# VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE
# (VJTI)

MATUNGA, MUMBAI 400 019

(Autonomous Institute affiliated to University of Mumbai)

**Curriculum**
**(Scheme of Instruction & Evaluation and Course contents)**

For First Year
of
Four-Year Undergraduate Programme Leading to
Bachelor of Technology (B Tech) Degree in Electrical Engineering

**Implemented from the batch admitted in Academic Year 2023-24**

**V J T I Veermata Jijabai Technological Institute**
(Central Technological Institute, Maharashtra State, INDIA)
H. R. Mahajani Marg, Matunga, Mumbai -400019
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## Credit Framework for UG Programme in Electrical Engineering (Level 4.5- UG Certificate)

## Semester I

| Sr. | Course Type | Course Code | Course Name | L | T | P | Hr | Cr | Examination Weightage in % | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | TA | MST | ESE |
| 1 | BSC | R5PH1011T | Physics | 2 | 1 | 0 | 3 | 3 | 20 | 30 | 50 |
| 2 | BSC | R5PH1011L | Physics Laboratory | 0 | 0 | 2 | 2 | 1 | ISCE: 60 | | 40 |
| 3 | BSC | R5MA1002T | Mathematics-I | 2 | 1 | 0 | 3 | 3 | 20 | 30 | 50 |
| 4 | ESC | R5ME1001T | Engineering Graphics | 2 | 0 | 0 | 2 | 2 | 20 | 30 | 50 |
| 5 | ESC | R5ME1001L | Engineering Graphics Laboratory | 0 | 0 | 2 | 2 | 1 | ISCE: 60 | | 40 |
| 6 | ESC | R5EE1031T | Basic Electrical Science | 3 | 0 | 0 | 3 | 3 | 20 | 30 | 50 |
| 7 | ESC | R5EE1031L | Basic Electrical Science Laboratory | 0 | 0 | 2 | 2 | 1 | ISCE: 60 | | 40 |
| 8 | ESC | R5ME1021T | Basic of Thermal Engineering | 3 | 0 | 0 | 3 | 3 | 20 | 30 | 50 |
| 9 | VSEC | R5EE1024L | Design Thinking and Idea Lab | 0 | 0 | 3 | 3 | 1.5 | ISCE: 60 | | 40 |
| 10 | AEC | R5HS1001L | Business & Technical Communication | 1 | 0 | 2 | 3 | 2 | ISCE: 60 | | 40 |
| 11 | CC1 | R5EE1025L | From Basket | 0 | 0 | 3 | 3 | 1.5 | ISCE:100 | | |
| | | | **Total** | **13** | **2** | **14** | **29** | **22** | | | |

abbreviations **L** Lecture, **T** Tutorial, **P** Practical, **TA** Teacher Assessment / Term work Assessment, **MST** Mid Semester Test, **ESE** End Semester Written Examination, **ISCE** In-semester Continuous Evaluation, **BSC** Basic Science Course, **ESC** Engineering Science Course, **VSEC** Vocational and Skill Enhancement Course, **AEC** Ability Enhancement Course, **CC** Co-curricular Course

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**Credit Framework for UG Programme in Electrical Engineering (Level 4.5- UG Certificate)**

**Semester II**

| Sr. | Course Type | Course Code | Course Name | L | T | P | Hr | Cr | Examination Weightage in % | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | TA | MST | ESE |
| 1 | BSC | R5CH1012T | Chemistry | 2 | 1 | 0 | 2 | 3 | 20 | 30 | 50 |
| 2 | BSC | R5CH1012L | Chemistry Laboratory | 0 | 0 | 2 | 2 | 1 | ISCE: 60 | | 40 |
| 3 | BSC | R5MA1012T | Mathematics-II | 2 | 1 | 0 | 3 | 3 | 20 | 30 | 50 |
| 4 | BSC | R5EE1026T | Bio Science for Electrical Engineers | 2 | 0 | 0 | 2 | 2 | 20 | 30 | 50 |
| 5 | ESC | R5SE1002T | Engineering Mechanics | 2 | 0 | 0 | 2 | 2 | 20 | 30 | 50 |
| 6 | ESC | R5SE1002L | Engineering Mechanics Laboratory | 0 | 0 | 2 | 2 | 1 | ISCE: 60 | | 40 |
| 7 | ESC | R5CO1012T | Programming for Problem Solving | 2 | 0 | 0 | 2 | 2 | 20 | 30 | 50 |
| 8 | ESC | R5CO1012L | Programming for Problem Solving Laboratory | 0 | 0 | 2 | 2 | 1 | ISCE :60 | | 40 |
| 9 | PCC | R5EE1027T | Basic Electronics | 2 | 0 | 0 | 2 | 2 | 20 | 30 | 50 |
| 10 | VSEC | R5EE1028L | Electrical Workshop | 0 | 0 | 3 | 3 | 1.5 | ISCE: 100 | | |
| 11 | IKS | R5EE1029T | Introduction to Ancient Indian Technology | 2 | 0 | 0 | 2 | 2 | 20 | 30 | 50 |
| | | | | | | | | | Or Credit Transfer | | |
| 12 | CC2 | R5EE1030L | From Basket | 0 | 0 | 3 | 3 | 1.5 | ISCE:100 | | |
| | | | **Total** | **14** | **2** | **12** | **28** | **22** | | | |

abbreviations **L** Lecture, **T** Tutorial, **P** Practical, **TA** Teacher Assessment / Term work Assessment, **MST** Mid Semester Test, **ESE** End Semester Written Examination, **ISCE** In-semester Continuous Evaluation, **BSC** Basic Science Course, **ESC** Engineering Science Course, PCC Program Core, **VSEC** Vocational and Skill Enhancement Course, IKS Indian Knowledge System, **CC** Co-curricular Course

# SEMESTER-I

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5PH1011T | SEMESTER | I | CREDITS | 3 | SCHEME | 2L:1T |
| COURSE | PHYSICS | | | | | | |

**Course Outcomes:**

After the completion of the course, students would be able to

**CO1** Classify, draw, describe, and distinguish crystal structures and crystallographic planes.

**CO2** Analyse crystal structures by X-ray diffraction.

**CO3** Describe properties of light using interference, diffraction, polarization, and its applications.

**CO4** Identify and summarize properties and applications of dielectric materials.

**CO5** Classify and analyze magnetic materials.

**Course Contents:**

| CRYSTAL STRUCTURE OF SOLIDS |
|---|
| Single crystal, polycrystalline, amorphous solids; Concepts of space lattice, atomic basis, unit cell & its characteristics; Monoatomic and diatomic Crystal, ligancy, imperfection |
| **CRYSTALLOGRAPHIC PLANES AND DIRECTION** |
| Concept of Miller indices and its determination for Crystallographic planes and their direction, examples, Interplanar spacing in terms of miller indices |
| **DETERMINATION OF CRYSTAL STRUCTURE USING X-RAYS** |
| Bragg's law of X-ray diffraction, Bragg's spectrometer, X-ray diffraction methods: - Laue, Powder, Rotating Crystal |
| **INTERFERENCE** |
| Temporal and spatial coherence, interference in parallel thin films, wedge shaped film, Michelson interferometer, antireflection coating |
| **DIFFRACTION** |
| Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at single slit, double slits and circular aperture, diffraction grating. |
| **POLARIZATION** |
| Polarization types, theory of production of Plane, circularly and elliptically polarized light, double refraction, uniaxial and biaxial crystals, Nicole prism, Dichroism, retardation plates: quarter wave and half wave, polarimeter. |
| **DIELECTRIC PROPERTIES** |
| Capacitance, Permittivity & dielectric constant; Polarizability-polar and nonpolar, dielectric susceptibility, Polarizations: - electronics, ionic, orientation interface, internal fields in solids, Dielectrics in alternating fields, ferroelectricity, piezoelectricity. |
| **MAGNETIC PROPERTIES** |
| Basic concepts, classification of magnetic materials, Domain theory of Ferromagnetism, Hysteresis Curve, Magnetostriction, magnetic materials. |

