TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

L	T	P	C
3	0	0	3

ENGINEERING PHYSICS
(Common to CSE & EEE)

Ist Year – IInd Semester

Course Objectives:
To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes:
CO1: Analyze the intensity variation of light due to polarization, interference and diffraction.
CO2: Familiarize with the basics of crystals and their structures.
CO3: Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials.
CO5: Identify the type of semiconductor using Hall effect.

UNIT I   Wave Optics
Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

Polarization: Introduction -Types of polarization – Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT II Crystallography and X-ray diffraction
Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT III Dielectric and Magnetic Materials
Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT IV   Quantum Mechanics and Free electron Theory
Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT V Semiconductors
Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effectand its applications.

Textbooks:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS ArunMurthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books:

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

 Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

L	T	P	C
0	0	2	1

ENGINEERING PHYSICS LAB
(Common to All Branches of Engineering)

Course Objectives:

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes: The students will be able to

CO1: Operate optical instruments like travelling microscope and spectrometer.
CO2: Estimate the wavelengths of different colours using diffraction grating.
CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance.
CO4: Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
CO5: Calculate the band gap of a given semiconductor.
CO6: Identify the type of semiconductor using Hall effect.

List of Experiments:
1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using acompound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde'sexperiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWOexperiments may be conducted in virtual mode.

References:
1. A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. ChandPublishers, 2017.
2. Physics Laboratory Manual – S.Ramesh, P. Apparao, Lorven Publications, 2013.

Web Resources
1. www.vlab.co.in
2. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)

Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)

Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.

web: www.tecnrt.org   email: tecnrt@gmail.com

Year and Semester	L	T	P	C
Ist Year - IInd Semester	3	0	0	3

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches of Engineering)

Course Objectives:
• To enlighten the learners in the concept of differential equations and multivariate calculus.
• To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Course Outcomes: At the end of the course, the student will be able to
CO1: Solve the differential equations related to various engineering fields.
CO2: Identify solution methods for partial differential equations that model physical processes.
CO3: Interpret the physical meaning of different operators such as gradient, curl and divergence.
CO4: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT I: Differential equations of first order and first degree
Linear differential equations – Bernoulli's equations, Exact equations and equations reducible to exact form.
Applications: Newton's Law of cooling, Law of natural growth and decay, Electrical circuits (L-R circuits).   (10 Periods)

UNIT II: Linear differential equations of higher order with Constant Coefficients
Homogeneous differential equations of higher order with constant coefficients, and Non-homogeneous differential equations of higher order with non-homogeneous term of the type e^{ax}, $\sin(ax)$, $\cos(ax)$, polynomials in x^n, $e^{ax}V(X)$, $x^nV(X)$, Method of Variation of parameters, Simultaneous linear equations.
 Applications: LCR circuit, Simple Harmonic motion.   (10 Periods)

UNIT III: Partial Differential Equations
Introduction and formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Higher order Homogeneous and non homogeneous Linear Partial differential equations with constant coefficients.
                                                                                      (10 Periods)

UNIT IV: Vector differentiation:
Scalar and vector point functions, vector operator Del, Gradient, Directional derivative, angle between surfaces, Divergence, solenoidal, Curl, irrotational, Scalar Potential, vector identities.
                                                                                      (08 Periods)

UNIT V : Vector integration
 Line integration, circulation, work done, surface integral, volume integral, Green's theorem in the plane, Stoke's theorem, Divergence theorem (without proofs) and related problems.
                                                                                      (10 Periods)

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, 43rd Edition, Khanna Publishers (New Delhi), 2020.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 10th Edition, John Wiley & Sons (U.S.A), 2008.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, 14th Edition Pearson Publishers (Chennai), 2018.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, 5th Edition. Pearson Publishers (Chennai), 2018,
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, 5th Edition (9th Reprint, Alpha Science International Ltd (U.k), 2021.
5. Higher Engineering Mathematics, B. V. Ramana, 2007 Edition, McGraw Hill (Chennai).

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

L	T	P	C
3	0	0	3

BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(Common to All branches of Engineering)

Course Objectives

To expose to the field of electrical & electronics engineering, laws and principles of electrical / electronic engineering and to acquire fundamental knowledge in the relevant field.

