buildings, dams, expressways, and infrastructure projects for 21st century. Importance of an interdisciplinary approach in civil engineering.	
Unit 2: Materials and construction 7 hrs	CO2
a) Basic materials for construction –Requirement, types, uses, properties, and importance of Civil Engineering materials like, Stone, brick, wood, glass, aluminum, cement, aggregates, concrete, steel, RCC, PSC, recycling of materials.	
b) *Substructure:* Definition and function of foundation (only concepts of settlement and bearing capacity of soils) Types of shallow foundations, deep foundations (only concept of friction and end bearing pile)	
c) *Superstructure:* Types of loads –dead load and live load, wind loads, earthquake considerations. Types of construction –Load bearing, framed, composite. Fundamental requirement of masonry.	
Unit 3: Surveying, Levelling and Mapping 7 hrs	CO3
a) Introduction: Definition of Surveying, Aims and applications, Fundamental principles of surveying, Classification of surveying, Plans and maps, Scales, Units of measurement.	
b) Linear Measurement: Methods, Instruments used in chain surveying, Selection of stations, Chaining, Ranging, Offsetting.	
c) Aims and applications, Definition of various terms, Instruments for leveling, Methods of leveling, Recording observations in level-book, Computing reduced levels by HI and rise & fall method, Definition of contour, Characteristics of contours of different terrains and application of contour maps, Introduction to planimeter, Introduction to Global positioning system (GPS), remote sensing (RS) and Geographical information system (GIS).	
Unit 4: Planning for built environment 7 hrs	
a) Definition and concept of plan of a simple residential building, Elementary principles and basic requirements for building planning, elevation, and section of a residential building.	CO4
b) Role of by-laws in regulating the environment, concept of built –up area, carpet area, plinth area, plot area, FSI.	
c) Use of various eco-friendly materials in construction, Concept of green buildings. Concept of an integrated built environment – natural and manmade.	

Term work **Any 6 practical exercises** from those given below should be carried out, record to be submitted in the field book and file which will form a part of term work.	**CO**
1. Study of any four types of maps and writing their uses.	CO3
2. Exercise on use of Dumpy level and Auto level.	CO3
3. Measurement of area of irregular figures by Digital planimeter.	CO3
4. Drawing of plan elevation and section for residential buildings, single-storeyed frames, load bearing structure. Preparing schedule of opening one half imperial sheet.	CO4
5. Determination of coordinates of a traverse using Global positioning system (GPS).	CO3
6. Measurement of distance by EDM and comparing it with the distance measure using tape.	CO3
7. Visit to a construction site for studying the various construction materials used, types of structures, type of foundation and components of superstructure submission of visit report.	CO2
8. Demonstration of use of any four civil engineering softwares.	CO1

Textbooks

1. Surveying and levelling by Kanetkar, Kulkarni- Pune Vidyarthi Prakashan
2. Build planning and build environment by Shah Kale,Patki-Tata MC Gaw Hill
3. Civil engineering materials by Dr S.V. Devdhar -Khanna Publications

Reference books

1) Basic Civil Engineering by M. S. Palanichamy Tata Mc-Graw Hill Publishing Co. Ltd.
2) Basic Civil Engineering B. Y. Shatheesh Gopi-Pearson
3) Elements of Civil Engineering and Engg Mech by R. V. Raikr– PHI Learning Pvt. Ltd.
4) Civil Engg. Drawing by S. C. Rangwala, Publication: Charotar Pub. House Anand
5) Surveying Vol. I & II by Dr. B. C. Punmia, Publication: Laxmi Publication Delhi
6) Surveying Vol. I and II, Author: S. K. Duggal, Publisher: Tata Mc-Graw hill Publication New Delhi
7) Building Construction, Author: Dr. B. C. Punmia, Publisher: Laxmi Pub. Delhi
8) Engineering Material, Author: Dr. S. C. Rangwala, Publisher: Charotar Pub. House
9) Elements of Civil Engineering Author: Dr. R. K. Jain and Dr. P. P. Lodha Publisher: McGraw Hill Education, India Pvt. Ltd.
10) Highway Engineering Author: Khanna S. K. and Justo C. E. G. Publisher: Nemchand and Brothers

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) *(2023 Pattern)*

Sem-I

2301104 : Language Communication Lab

Teaching Scheme:	Credits	Examination Scheme	
Theory: 0 hrs/week	Th:00	Theory	CIA: --
Practical: 02 hrs/week	Practical: 01		End-Sem:--
		Pract:	--
		Oral:	25
		Termwork	--

Course Objectives:

1. To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
2. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
3. To improve the fluency of students in spoken English and neutralize their mother tongue influence
4. To train students to use language appropriately for public speaking and interviews.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Better understanding of nuances of English language through audio- visual experience and group activities

CO2: Neutralization of accent for intelligibility.

CO3: Speaking skills with clarity and confidence which in turn enhances their employability skills.

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) *(2023 Pattern)*

Sem-I

2301104 : Language Communication Lab

Module 1 **7 hrs**	**CO**
Computer Assisted Language Learning (CALL) Lab: *Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening. *Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants. **Interactive Communication Skill Lab**: *Understand:* Communication at Work Place- Spoken vs. Written language. *Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.	CO1
Module 2 **7 hrs**	
CALL Lab: *Understand:* Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context. *Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context. **ICS Lab**: *Understand:* Features of Good Conversation – Non-verbal Communication. *Practice:* Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette	CO2
Module 3 **7 hrs**	
Technical skill Essential of writing – Technical paper / report writing, concise writing Administrative / Business documentation - Circular writing- meeting – agenda-minutes - Resolution	CO2
Module 4 **7 hrs**	
Getting ready for job – Before interview- Curriculum vitae / Resume -covering letter e-mail writing During Interview- Mock interview- Psychometric test- Follow up After Interview – Excelling profession – Team spirit – work culture	CO3

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

F.Y. B. Tech(Common) *(2023 Pattern)*

Sem-I

2301105: Social Media Content Creation Lab

Teaching Scheme:	**Credits: 01**	**Examination Scheme**	
Theory: --	**Th: 00**	**Theory**	**CIA: --**
Practical: 2 hr/week	**PR: 01**		**End-Sem: --**
		Pract:	**25**
		Oral:	**--**
		Termwork	**25**

Course Objectives: The student should be able to

1. Understanding the ethics while designing social media content
2. Understand and design the topic based social media content without violating IPR
3. Understand and learn basics of tools for digital content development

Course Outcomes:

On completion of the course, learner will be able to –

CO1: Recognize and produce ethically correct contents for social media

CO2: Write script and collect relative data for content delivery without violating IPR

CO3: Understand and use different content creation tools

CO4: Launch his/her own social media channel/blog on YouTube/Google etc

Sr. No.	**List of Practical's**	**CO**
1	Identify the local/global topic before human society and create a presentation for it.	CO1
2	Study of different FOSS tools required to create video content for social media	CO3
3	Create and setup your own social blog or YouTube Channel	CO4
4	Create a sample video using script, presentation, and Tools on some engineering topic	CO1 to CO4
5	Create a sample video using script, presentation, and Tools on some historical topic	CO1 to CO4
6	Create a sample video using script, presentation, and Tools on some Health topic	CO1 to CO4
7	Create a sample video using script, presentation, and Tools on some cooking topic	CO1 to CO4