**Reference Books:**


1. Modern Physics, 3rd edition, R Serway, C Moses and C Moyer, Thomson Learning inc,
2. Material Science and Engineering: An Introduction, 6th edition., Callister W.C. Jr., John Wiley & Sons
3. Applied Physics I for Science and Engineering, Dattatray Wavhal, ISBN 978-93-5267-180-9, 2016
4. Applied Physics II for Science and Engineering, Dattatray Wavhal, ISBN 978-93-5268-289-8, 2017
5. A textbook of Engineering Physics, M N Avadhanulu and P. G. Kshirsagar

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5PH1011L | SEMESTER | I | CREDITS | 1 | SCHEME | 0L:2P |
| COURSE | PHYSICS LABORATORY | | | | | | |

**Course Outcomes:**

The student should be able to

**CO1** Draw and analyze unit cells, Miller planes and Miller directions.

**CO2** Calculate radius of curvature of lens, wavelength and small thickness, velocity of sound waves using Interference.

**CO3** Finding energy of spectral lines and grating element using diffraction phenomena.

**CO4** Determine optical activity by polarimeter and verification of Malus Law

**CO5** Study of magnetic properties using hysteresis/curie temperature/ susceptibility

**Course Contents:**
**(Any 10)**

1. Crystal Structure (Unit Cells)
2. Crystal Structure (Miller planes)
3. Newton's Ring Experiment
4. Wedge shape Method
5. Michelson Interferometer
6. Ultrasonic Interferometer
7. Wavelength and energy measurement of spectral lines using spectrometer.
8. Laser diffraction method
9. Specific rotation of Cane sugar solution using polarimeter.
10. Polarization of light and verification of Malus law
11. Hysteresis of a ferromagnetic material
12. Curie temperature by two probe method
13. Susceptibility of solids by Gouy's method

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5MA1003T | SEMESTER | I | CREDITS | 3 | SCHEME | 2L:1P |
| COURSE | MATHEMATICS – I | | | | | | |

**Course Outcomes:**

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

**CO1** Characterize a linear system in terms of number of solutions, whether it is consistent or not.

**CO2** Compute eigenvalues and eigenvectors of a square Matrix and determine if it is diagonalizable.

**CO3** Demonstrate the concepts of vector spaces, subspaces, span, basis, dimension and their properties with examples and identify their subspaces.

**CO4** Calculate functional value of some point in a neighborhood using Taylor's series expansion and find the limit of a function at a point or at infinity using L'Hospital's rule.

**CO5** Determine if an infinite series is convergent or not using suitable test.

**CO6** Be familiar with the theorems of differentiability such as mean value theorem and interpret it geometrically.

**CO7** Evaluate partial derivatives and apply it to find minima and maxima of a multivariate function. Also Find directional derivatives and gradient and illustrate geometric meaning with the help of sketches.

**CO8** Apply definite integration to evaluate surface areas and volumes of revolution and evaluate improper integrals.

**CO9** Evaluate multiple integrals for regions in a plane and find volume, area bounded by the curves, mass, center of gravity of solid geometric figures.

**Course Contents:**

| Module | Contents |
|---|---|
| 1 | **LINEAR ALGEBRA:** Rank of a matrix, System of linear equations- check for consistency, Eigenvalues & eigenvectors of a matrix, Diagonalization, Cayley-Hamilton theorem, Minimal polynomial, Finding Inverse and Powers of a matrix, Linear dependence and independence of vectors, Vector spaces, Basis, Dimension, Subspaces, Linear transformations, Rank of a Linear transformation, Orthogonal transformation, Inner product spaces. |
| 2 | **DIFFERENTIAL CALCULUS:** Mean value theorem, Rolle's theorem, Indeterminate form, L'Hospital's rule, Taylor's theorem and Truncation error, Partial Derivatives, Chain rule, Total Derivative, Differentiation of an implicit function, Directional Derivative, Gradient, maxima, minima and saddle points of a multivariable function, Lagrange's multipliers method, tangent plane and normal line, Convergence of sequence and series, Tests for convergence -ratio test, root test, p-series test, comparison test, alternating series test, absolute convergence test. |
| 3 | **INTEGRAL CALCULUS:** Evaluation of definite integration to find surface areas and volumes of revolution, Introduction to Improper Integrals and Gamma functions and its properties, Multiple |

| | |
|---|---|
| | integrals, change of order of integration in double integrals, Change of variables (Cartesian to polar), Triple integrals (Cartesian, cylindrical and spherical co-ordinates). Applications: areas and volumes, Center of mass and Gravity (constant and variable densities). |
| 4 | **NUMERICAL METHODS:**<br>Numerical solutions of non-linear equations, Interpolation by Newton's and Lagrange polynomials, Integration by trapezoidal and Simpson's rule. |

**References:**


1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9 th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9 th Edition, John Wiley & sons, 2006.
3. Ramana B. V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11 th Reprint, 2010.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw Hill, New Delhi 2008.
5. N.P.Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint 2008.
6. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 th Edition, 2010.
7. M.K.Jain, S.R.K. Iyengar, R.K.Jain, Numerical methods for scientific and engineering computation,Fourth Edition.

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5ME1001T | SEMESTER | I | CREDITS | 2 | SCHEME | 2L:0P |
| COURSE | ENGINEERING GRAPHICS | | | | | | |

**Course Outcomes:**

The student should be able to –

**CO1** Represent projections of lines and solids.
**CO2** Draw projections of solids cut by section planes.
**CO3** Convert the pictorial view into orthographic projections.
**CO4** Convert the orthographic projections into isometric view.

**Course Contents:**

**Introduction to Drawing & Geometrical Contraction**

Introduction: Introduction and importance of engineering drawing, Drawing Instruments and their use, Drawing layout, types of lines, lettering and Dimensioning

Engineering Curves: Cycloid, Epicycloid, and Hypocycloid; Involutes.

**Projection of Points and Lines**

Introduction: Method of projections, Orthographic projection, Reference planes, Quadrants, Reference line etc. Projection of Points.

Projections of lines: Line inclined to both the reference planes (excluding the traces), True/Apparent lengths & inclinations.