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

CO1. Describe fundamental laws, operating principles of motors / generators, MC/MI instruments (L2)
CO2. Demonstrate the working of electrical machines, measuring instruments and power Generation stations. (L2)
CO3. Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines. (L3)
CO4. Calculate electrical load and electricity bill of residential and commercial buildings. (L4)

PARTA: BASIC ELECTRICAL ENGINEERING

UNIT I   DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series – parallel circuits, SuperPosition theorem, Simple numerical problems.
AC Circuits: A. C. Fundamentals: Equation of AC Voltage and current, wave form, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor(Simple Numerical problems).

UNIT II   Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.
Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wattmeter.

UNIT III   Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non conventional energy resources; Lay out and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of house hold appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse, Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Textbooks:

1. BasicElectricalEngineering,D.C.Kulshreshtha,TataMcGrawHill,2019,FirstEdition
2. PowerSystemEngineering,P.V.Gupta,M.L.Soni,U.S.BhatnagarandA.Chakrabarti,DhanpatRai & Co, 2013
3. FundamentalsofElectricalEngineering,RajendraPrasad,PHIpublishers,2014,ThirdEdition

Reference Books:
1. Basic Electrical Engineering, D. P. Kothariand I. J. Nagrath, McGrawHill,2019, Fourth Edition
2. PrinciplesofPowerSystems,V.K.Mehtha,S.ChandTechnicalPublishers,2020
3. BasicElectricalEngineering,T.K.NagsarkarandM.S.Sukhija,OxfordUniversityPress,2017
4. Basic Electricalan dElectronics Engineering, S. K. Bhatacharya , Person Publications 2018 , Second Edition.

Web Resources:
1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART-B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

UNIT I   SEMICONDUCTORDEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics ofPNJunctionDiode—ZenerEffect—ZenerDiodeanditsCharacteristics.BipolarJunction

Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT II   BASICELECTRONICCIRCUITSAND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III   DIGITALELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra , Basic Theorem sand properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates–NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits – Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Textbooks:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R.P.Jain,ModernDigitalElectronics,4th Edition,TataMcGrawHill,2009

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand &Co, 2010.
2. Santiram Kal, Basic Electronics-Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits Conventional Flow Version, Pearson Education, 2009.

End examination pattern:

i) Question paper shall be in two parts viz., Part A and Part B with equal weight age of 35 marks each.

ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5marks such that each question carries1mark.

iii) In each part, questions from 2 to 4, there shall be either / or type questions of 10 marks each. Student shall answer any one of them.

iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

L	T	P	C
0	0	3	1.5

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP
(Common to All branches of Engineering)

Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

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

CO1. Measure voltage, current and power in an electrical circuit.(L3)

CO2. Measure of Resistance using Wheatst one bridge (L4)

CO3. Discover critical field resistance and critical speed of DC shunt generators.(L4)

CO4. Investigate the effect of reactive power and power factor in electrical loads.(L5)

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Breadboard, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that hardware tools and instruments are learned to beused by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Qmeter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that measuring instruments are learned to be used by thestudents.
3. Components:
   - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
   - Testing of component slike Resistor, Capacitor, Diode, Transistor, IC set c.-Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART-A : ELECTRICALENGINEERINGLAB

List of experiments:

1. Demonstration of Basic Electrical equipment

2. Verification of KCL and KVL

3. Verification of Superposition theorem

4. Magnetization Characteristics of DC shunt Generator

5. Measurement of Power and Power factor using Single-phase wattmeter

6. Measurement of Earth Resistance using Megger

7. Calculation of Electrical Energy for Domestic Premises

Reference Books:

1. BasicElectricalEngineering,D.C.Kulshreshtha,TataMcGrawHill,2019,FirstEdition

2. PowerSystemEngineering,P.V.Gupta,M.L.Soni,U.S.BhatnagarandA.Chakrabarti,DhanpatRai & Co, 2013

3. FundamentalsofElectricalEngineering,RajendraPrasad,PHIpublishers,2014,ThirdEdition

Note: Minimum Six Experiments to be performed.

PART- B: ELECTRONICS ENGINEERING LAB

Course Objectives:
- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

Course Outcomes: At the end of the course, the student will be able to

CO1: Identify & testing of various electronic components.

CO2: Understand the usage of electronic measuring instruments.

CO3: Plot and discuss the characteristics of various electron devices.