**Projection Solids, Sections of Solids**

Projections of Solids: Solids (Prism, Pyramid, Cylinder, Tetrahedron, Hexahedron and cone only with their axis inclined to HP or VP only (Excluding Spheres, Composite and Hollow solids) Use change of position or Auxiliary Plane method.

Section of Solids: Section of Prism, Pyramid, Cylinder, Tetrahedron, Hexahedron & cone cut by plane. Use change of Position or Auxiliary plane method.

**Orthographic Projections**

Multi View Orthographic projections of simple machine parts by first angle method, Sectional views of simple machine parts (full & Half Section only)

**Isomeric Projection**

Isomeric scale, isometric view/Drawing of simple blocks with plain and cylindrical surfaces. (excluding spherical surface)

***Note: Only FIRST ANGLE Method of projections must be used throughout the course.***

**Text books**

1. N. D. Bhatt, Engineering Drawing, Charotar publishing house, 53rd Edition, 2014
2. N. H. Dubey, Engineering Drawing Nandu Publishers & printers, 15th Edition, 2015

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5ME1001L | SEMESTER | I | CREDITS | 1 | SCHEME | 0L:2P |
| COURSE | ENGINEERING GRAPHICS LABORATORY | | | | | | |

**Course Outcomes:**

The student should be able to –

**CO1** Draft various Geometrical Elements used in Engineering Practice using CAD software.

**CO2** Draft projections of various objects and their representation and dimensioning using CAD software.

**CO3** Represent objects through isometric projections. Interpret drawings of engineering parts and objects.

**CO4** Acquire drawing skills pertaining to various topics like projection of points, lines and solids.

**Course Contents:**

**Introduction to Computer Aided sketching**

Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tools bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of co-ordinate points, lines, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, offset, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions material conventions and lettering

**Minimum 10 Exercises based on above mentioned topics with minimum two problems in each Exercise.**

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5ME1021T | SEMESTER | I | CREDITS | 3 | SCHEME | 3L:0P |
| COURSE | BASICS OF THERMAL ENGINEERING | | | | | | |

**Course Outcomes:**

**After the completion of course, the student should be able to**

**CO1** Apply the Laws of Thermodynamics to different systems.
**CO2** Analyze the thermodynamic performance of Power Cycles and Power Plant.
**CO3** Examine the performance of steam generators, turbines and condensers
**CO4** Examine the performance of steam nozzles and turbines.

**Course Contents:**

| Module | Content |
|---|---|
| **1** | Thermodynamic Concepts &Laws of Thermodynamics:<br>Concepts of system, surroundings, universe, Intensive and Extensive Properties, path.Thermodynamic processes such as Adiabatic, Isentropic, Isothermal processes. Concept of Internal energy and Enthalpy. Thermodynamic Cycle. Thermal Equilibrium and Zeroth Law of Thermodynamics.<br>First Law of Thermodynamics, application of First law to nonflow and steady flow processes.<br>Second law of Thermodynamics. Entropy. |
| **2** | Properties of steam: wet, dry saturated and superheated steam. Use of steam tables and Mollier diagram.<br>Application of steam in electrical power generation. Major components of Thermal power plant. |
| **3** | Steam power cycles:<br>Carnot cycle, Rankine Cycle, Reheat cycle, Regeneration cycle. T-s and h-s diagrams. |
| **4** | Steam Generators: classification, water tube, fire tube boilers,Cochran and Babcock Wilcox boilers. Boiler efficiency and equivalent evaporation. High pressure boilers. Important features of High pressure boilers.<br>Steam Nozzles: convergent, convergent divergent nozzles, nozzle efficiency.<br>Steam Turbines: types of steam turbines, compounding in steam turbines, velocity, pressure and temperature of steam at exit of turbine, diagram and stage efficiency. Governing in steam turbines |
| **5** | Steam Condensers: classification of condenser, necessity of steam condensers in power plants, working of condensers, Vacuum efficiency, Condenser efficiency.Study of surface condensers. |

**Text Books:**


1. R. Yadav, Fundamentals of Thermodynamics & Heat Engines–Vol I, Fifth Edition, Central Publishing House, Allahabad, 2012
2. Domkundwar, Kothandaraman & Domkundwar, A course in Thermal Engineering, Dhanpat Rai & Co.,Third Edition, 2016.
3. P. K. Nag, Basic & Applied Thermodynamics

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5EE1031T | SEMESTER | I | CREDITS | 3 | SCHEME | 3L:0P |
| COURSE | BASIC ELECTRICAL SCIENCE | | | | | | |

**Course Outcomes:**

**After the completion of course, the student should be able to**

1. To understand fundamentals of DC circuits and apply knowledge for analyzing network theorems in DC circuits.
2. To learn the fundamentals and analyze single phase AC circuits.
3. To learn the fundamentals and analyze three phase AC circuits.
4. To analyze star and delta connections and concepts of phasors in AC single and three phase system.
5. To Describe the construction, operation, and characteristics of single phase transformer.

**Course Outcomes:**

| Module | Contents |
|---|---|
| 1 | **DC Circuits (Only Independent Sources):** Kirchhoff 's laws, Ideal and practical voltage and current source, Mesh and Nodal analysis, Super node and Super mesh analysis, Source transformation, Star-delta transformation, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem |
| 2 | **AC Circuits:** Generation of alternating voltage and currents, RMS and Average value of different form factor, crest factor, AC applied to resistance, inductance and waveforms, capacitance. |
| 3 | **Fundamentals of AC Circuits- I:**R-L, R-C and R-L-C seriescircuits, phasor diagrams, calculations of power and power factor, series resonance, Q factor and bandwidth in AC series resonance circuits.<br><br>**Fundamentals of AC Circuits- II:** R-L-C parallelcircuits, phasor diagrams, calculations of power and power factor, parallel resonance, Q factor and bandwidth in AC parallel resonance circuits. |
| 4 | **Three Phase Circuits:** Three phase voltage and current generation, star and delta connections (balanced load only), relationship between phase and line currents and voltages, Phasor diagrams, Basic principle of wattmeter, measurement of power by one and two wattmeter methods. |
| 5 | **Single-phase transformer**: Construction and working principle of a single-phase transformer. EMF equation and losses in the transformer. Ideal and practical transformer, equivalent circuit, losses in transformers, regulation, and efficiency. Autotransformer. |

**Text Books:-**


**1**.B.L.Theraja, "Text Book of Electrical Technology", by S.Chand& Co Ltd, India
**2.**Mittle. V.N., "Basic Electrical and Electronics Engineering", Tata McGraw Hill, New Delhi, 1st edition.
**3**. V.K.Mehta , "Principles of Electrical Engineering", by S.Chand& Co. Ltd, India.


**Reference Books:-**


**1**. A.VincentDeltoro , "Principles of Electrical Engineering" PHI

**2**. S.Parker Smith, "Principles of Electrical Engineering" by Oxford University

**3**. William Hayt and Kimmerly "Electric circuit Analysis" , Tata Mcgraw Hills

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PROGRAMME NAME** | **BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING** | | | | | | |
| **COURSE CODE** | **R5EE1031L** | **SEMESTER** | I | **CREDITS** | 1 | **SCHEME** | 0L:2P |
| **COURSE** | **BASIC ELECTRICAL SCIENCE LABORATORY** | | | | | | |

## Course Outcomes:

**After the completion of course, the student should be able to**

1. To understand fundamentals of DC circuits and apply knowledge for analyzing network theorems in DC circuits.
2. To learn the fundamentals and analyse single phase AC circuits.
3. To learn the fundamentals and analyse three phase AC circuits.
4. To analyse star and delta connections and concepts of phasors in AC single and three phase system.
5. To Describe the construction, operation, and characteristics of DC machines.

| Module | Content |
|---|---|
| **1** | To find the value of resistors, inductors and capacitors using various methods |
| **2** | To verify the Nodal and Mesh analysis techniques |
| **3** | To verify the Superposition theorem. |
| **4** | To verify Thevenin's theorem |
| **5** | To verify Norton's theorem |
| **6** | To verify Maximum Power transfer theorem. |
| **7** | To study the RL, RC and RLC series circuit |
| **8** | To study the RL, RC and RLCparallel circuit |
| **9** | To verify the relation between line and phase values in the star/Delta connected network. |
| **10** | To find the efficiency and regulation of single phase transformer by direct loading method |

**Text Books:-**


**1**.B.L.Theraja, "Text Book of Electrical Technology", by S.Chand& Co Ltd, India
**2.**Mittle. V.N., "Basic Electrical and Electronics Engineering", Tata McGraw Hill, New Delhi, 1st edition.
**3**. V.K.Mehta , "Principles of Electrical Engineering", by S.Chand& Co. Ltd, India.


**Reference Books:-**


**1**. A.VincentDeltoro , "Principles of Electrical Engineering" PHI

**2**. S.Parker Smith, "Principles of Electrical Engineering" by Oxford University

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5EE1024L | SEMESTER | I | CREDITS | 1.5 | SCHEME | 0L:3P |
| COURSE | DESIGN THINKING | | | | | | |

**Course Outcomes:**

**After the completion of course, the student should be able to**

1. Students will be able to identify an Opportunity from a Problem.
2. Students will be able to frame a product or service idea.
3. Students will be able to design and develop a Prototype.
4. Students will be able to pitch their idea

**Course Contents:**

| Module | Content |
|---|---|
| **1** | Introduction to Design Thinking: LRI Assessment, Introduction to Design Thinking, Understanding the Mindsets-Empathy, Optimism, Embrace Ambiguity, Make it, Learn from Failure, Iterate, Create Confidence, Creativity Convergent & Divergent Thinking |
| **2** | Design Thinking Methodology: The 5 Stages of the Design Thinking Process-Empathies, Define (the problem), Ideate, Prototype, and Test |
| **3** | Ideation tools & exercises. Sample Design Challenge, Introduction to the Design Challenge Themes, Storytelling and Tools for Innovation |
| **4** | Empathize-Understand customers, Empathy Maps, Empathies-Step into customers shoes Customer Journey Maps, Define- Analysis & Drawing Inferences from Research |
| **5** | The Design Challenge: Define the Design Challenge, Prototyping & Iteration-Feasibility Study, Testing Documentation and the Pitching. Process of patenting. |

**Text Books:-**

- Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School -Idris Mootee.

**References Books:**

- Zero to One: Note on Start-Ups, or How to Build the Future.
- The Lean Startup: How Constant Innovation Creates Radically Successful Businesses.

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5HS1001L | SEMESTER | I | CREDITS | 2 | SCHEME | 1L:2P |
| COURSE | BUSINESS & TECHNICAL COMMUNICATION | | | | | | |

**Course Outcomes**

**After completion of course, students would be able to:**

1. Apply the principles and practices of business communication for communicating in a professional environment.
2. Design a technical document with correctness of language, appropriate vocabulary and style.
3. Display competence in oral and visual communication.
4. Demonstrate capabilities for self-assessment and development.

**Course Contents**

FOUNDATIONS OF BUSINESS ENGLISH
- Introduction to Business English and its importance in the professional world.
- Business Vocabulary and commonly used expressions.
- Business Idioms at the workplace.

BUSINESS AND TECHNICAL WRITING
- Understanding Business writing language, style and tone.
- Crafting clear and concise business documents: Instruction Manuals/Brochures.
- Developing Email Etiquette.

BUSINESS GRAMMAR AND LANGUAGE USAGE
- Review of essential English grammar rules.
- Identifying commonly made errors in Indian English.

GROUP DISCUSSION
- Basics of a Group Discussion.
- Understanding the different types of Group Discussions.
- Practical tips and suggestions for a GD.

PRESENTATION SKILLS
- Structuring a compelling business presentation.
- Engaging an audience and using visual aids effectively.

INTRODUCTION TO PUBLIC SPEAKING FOR ENGINEERS
- Techniques to manage and reduce public speaking anxiety.
- Crafting a clear and concise speech outline.
- Tailoring the message for different audiences.

CRITICAL THINKING SKILLS
- Introduction to the processes of logical reasoning to interpret arguments.
- Evaluating information from a lens of fact checking, evidentiary support, confirmation bias and language analysis.

**Text Books**


1. H. S. Mukherjee, *Business Communication: Connecting at Work*, Oxford University Press; Pap/Cdr edition (26 November 2012), ISBN: 9780198073475
2. A. Rizvi, *Effective Technical Communication*, McGraw Hill Education; 1 edition (27 June 2005), ISBN: 0070599521
3. M. Raman, P. Singh, *Business Communication*, Oxford; Second edition (6 August 2012), ISBN: 9780198077053


**Recommended Reading:**


1. E. H. Mcgrath, *Basic Managerial Skills for All*, Prentice Hall India Learning Private Ltd.; 9 edition (2011), ISBN: 9788120343146
2. R. Subramanian, *Professional Ethics*, Oxford University Press; Second edition (17 April 2017), ISBN: 0199475075

# SEMESTER II

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5CH1012T | SEMESTER | II | CREDITS | 3 | SCHEME | 2L:1T |
| COURSE | CHEMISTRY | | | | | | |

**Course Outcomes:**

The student should be able to

**CO1** Correlate the different chemical reaction mechanisms with rate of reaction that are used in the industrial synthesis of organic molecules and drugs.

**CO2** Rating the chemical fuels based on their chemical composition, and properties. Choosing the alternate energy sources.

**CO3** Analyze the basic cause of corrosion, its reactions & corrective preventive measure to reduce the rate and adopt suitable method of treatment suitable for various industrial applications.

**CO4** Analyse functional material based on their structure, and performance. Rationalize the concept Sustainability and adopt green chemistry approach

**CO5** Select appropriate separation methods required in manufacturing industries by understanding the basic concept of chromatographic techniques. Choose the spectroscopic techniques for characterization of materials.

**Course Contents:**

**Reactions, Mechanisms & Kinetics**

Introduction to Chemical reactions, Material balance for organic reactions, Mass balance and stoichiometry, SN1, SN2 Reactions, Chemical Kinetics, Energy profile diagram, Synthesis of drug molecule.