CO4: Explain the operation of a digital circuit.

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.

2. Plot V–I characteristics of Zener Diode and its application as voltage Regulator.

3. Implementation of half wave and full wave rectifiers

4. Verification of Truth Table of AND,OR, NOT gates using ICs.

5. Verification of Truth Table of Ex-OR, Ex-NOR gates using ICs.

6. Verification of Truth Table of UNIVERSAL gates using ICs.

7. Implementation of Boolean Function using Logic Gates.

Tools / Equipment required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active device.

References:
1. R. L. Boylestad & Louis Nashlesky, ElectronicDevices&CircuitTheory,PearsonEducation,2021.
2. R.P.Jain,ModernDigitalElectronics,4th Edition,TataMcGrawHill,2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education 2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Software and Hardware.

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

L	T	P	C
1	0	4	3

ENGINEERING GRAPHICS
(Common to All branches of Engineering)

Course Objectives:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

Course Outcomes:
CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
CO3: Understand and draw projection of solids in various positions in first quadrant.
CO4: Explain principles behind development of surfaces.
CO5: Prepare isometric and perspective sections of simple solids.

UNIT I
Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.
Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.
Scales: Plain scales, diagonal scales and vernier scales.

UNIT II
Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.
Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

Textbook:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

DATA STRUCTURES
(Common to CSE, IT & allied branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

Course Outcomes: At the end of the course, Student will be able to

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.

CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.

CO5: Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.

CO6: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

UNIT I
Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Stack ADT, Queue ADT, time and space complexity analysis for linear data structures. Searching Techniques: Linear Search, Binary Search; Sorting Techniques: Bubble sort, Selection sort, Insertion Sort, Merge Sort & Quick Sort

UNIT II
Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

UNIT III
Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, back tracking, reversing list, factorial calculation, Expression Conversions Infix to Post fix, Infix to Prefix, Evaluating of Postfix Expression.

UNIT IV
Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, circular queues, priority queues, Dequeus.

UNIT V
Trees: Introduction to Trees, basic terminology of trees, Representation of Trees Using Arrays & Linked list Binary Search Tree – Insertion, Deletion & Tree Traversals
Graphs: Introduction to Graphs, Graph Traversals (BFS & DFS)

Textbooks:
1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

Reference Books:
1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E.Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

L	T	P	C
0	0	3	1.5

ELECTRICALCIRCUITSLAB
(EEE & allied branches)

Course Objectives:

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics. It also gives practical exposure to the usage of different circuits with different conditions.

Course Outcomes:

CO1: Understand the concepts of network theorems, node and mesh net works, series and parallel resonance and Locus diagrams.

CO2: Apply various theorems to compare practical results obtained with theoretical calculations.

CO3: Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil.

CO4: Analyse different circuit characteristics with the help of fundamental laws and various configurations.

CO5: Create locus diagrams of RL, RC series circuits and examine series and parallel resonance.

List of Experiments:

1. Verification of Kirchh off's circuit laws
2. Verification of node and mesh analysis.
3. Verification of network reduction techniques.
4. Determination of cold and hot resistance of an electric lamp
5. Determination of Parameter so fachoke coil.
6. Determination of self, mutual inductances, and coefficient of coupling
7. Series and parallel resonance
8. Locus diagrams of R-L(L Variable) and R-C(C Variable) series circuits
9. Verification of Super position theorem
10. Verification of Thevenin's and Norton's Theorems
11. Verification of Maximum power transfer theorem
12. Verification of Compensation theorem
13. Verification of Reciprocity and Millman's Theorems

Reference Books:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata McGraw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E.Van Valkenburg, PearsonEducation,2019,Revised Third Edition.

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

	L	T	P	C
ELECTRICAL CIRCUIT ANALYSIS-I (EEE & allied branches)	3	0	0	3

Course Objectives:

To develop an understanding of the fundamental laws, elements of electrical circuits and to apply circuit analysis to DC and AC circuits.

Course Outcomes:

CO1: Remembering the basic electrical elements and different fundamental laws.

CO2: Understand the network reduction techniques, transformations, concept of self-inductance and mutual inductance, phasor diagrams, resonance and network theorems.

CO3: Apply the concepts to obtain various mathematical and graphical representations.