**Energy Source**:

Types of Chemical fuels, Calorific value, Determination of calorific value, combustion calculations, Analysis of coal, proximate and ultimate analysis, Fuels for IC engines, Effect of Chemical composition of fuel on knocking, anti-knocking agents. Limitations of fossil fuels, Alternative fuels: Power alcohol, biomass, biogas, Biodiesel, Green hydrogen.

**Science of Corrosion**

Direct chemical corrosion, Electrochemical corrosion, and its reaction mechanisms. Types of electrochemical corrosion include differential aeration, galvanic, and concentration cell corrosion. Additionally, Electrochemical corrosion can manifest as pitting, Intergranular Corrosion, Soil Corrosion, and Waterline Corrosion. Factors Affecting Corrosion, Protection from Corrosion, and Applications with Few Practical Problems of Corrosion.

**Functional Materials for Engineers**

Plastic, Elastomeric, & Fiber forming polymers, structural requirement, molecular weight determination, effect of structure, bonding, molecular weight, degree of polymerisation on the performance of the polymers. Glass transition temperature, Structure property relationship.

**Lubricants:** Types of lubricants, Mechanism of lubrication, Physical and Chemical properties of lubricants, selection of lubricants.
**Cementations Materials:** Chemical composition of cement, Admixtures used in concrete, Chemical reactions involved, bitumen emulsions.

**Identification, Separation & Purification**
Types of Separation techniques: Column Chromatography, Thin layer chromatography, Paper chromatography. Spectroscopic principles and its applications, U.V. Spectroscopy, Fourier Transform Infra-Red Spectroscopy, Flame photometry. Determination of hardness of water by EDTA method and removal of hardness by ion exchange and zeolite method.

**Sustainable Engineering Chemistry**
Concept of sustainability and its significance, Waste minimization, Atom Economy, Reduction of Materials and Energy requirement, Green Chemistry approach, Industrial applications of green chemistry.

**Textbooks**


1. Engineering Chemistry by Jain and Jain, Danpatrai publications;16$^{th}$ edn. (2013)
2. Engineering Chemistry by Dr.S.S.Dara, Dr.S.S.Umare, S.Chand & CompanyLtd,12$^{th}$ ed.
3. A Text Book of Engineering Chemistry by Shashi Chawla, Dhanpatrai publications; 4$^{th}$ edn;(2010)


**Reference Books**


1. Polymer Science-Billmayer, F.John Willey&Sons, N.Y.; 3$^{rd}$ edn(1984)
2. Introduction to Material Science William Callister, John Willey & Sons, N.Y.; 9$^{th}$ edn;(2013)
3. Engineering .Chemistry- NPTEL web- book, by T.L. Tembe, Kamaluddin and M.S.Krishnan
4. Fundamentals of Molecular spectroscopy: Colin N.Banwell & Elaine M. McCash, Tata McGraw- Hill 4$^{th}$ edn.
5. Fundamentals of Electrochemistry, Second Edition, V. S. Bagotsky, Wiley Interscience (2006).

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5CH1012L | SEMESTER | II | CREDITS | 1 | SCHEME | 0L:2P |
| COURSE | CHEMISTRY LABORATORY | | | | | | |

**Course Outcomes:**

The student should be able to

**CO1** Determine the quality of water suitable for different sectors.
**CO2** Determine physical and chemical characteristics of lubricating oils.
**CO3** Synthesis of Biodiesel, Chalcones, and Calculating Atom Economy.
**CO4** Analysis of coal by the proximate method.
**CO5** Separate and analyse by Chromatographic techniques

**Course Contents**

**Title of the Experiment: (Any 10 experiments)**

1. Saponification value of oils
2. Acid value of an Oil
3. Viscosity &Viscosity Index by Redwood Viscometer
4. Flash Point by Abel's & Pensky-Marten's Apparatus
5. Conductometric titrations
6. Analysis Of fuel: Proximate analysis of coal sample
7. Determination of adulteration in transport fuels
8. Separation by TLC & Paper chromatography
9. Determination of alkali metals by Flame photometry
10. Synthesis of Biodiesel to find out Atom Economy.
11. Synthesis of drug molecule
12. Determination of hardness of water by EDTA method.

**References:**


1. Lab. Manual for Engineering Chemistry - Dr.S.K.Basin & Dr. S.K. Rani, Dhanapat Rai Publishing Company; (2009)
2. Practical Manual for Chemistry of Engineering Materials - D.D. Shah, Nandu Publication, Mumbai
3. Post Graduate Practical Chemistry - H.N. Patel, S.P. Turakhia, S.S. Kelkar, S.R. Puniyani, Himalaya Publishing House, 5th edn; (2008)
4. A Manual of Practical Engineering Chemistry Sudha Jain & Shradha Sinha, S.Chand Company Ltd 1st edn (2002)

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5MA1012T | SEMESTER | II | CREDITS | 3 | SCHEME | 2L:1T |
| COURSE | MATHEMATICS-II | | | | | | |

**Course outcomes:**

The student should be able to,

**CO1** Find the complete solution of a differential equation with constant coefficients in terms of the complementary function and the particular integral.

**CO2** Formulate Differential equations from the given physical problems and solve first-order Differential equations using different techniques.

**CO3** Characterise complex functions in terms of analyticity, find harmonic conjugates and study geometric properties of conformal mappings.

**CO4** Study complex power series, classify singularities of a function, evaluate line integrals and apply the residue theorem to evaluate real integrals.

**CO5** Develop better understanding of scalar and vector fields and apply gradient to solve problems involving normal vectors to level surfaces.

**CO6** Apply the integral theorems such as Stokes theorem, Green's theorem and Gauss divergence theorem to evaluate line, surface and volume integrals and give physical interpretation of curl and divergence of a vector field.Course Contents

**Ordinary Differential Equations**

Solving First order equations – Exact, linear and Bernoulli's equations, higher order linear differential equations with constant coefficients, Complementary functions and Particular integrals by operator method, method of variation of parameters, Method of Undetermined coefficients, Euler-Cauchy equation; initial and boundary value problems.Partial Differential Equation

**Vector calculus**

Vector functions- Limits, continuity and differentiation, scalar and vector fields, gradient, divergence and curl, Line integrals, Surface integrals, Volume integrals, Stoke's theorem, Gauss' Divergence theorem, Green's theorem.Complex Variables: Integration.

**Complex Variables – Differentiation:**

Complex Functions- Limits, Continuity and differentiability, Analytic functions, Cauchy Riemann equations, Harmonic conjugates, Conformal mappings, Linear fractional transformations and their properties.

**Complex Variables – Integration:**

Cauchy's Integral theorem and formula, Taylor's series- radius of convergence, Laurent's series, Singularities and Poles, Residue theorem, Evaluation of real integrals using contour integration and concept of residues.

**References**


1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & sons, 2006.
3. Ramana B. V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw Hill, New Delhi 2008.
5. N.P.Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint

2008.
6. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
7. Susan Jane Colley, Vector Calculus, 4th Edition, 2012.
8. John H. Matthews and Russell W. Howell, Complex Analysis for Mathematics and Engineering, Third Edition

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5EE1026T | SEMESTER | II | CREDITS | 2 | SCHEME | 2L:0P |
| COURSE | BIO SCIENCE FOR ELECTRICAL ENGINEERS | | | | | | |

**Course Outcomes:**

**After the completion of the course, the student should be able to**

**CO1** Illustrate the origin of various biological signals and their characteristics.
**CO2** Gain knowledge on characteristics of bio signals
**CO3** Measure various electrical parameters with accuracy, precision, resolution
**CO4** Provide an engineering approach to different measurement techniques for non-electrical bio-parameters.