CO4: Analyze nodal and mesh networks, series and parallel circuits, steady stateresponse, different circuit to pologies (with R,L and C components).

CO5: Evaluation of Network theorems, electrical, magnetic and single-phase circuits.

UNIT -I INTRODUCTION TO ELECTRICAL CIRCUITS

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series- parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis.

UNIT-II MAGNETICCIRCUITS

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction– concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT-III SINGLEPHASECIRCUITS

Characteristics of periodic functions, Average value, R.M.S. value, form factor, representation of a sine function, concept of phasor, phasor diagrams, node and mesh analysis. Steady state analysis of R, L and C circuits to sinusoidal excitations-response of pure resistance, inductance, capacitance, series RL circuit, series RC circuit, series RLC circuit, parallel RL circuit, parallel RC circuit.

UNIT-IV RESONANCEANDLOCUSDIAGRAMS

Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and band width, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and band width; Locus diagram: RL, RC, RLC with R, L and Cvariables.

UNIT-V NETWORK THEOREMS (DC & ACEXCITATIONS)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem

Textbooks:
1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata McGraw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E.VanValkenburg,PearsonEducation,2019,RevisedThirdEdition

Reference Books:

1. Fundamentals of Electrical Circuits, Charles K.Alexander and Mathew N.O. Sadiku, McGraw Hill Education(India),2013, Fifth Edition
2. Electric Circuits (Schaum's outline Series), Mahmood Nahvi,Joseph Edminister, and K.Rao, McGraw HillEducation,2017, FifthEdition.
3. ElectricCircuits,DavidA.Bell,OxfordUniversityPress,2009,SeventhEdition.
4. Introductory Circuit Analysis, Robert L Boylestad, Pearson Publications, 2023, Fourteenth Edition.
5. CircuitTheory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai&Co., 2018, Seventh Revised Edition.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ee81/preview
2. https://nptel.ac.in/courses/108104139
3. https://nptel.ac.in/courses/108106172
4. https://nptel.ac.in/courses/1171061

L	T	P	C
0	0	3	1.5

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

DATA STRUCTURES LAB
(Common to CSE, IT & allied branches)

Course Objectives:
The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

Course Outcomes: At the end of the course, Student will be able to

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
CO4: Apply queue-based algorithms for efficient task scheduling and breadth- first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.
CO5: Recognize scenarios where hashing is advantageous, and design hash-based solutions forspecific problems.

List of Experiments:
Exercise 1: Array Manipulation

   i)   Write a program to reverse an array.
   ii) C Programs to implement the Searching Techniques – Linear & Binary Search
   iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

Exercise 2: Linked List Implementation
   i)   Implement a singly linked list and perform insertion and deletion operations.
   ii) Develop a program to reverse a linked list iteratively and recursively.
   iii) Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications
   i)   Create a program to detect and remove duplicates from a linked list.
   ii) Implement a linked list to represent polynomials and perform addition.

Exercise 4: Double Linked List Implementation
   i)   Implement a doubly linked list and perform various operations to understand its properties and applications.
   ii) Implement a circular linked list and perform insertion, deletion, and traversal.
   iii) Implement a double-ended queue(deque) with essential operations.

Exercise 5: Stack Operations
 i) Implement a stack using arrays and linked lists.
 ii) Write a program to evaluate a postfix expression using a stack.
 iii) Implement a program to check for balanced parentheses using as tack.

Exercise 6: Queue Operations
 i) Implement a queue using arrays and linked lists.
 ii) Develop a program to simulate a simple printer queue system
 iii) Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications
 i) Use a stack to evaluate an infix expression and convert it to postfix.
 ii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Search Tree
 i) Implementing a BST using Linked List.
 ii) Traversing of BST

Reference Books:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni,Susan Anderson-Freed, Silicon Press, 2008
3. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
4. C Data Structures and Algorithms by Alfred V. A ho, Jeffrey D. Ullman, and John E. Hopcroft
5. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
6. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein
7. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures,Sorting, Searching, and Graph Algorithms by Robert Sed gewick.

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

L	T	P	C
0	0	2	1

IT WORK SHOP
(Common to all Branches of Engineering)

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and otherOperating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes:
CO1: Perform Hardware troubleshooting.
CO2: Understand Hardware components and inter dependencies.
CO3: Safeguard computer systems from viruses/worms.
CO4: Document/ Presentation preparation.
CO5: Perform calculations using spreadsheets.

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Labinstructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finallystudents should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWWon the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LANproxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and howto use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS officeor equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Usinghelp and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeXand Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns,Images from files and clipart, Drawing toolbar and Word Art, Formatting Images,Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS)tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using helpand resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel –average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP
Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators,Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the modelresponds. Try asking questions, starting conversations, or even providing incomplete sentencesto see how the model completes them.
- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: Whatis the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a storyor a description of a scene, and let the model generate the rest of the content. This can be a funway to brainstorm creative ideas
- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output tosee how accurate and fluent the translations are.
- Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:
1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dreamtech,2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited,PearsonEducation, 2012, 2nd edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan–CISCO Press, Pearson Education, 3rd edition

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

Year and Sem	Course Code	Category	L	T	P	C	I.M	E.M	EXAM
Ist B. Tech IInd Sem	R231112L	BS	0	0	1	0.5			3Hrs

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE
(Common to All branches of Engineering)

Course Objectives:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

Course Outcomes: After completion of the course the students will be able to
   CO1: Understand the importance of discipline, character and service motto.
   CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.
   CO3: Explore human relationships by analyzing social problems.
   CO4: Determine to extend their help for the fellow beings and downtrodden people.
   CO5: Develop leadership skills and civic responsibilities.

UNIT I
Orientation
General orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.
Activities:
  i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
  ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
  iii) Displaying success stories-motivational biopics- award winning movies on societalissues etc.
  iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II
Nature & CareActivities:
  i) Best out of waste competition.
  ii) Poster and signs making competition to spread environmental awareness.
  iii) Recycling and environmental pollution article writing competition.
  iv) Organising Zero-waste day.
  v) Digital Environmental awareness activity via various social media platforms.
  vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
  vii) Write a summary on any book related to environmental issues.

UNIT III
Community Service
Activities:
  i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.
  ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
  iii) Conducting consumer Awareness. Explaining various legal provisions etc.
  iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
  v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:
1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:
1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:
- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, to talling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

L	T	P	C
2	0	0	2

COMMUNICATIVE ENGLISH
(Common to All Branches of Engineering)

Course Objectives:

The main objective of introducing this course, *Communicative English,* is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

Course Outcomes:
CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues.
CO2: Apply grammatical structures to formulate sentences and correct word forms.
CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions and enhancing Vocabulary.
CO4: Evaluate reading / listening texts and to write summaries based on global comprehension of these texts.
CO5: Create a coherent paragraph, essay, and resume.

UNIT I
Lesson: HUMAN VALUES: Gift of Magi **(Short Story)**

Listening:	Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking:	Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading:	Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing:	Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar:	Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary:	Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II
Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening:	Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
Speaking:	Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading:	Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing:	Structure of a paragraph - Paragraph writing (specific topics)
Grammar:	Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary:	Homonyms, Homophones, Homographs

UNIT III
Lesson: BIOGRAPHY: Elon Musk

Listening:	Listening for global comprehension and summarizing what is listened to.
Speaking:	Discussing specific topics in pairs or small groups and reporting what is discussed
Reading:	Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing:	Summarizing, Note-making, paraphrasing
Grammar:	Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary:	Compound words, Collocations

UNIT IV

Lesson: INSPIRATION: The Toys of Peace by Saki

Listening:	Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking:	Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading:	Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing:	Letter Writing: Official Letters, Resumes
Grammar:	Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary:	Words often confused, Jargons

UNIT V
Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

Listening:	Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking:	Formal oral presentations on topics from academic contexts
Reading:	Reading comprehension.
Writing:	Writing structured essays on specific topics.
Grammar:	Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary:	Technical Jargons

Textbooks:
1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:
1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:
GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

COMMUNICATIVE ENGLISH LAB
(Common to All Branches of Engineering)

L	T	P	C
0	0	2	1

Course Objectives:

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

Course Outcomes:

CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills.

CO2: Apply communication skills through various language learning activities.

CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.

CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.

CO5: Create effective Course Objectives:

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills, & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:

- Walden Infotech
- Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India,2016
3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed), Kindle, 2013

Web Resources:
Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured

7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:
1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

Year and Sem	Course Code	Category	L	T	P	C	I.M	E.M	EXAM
Ist B. Tech IIndSem	R231104	BS	3	0	0	3			3Hrs

CHEMISTRY
(Common to ECE, IT & AIML)

Course Objectives:
- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce the concepts of modern engineering materials.