**Course Contents:**

| Module | Content |
|---|---|
| 1 | **INTRODUCTION:**<br>i. Role of technology in medicine,<br>ii. Physiological System of the body: The cardiovascular system, The respiratory system, The nervous system<br>iii. Sources of Biomedical signals,<br>iv. Role of engineers in healthcare facilities. |
| 2 | **BIO ELECTRIC SIGNALS AND ELECTRODES**<br>i. Origin of Bio electric signal, Electrocardiography (ECG),(Electroencephalograph(EEG), Electromyography (EMG)<br>ii. Bio signals characteristics – Origin of io potential and its propagation. Frequency and amplitude ranges.<br>iii. Electrode configurations: Electrode-electrolyte interface, electrode–skin interface impedance, polarisation effects of electrode–non–polarizable electrodes. Unipolar and bipolar configuration, classification of electrodes |
| 3 | **PHYSIOLOGICAL TRANSDUCERS:**<br>i. Introduction to Transducer<br>ii. Classification of Transducers<br>iii. Performance Characteristics of Transducers<br>iv. Displacement, Position and Motion Transducers<br>v. Pressure Transducers<br>vi. Transducers for Body Temperature Measurement<br>vii. Photoelectric Transducers |

| | |
|---|---|
| **4** | **BIOSENSORS:**<br>i. General configuration of biosensor<br>ii. Types of biosensors<br>iii. Basic principle and instrumentation of different types of biosensors:<br>iv. Advance materials and techniques for developing biosensors |

**Text Books:**

- Biomedical Instrumentation and measurement",Leslie Cromwell, 2nd edition, Prentice hall of India, New Delhi, 2015
- "Medical Instrumentation Application and Design", John G. Webster, 4th edition, Wiley India Pvt Ltd, New Delhi, 2015.

**References Books:**

- "Handbook of Biomedical Instrumentation",Khandpur R.S, Tata McGraw Hill, New Delhi, 2003.
- "Introduction to Biomedical Engineering", John Enderle, Susan Blanchard, Joseph Bronzino, second edition, Academic Press,2005.
- "Introduction to Biomedical Equipment Technology", John Enderle, Susan Blanchard, Joseph Bronzino, Pearson Education, 2004.

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5SE1002T | SEMESTER | II | CREDITS | 1 | SCHEME | 0L:2P |
| COURSE | ENGINEERING MECHANICS | | | | | | |

**Course Outcomes:**

The student should be able to

**CO1** Analyse the force system and relate it to the Engineering Applications.

**CO2** Calculate centroids and centre of gravity of plane areas and volumes.

**CO3** Analyse the different motions of a particle and apply principles of work, energy, impulse & momentum.

**Course Contents:**

| FUNDAMENTAL OF MECHANICS |
|---|
| Review of basic concepts – mass, space, time and force: Particles and rigid bodies: Scalars and vectors: Free, sliding, fixed and unit vectors: Addition, subtraction and multiplication of two vectors. Definition of a force: Classification of forces: Principles of transmissibility, etc. |
| **FORCE SYSTEMS** |
| Introduction to different force systems, Composition of forces, triangle, parallelogram and polygon law of forces, addition of two parallel forces, Resolution of forces, moment of a force, Varignon's Theorem, Couple of forces, force – couple systems, Resultant of a force system, Equilibrium conditions for a force system, Free body diagram, Different types of supports, etc. |
| **DISTRIBUTED FORCES** |
| Line, area and volume distributions of forces, Centre of gravity, Centre of mass, Centroid of plane figures, Cerntroid of composite figures, Moment of Inertia, Area and mass moments of inertia, Perpendicular and parallel axes theorems of moment of inertia, Radius of gyration, etc. |
| **DRY FRICTION** |
| Laws of dry friction, Co-efficient of friction, Angle and cone of friction, Angle of repose, Applications of friction to wedges and screw jacks, etc. |
| **VIRTUAL WORK** |
| Work done by forces and couples, Virtual displacement and virtual work, Principle of virtual work for equilibrium bodies in equilibrium, Active force diagram, Degree of freedom, etc. |
| **KINEMATICS OF PARTICLES:** |
| Differential equations of kinematics, plane, rectilinear and curvilinear motions, Cartesian co- ordinate system, Normal and tangent co-ordinate system, projectile motion, etc. |
| **KINETICS OF PARTICLES:** |
| Newton's second law of motion, Work and energy principle, Gravitational-potential energy, elastic-potential energy, kinetic energy, power, efficiency, Principle of impulse and momentum, Impact motion, Direct central impact, etc. |

**Recommended books**

1. A textbook of Engineering Mechanics, Dr. Sadhu Singh (S. Chand publishing)
2. Tayal A.K., Mechanics for Engineering, Statics and Dynamics, Umesh Publication, N. Delhi, 2008.
3. Engineering Mechanics, K. L. Kumar, Veenu Kumar, McGrow Higher Education.

**Additional Reading**

1. Shames I.H, Engineering Mechanics, P.H.I. India 1980.
2. Kumar K. L., Engineering Mechanics, McGraw Hill publishing company New Delhi 2008.
3. Beer and Johnston, Mechanics for Engineers, McGraw Hill, 2009.
4. Timoshenko and Young, Mechanics for Engineers, McGraw Hill, 2010.
5. Mclean and Nelson, Mechanics for Engineers, Schaum Outline Series 2010.
6. Hibbeler R.C., Mechanics for Engineers, Pearson Education, 2012.

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5SE1002L | SEMESTER | II | CREDITS | 1 | SCHEME | 0L:2P |
| COURSE | ENGINEERING MECHANICS LABORATORY | | | | | | |

**Course Contents:**

**List of Practicals (Any 10)**

**Bell Crank Lever:**
- Study the equilibrium conditions of a bell crank lever under different loads and angles.
- Calculate the Electrical advantage and efficiency of the bell crank lever.

**Simple Beam:**
- Determine the reactions at the supports of a simple beam loaded with various point loads and distributed loads.
- Verify the principles of equilibrium and deflection calculations for the beam.

**Simple Jib Crane:**
- Analyze the forces acting on a simple jib crane and calculate the reactions at its base.

**Link Chain:**
- Study the forces acting on a link chain when subjected to a load.
- Determine the tension in different segments of the chain and its equilibrium conditions.

**Screw Jack (Friction):**
- Investigate the working of a screw jack, considering frictional forces.
- Calculate the input force required to lift a given load using the screw jack.

**Shear Leg Apparatus:**
- Set up and analyze a shear leg apparatus to lift a load using multiple ropes and pulleys.
- Calculate the forces in the ropes and verify equilibrium conditions.

**'g' by Falling Weight Method:**
- Measure the acceleration due to gravity using the falling weight method.
- Analyze the motion of a freely falling weight and calculate 'g' from the recorded data.

**Plane Motion of Bodies:**
- Investigate the motion of bodies on inclined planes under the influence of gravity.
- Determine the acceleration, time of motion, and distance covered on the inclined plane.

**Moment of Inertia (M.I.) of Flywheel:**
- Determine the moment of inertia of a flywheel experimentally using rotational dynamics.
- Compare experimental results with theoretical calculations.

**Compound Pendulum:**
- Study the behaviour of a compound pendulum and analyze its oscillations.
- Calculate the period of oscillation and verify the principles of simple harmonic motion.

**Torsional Pendulum:**

- Set up a torsional pendulum and measure the torsional constant of the material.
- Calculate the moment of inertia of the pendulum and analyze its oscillations.

**Principle of Conservation of Energy (Connected Bodies with Flywheel):**

- Study the energy transfer and conservation principles in a system of connected bodies with a flywheel.
- Analyze the changes in potential and kinetic energy and validate the principle of conservation of energy.

**Stiffness of Spring:**

- Determine the stiffness (spring constant) of a spring experimentally.
- Analyze the relationship between force and displacement for the spring.

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5CO1012T | SEMESTER | II | CREDITS | 2 | SCHEME | 2L:0P |
| COURSE | PROGRAMMING FOR PROBLEM SOLVING | | | | | | |

**Course Outcomes:**

The student should be able to

**CO1** Interpret the concepts of the C++ programming language.

**CO2** Use control structures such as loops and conditional statements to control the flow of their programs.

**CO3** Develop simple C++ programs to solve computational problems using fundamental programming constructs.

**CO4** Use file handling to store and retrieve data efficiently from files.

**CO5** Develop problem-solving skills by applying C++ programming techniques to real-world scenarios and challenges.

**Course Contents:**

| Module | Contents |
|---|---|
| 1 | **Introduction to Programming and C++**<br>Elements of a computer systems, DOS Commands & Linux environment, Overview of programming languages, Introduction to C++ and its features, Setting up a C++ development environment, Language Processors, Object Oriented Programming Paradigm and benefits, Applications of Object Oriented programming. |
| 2 | **Beginning with C++**<br>Tokens, Expressions, Control Structures, Array, Functions, Structures, Unions and pointers, String Manipulation |
| 3 | **C++ Programming Features**<br>Classes, Objects, Constructors, Destructors, Inheritance and Polymorphism, Virtual Base Classes, Abstract Classes. |
| 4 | **Working with Files**<br>Classes for File Stream Operations and I/O stream operation, Opening and Closing a File, Detecting end-of-file, more about Open(): File Modes, Sequential Input and Output operations. **Case Studies of C++** |
| 5 | **Programming:**<br>Number Conversions, Telecom Billing System, Logistic management of solid waste, Design of a scientific calculator |

**Text Books**


1. How to Solve It: A New Aspect of Mathematical Method, by G. Polya, Princeton University Press, 2015
2. The C++ Programming Language, Fourth Edition by Bjarne Stroustrup, Addison-Wesley Educational Publishers Inc
3. Programming and Problem Solving with C++ by Chip Weems, Nell Dale and Tim Richards, Jones and Bartlett Publishers, Inc, 2022
4. Scientific Approach to Problem Solving: With C++ Programming by Sal Washah, Cognella, Inc, 2013.

**Reference Books:**


1. Effective C++, 3rd edition, by Scott Meyers, Addison-Wesley Educational Publishers Inc
2. Solving Mathematical Problems: A Personal Perspective, Illustrated Edition, by Terence Tao, Oxford University Press, 2006.
3. Object-Oriented Programming with C++, 8th edition, by E Balagurusamy, Publisher McGraw Hill

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5CO1012L | SEMESTER | II | CREDITS | 1 | SCHEME | 0L:2P |
| COURSE | PROGRAMMING FOR PROBLEM SOLVING LABORATORY | | | | | | |

**Course Outcomes:**

The student should be able to

**CO1** Understand Linux Environment, basic Linux commands and computer elements.

**CO2** Demonstrate proficiency in writing basic C++ programs, including understanding data types, variables, control structures, and functions.

**CO3** Implement classes and objects, understand inheritance and polymorphism, and apply OOP principles in their code.

**CO4** Apply C++ knowledge to design and implement complete software solutions for specific problem domains.

**CO5** Develop their ability to manipulate strings, including concatenation, substring extraction, and other string operations.

**CO6** Read from and write to files in C++, enabling them to process data from external sources.

**Course Contents:**

**List of Practicals**

1. Study of Linux Commands, language processor and Computer Elements.
2. Study of Input and Output operations in C++ - Write a program in C++ for entering the detailed information of student and print all details of student.
3. Study of for loop in C++ - Write a program in C and C++ to print Fibonacci series of any number inputted by person.
   Additional Program for practice - Write a program in C++ to find binary values of integer using for loop.
4. Study of if-else loop in C++ - Write a program in C++ to check whether entered character is a vowel or not using if-else statement.
5. Study of if – else if - else loop in C++ - Write a C++ program to accept marks of subjects for a student. Calculate the total and percentage of marks, also decide grade of student depending on the percentage using if-else-if-else statements.
   Study of while loop and do-while in C++ - Write a C++ program to display numbers from 1 to 10 with the help of a while loop and do-while loop.
6. Study of switch case in C++ - Write a program in C++ to make a menu driven calculator. Additional Program for practice: Write a menu driven program in C++ to find sum of positive numbers, sum of negative numbers & avg of all numbers in an array.
7. Study of arrays and structures in C++
   a) Write a program in C++ to display the information of 10 employees using array of structure variable.
   b) Write a program in C++ to illustrate use of array within structure.
   c) Write a program in C++ to illustrate use of nested structure.

8. Study of Classes and Objects in C++ - Write a program in C++ to add two integers using classes.
   Additional Program for practice: Read and Print Student Information using class Student.
9. (a) Study of Function Overloading in C++.
   (b) Study of Operator Overloading in C++ (Overloading unary and binary operators).
10. Study of Constructors and Destructors in C++ -
    Write a program in C++ with class Rectangle with the data fields width, length, area and colour. The length, width and area are of double type and colour is of string type. The methods are get_length(), get_width(), get_colour() and find_area(). Create two objects of Rectangle and compare their area and colour. If the area and colour both are the same for the objects then display "Matching Rectangles", otherwise display "Non-matching Rectangle". Use Constructors.
    Additional Program for Practice - Write a program in C++ to implement Stack. Design the class for stack and the operations to be performed on stack. Use Constructors and destructors.
11. Study of Inheritance, virtual class and virtual function in C++ - Create a base class called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function get_data() to initialize base class data members and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine this function in the derived classes to suit their requirements.
12. Study of friend class and friend function in C++.
13. Study of String Manipulation in C++ - Write a program in C++ to perform string operations by using predefined string functions.
14. Study of File Handling in C++ - Write a program in C++ to open, read and close a file using file stream operations.