Course Outcomes: At the end of the course, the students will be able to:

CO1: To understand the concepts of molecular orbitals and bond orders

CO2: Apply the principle of Band diagrams in the application of conductors and semiconductors

CO3:. Compare the materials of construction for battery and fuel cells

CO4: Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.

CO5: Summarize the concepts of Instrumental methods.Explain the principles of spectrometry.

UNIT-I Structure and Bonding Models:
Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT –II Modern Engineering materials
Semiconductors – Introduction, basic concept, application   Super conductors-Introduction basic concept, applications. Super capacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

UNIT III   Electrochemistry and Applications
Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry-potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Construction and working of standard Hydrogen Elelctrode and Calomel Electrode.
Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT IV   Polymer Chemistry
Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics with differences, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres. Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA),Preparation,properties and applications.

UNIT V   Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law applications and limitations. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR Spectroscopies,Instrumentation, Identification and Applications of IR. Procedure and applications of MRI &CT-scans.

Textbooks:
1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:
1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

Year and Sem	Course Code	Category	L	T	P	C	I.M	E.M	EXAM
Ist B. Tech IInd Sem	R231104L	BS	0	0	2	1			3Hrs

CHEMISTRY LAB
(Common to ECE, IT& AIML)

Course Objectives:

- Verify the fundamental concepts with experiments.
- Course Outcomes: At the end of the course, the students will be able to

CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Measure the strength of an acid present in secondary batteries.
CO4: Analyse the IR spectra of some organic compounds.
CO5: Calculate strength of acid in Pb-Acid battery.

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method

2. Conductometric titration of strong acid vs. strong base

3. Conductometric titration of weak acid vs. strong base

4. Determination of cell constant and conductance of solutions

5. Potentiometry - determination of redox potentials and emfs

6. Determination of Strength of an acid in Pb-Acid battery

7. Preparation of a Bakelite

8. Verify Lambert-Beer's law

9. Wavelength measurement of sample through UV-Visible Spectroscopy

10. Identification of simple organic compounds by IR

11. Preparation of nanomaterials by precipitation method

12. Estimation of Ferrous Iron by Dichrometry

13. Estimation of Total Hardness of water by EDTA method.

14. Estimation of Vitamin-C.

15. Determination of Mg^{+2} in an antacid..

Reference:

1. Vogel; Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar
2. Engineering chemistry lab by S.S.Dhara,S.S Publications

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

Year and Semester	L	T	P	C
Ist Year - IInd Semester	3	0	0	3

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches of Engineering)

Course Objectives:
- To enlighten the learners in the concept of differential equations and multivariate calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Course Outcomes: At the end of the course, the student will be able to
CO1: Solve the differential equations related to various engineering fields.
CO2: Identify solution methods for partial differential equations that model physical processes.
CO3: Interpret the physical meaning of different operators such as gradient, curl and divergence.
CO4: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT I: Differential equations of first order and first degree   (10 Periods)
Linear differential equations – Bernoulli's equations, Exact equations and equations reducible to exact form.
Applications: Newton's Law of cooling, Law of natural growth and decay, Electrical circuits (L-R circuits).

UNIT II: Linear differential equations of higher order with Constant Coefficients   (10 Periods)
Homogeneous differential equations of higher order with constant coefficients, and Non-homogeneous differential equations of higher order with non-homogeneous term of the type e^{ax}, $\sin(ax)$, $\cos(ax)$, polynomials in x^n, $e^{ax}V(X)$, $x^nV(X)$, Method of Variation of parameters, Simultaneous linear equations.
Applications: LCR circuit, Simple Harmonic motion.

UNIT III: Partial Differential Equations   (10 Periods)
Introduction and formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Higher order Homogeneous and non homogeneous Linear Partial differential equations with constant coefficients.

UNIT IV: Vector differentiation   (08 Periods)
Scalar and vector point functions, vector operator Del, Gradient, Directional derivative, angle between surfaces, Divergence, solenoidal, Curl, irrotational, Scalar Potential, vector identities.