**Text Books:**

1. The C++ Programming Language, Fourth Edition by Bjarne Stroustrup, Addison-Wesley Educational Publishers Inc
2. Object-Oriented Programming with C++, 8th edition, by E Balagurusamy, Publisher McGraw Hill

**Reference Books:**

1. Effective C++, 3rd edition, by Scott Meyers, Addison-Wesley Educational Publishers Inc
2. Object-Oriented Analysis and Design with Applications by Grady Booch, 3rd edition, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, and Kelli A. Houston, Addison Wesley publisher

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5EE1027T | SEMESTER | II | CREDITS | 2 | SCHEME | 2L:0P |
| COURSE | BASIC ELECTRONICS | | | | | | |

**Course Outcomes:**

**CO1** Understand the semiconductor physics of the intrinsic, p and n materials.
**CO2** Understand the function and operation of diodes.
**CO3** Understand the function and operation transistors.
**CO4** Understand the fundamental concepts of digital electronics.

**Course Contents:**

| Module | Contents |
|---|---|
| 1 | **Semi-Conductors and Diodes:** Conductors, Semiconductors, Intrinsic Semiconductors, Extrinsic Semi-Conductors. Diode Theory: Basic Ideas, The ideal Diode, Forward and Reverse Bias, Diode Equation, Volt-Ampere Characteristic. Special diodes: symbol of zener diode, operation, V-I characteristics, symbol of photo diode, working principle, LED symbol and principle. |
| 2 | **Rectifiers:** Half-wave Rectifier, Full-wave and Bridge Rectifier, derivation of Ripple factor, efficiency of Half-wave, full-wave and Bridge rectifiers. Merits and demerits of Half-wave, full-wave and Bridge rectifiers, Comparisons of rectifiers, Controlled Rectifier Introduction |
| 3 | **Bipolar Junction Transistors:** Symbols of pnp and npn transistors and their working principles, Transistor currents, input and output characteristics of Common base configuration, Common Emitter configuration Transistor Switch, Amplifiers: working principles of Common base amplifier, Common Emitter amplifier, Common collector amplifier and their applications |
| 4 | **Digital Electronics:** Number systems, Binary arithmetic, Logic gates: OR, NOT, AND, NOR, NAND, XOR, XNOR gate; Truth tables, Multiplexers, Demux, Encoder, Decoder ,Combinational circuits: SOP, POS form; K-map ,Introduction of Flip-flops |

**Text Books:-**


- "Electronic Devices and Circuit Theory",Robert L. Boylestad, Pearson Education, 11th Edition, 23 July 2013.
- "Electronic Devices and Circuits", David A.Bell, Oxford, 5th edition, 2009.


**References:**


- "Digital Fundamentals", Thomas L. Floyd, Pearson Education,11th Edition, 30 August 2017.
- "Digital Electronics Principles, Devices and Applications", Anil K Maini, Willey, 1st edition (27 July 2007).

| PROGRAMME NAME | BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE | R5EE1028L | SEMESTER | II | CREDITS | 1.5 | SCHEME | 0L:0T:3P |
| COURSE | ELECTRICAL WORKSHOP | | | | | | |

**Course Outcomes:**

**CO1** Demonstrate safety measures against electric shocks.
**CO2** Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols.
**CO3** Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings.
**CO4** Identify various Resistors, capacitors, inductors and transformers.
**CO5** Use components as per the requirements of the circuits. Work in a team with good interpersonal skills.

**Course Contents:**

| Module | Contents |
|---|---|
| 1 | a) Demonstrate the precautionary steps adopted in case of Electrical shocks.<br>b) Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB with ratings |
| 2 | Wiring of simple light circuit for controlling light/ fan point (PVC conduit wiring) |
| 3 | Wiring of light/fan circuit using Two way switches. (Staircase wiring) |
| 4 | Importance of Neutral and structure Grounding and exposure to various earthing schemes |
| 5 | Assembling and dissembling of D. C. Machine, single phase motor |
| 6 | Assembling and dissembling of single phase transformer |
| 7 | Test resistor, capacitor, inductor, P-N junction Diode using CRO & Multimeter. |

**Text Books:**

- Electrical engineering materials and electronic components, TTTI Chandigarh, Raina K. B., Bhattacharya S. K., Juneja T.

**References:**

- List of Software/Learning Websites: http://www.electronics-tutorials.com, http://www.efymag.com/, http://en.wikipedia.org/wiki/Electronic_component

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PROGRAMME NAME** | **BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING** | | | | | | |
| **COURSE CODE** | **R5EE1029T** | **SEMESTER** | II | **CREDITS** | 2 | **SCHEME** | 2L:0P |
| **COURSE** | **INTRODUCTION TO ANCIENT INDIAN TECHNOLOGY** | | | | | | |

**Course Outcomes:**

The students would know about the various aspects of Ancient Indian Technology in various sectors:

**CO1** Introduction to ancient Indian Technology in general and Electrical Engg
**CO2** Ancient Indian Technology related to Agricultural practices
**CO3** Ancient Indian Technology related to textile and Metallurgy
**CO4** Ancient Indian Technology related to Civil and Urban Planning, Water and irrigation systems

**Course Contents:**

| | | | |
|---|---|---|---|
| **MODULE 1** | 1.0 | **INTRODUCTION TO ANCIENT INDIAN CIVILIZATION:**Ancient Indian Civilization's gift to the world, Brief Review of Ancient Indian Scriptures , Why do we need to look at Ancient Indian Science and Technology, Glimpses of Ancient Indian Science and Technology, Basic Principles of carrying out science and technology, Arrays of Physics, chemistry, and indoor games, Marvels of Ancient Indian Technology (AIT) | 8 hrs |
| | 1.1 | **ELECTRICITY** and applications of Electricity in Ancient Indian technology | 2 hrs |
| **MODULE 2** | 2.0 | **INTRODUCTION TO INDIAN AGRICULTURE:** Problems arising due to modern agriculture practices, Pesticides and soil degradation, Agriculture – A primary productive activity, An Agriculture Tools – A Plough, Soil and seeds, Sowing Methods, Indigenous cattle and manuring | 8 hrs |
| **MODULE 3** | 3.0 | **ANCIENT INDIAN TEXTILE TECHNOLOGY:** Handlooms and Charkha, Different types of Handlooms | 1 hr |
| | 3.1 | **METALLURGY:** World of materials, Metals – Gold silver lead, History of Copper, Iron during Vedic Period, Iron smelting process in ancient India, Iron and Steel crafts in ancient India, Extraction and smelting of Zinc in ancient India, Metal casting in ancient India, Glass Technology in Ancient India | 6 hrs |
| **MODULE 4** | 4.0 | **CIVIL AND URBAN PLANNING:** Ancient Rural Indian Housing, Thatched Roof House, Rural Walls and Roof materials, Indus Valley and Harappan Civilization, First and Second Indian Civilization, Town topologies and Brick and Tile making process, | 6 hrs |
| | 4.1 | **WATER AND IRRIGATION:** Availability of Water and Freshwater, Ancient Indian Wells, Temple water tanks and dams, Tank irrigation system and rainwater harvesting, Waterbodies – Lakes and canals, Sluices and Embankments | 9 hrs |

Ref: NPTEL: Introduction to Ancient Indian Technology