UNIT V : Vector integration   (10 Periods)
Line integration, circulation, work done, surface integral, volume integral, Green's theorem in the plane, Stoke's theorem, Divergence theorem (without proofs) and related problems.

Textbooks:
1. Higher Engineering Mathematics, B. S. Grewal, 43rd Edition, Khanna Publishers (New Delhi), 2020.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 10th Edition, John Wiley & Sons (U.S.A), 2008.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, 14th Edition Pearson Publishers (Chennai), 2018.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, 5th Edition. Pearson Publishers (Chennai), 2018,
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, 5th Edition (9th Reprint, Alpha Science International Ltd (U.k), 2021.
5. Higher Engineering Mathematics, B. V. Ramana, 2007 Edition, McGraw Hill (Chennai).

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

PART- A
BASIC CIVIL ENGINEERING

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering-Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction MaterialsCement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques- Glossary terms of civil- Significance and guide lines of NBC

UNIT II

Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

UNIT III

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements – Basic knowledge on road safety- Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering. • Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Textbooks:
1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mc graw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

Reference Books:
1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B
BASIC MECHANICAL ENGINEERING

Course Objectives: The students after completing the course are expected to
- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Course Outcomes: On completion of the course, the student should be able to
CO1: Understand the different manufacturing processes.
CO2: Explain the basics of thermal engineering and its applications.
CO3: Describe the working of different mechanical power transmission systems and power plants.
CO4: Describe the basics of robotics and its applications.

UNIT I
Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.
Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT II
Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.
Thermal Engineering – Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT III
Power plants – Working principle of Steam, Diesel, Hydro, Nuclear power plants.
Mechanical Power Transmission **-** Belt Drives, Chain, Rope drives, Gear Drives and their applications.
Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject.)

Textbooks:
1. Internal Combustion Engines by V. Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:
1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.
2. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
3. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
4. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

DATA STRUCTURES LAB
(Common to CSE, IT & allied branches)

L	T	P	C
0	0	3	1.5

Course Objectives:

The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

Course Outcomes: At the end of the course, Student will be able to

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.

CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

CO4: Apply queue-based algorithms for efficient task scheduling and breadth- first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.

CO5: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

List of Experiments:

Exercise 1: Array Manipulation

     i)   Write a program to reverse an array.
    ii) C Programs to implement the Searching Techniques – Linear & Binary Search
   iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

    Exercise 2: Linked List Implementation
     i)   Implement a singly linked list and perform insertion and deletion operations.
    ii) Develop a program to reverse a linked list iteratively and recursively.
   iii) Solve problems involving linked list traversal and manipulation.

    Exercise 3: Linked List Applications
     i)   Create a program to detect and remove duplicates from a linked list.
    ii) Implement a linked list to represent polynomials and perform addition.

    Exercise 4: Double Linked List Implementation
     i)   Implement a doubly linked list and perform various operations to
        understand its properties and applications.
    ii) Implement a circular linked list and perform insertion, deletion, and traversal.
   iii) Implement a double-ended queue(deque) with essential operations.

Exercise 5: Stack Operations
    i)   Implement a stack using arrays and linked lists.
    ii) Write a program to evaluate a postfix expression using a stack.
    iii) Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations
    i)   Implement a queue using arrays and linked lists.
    ii) Develop a program to simulate a simple printer queue system
    iii) Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications
    i)   Use a stack to evaluate an infix expression and convert it to postfix.
    ii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Search Tree
    i)   Implementing a BST using Linked List.
    ii) Traversing of BST

Reference Books:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni,Susan Anderson-Freed, Silicon Press, 2008
3. Algorithms and Data Structures: The Basic Toolbox by KurtMehlhorn and Peter Sanders
4. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman,and John E.Hopcroft
5. Problem Solving with Algorithms and Data Structures" by Brad Millerand David Ranum
6. Introduction to Algorithms by Thomas H. Cormen, Charles E.Leiserson, Ronald L.Rivest, and Clifford Stein
7. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures,Sorting, Searching, and Graph Algorithms by Robert Sedge wick.

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) - 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

DATA STRUCTURES
(Common to CSE, IT & allied branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

Course Outcomes: At the end of the course, Student will be able to

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.

CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.

CO5: Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.

CO6: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

UNIT I
Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Stack ADT, Queue ADT, time and space complexity analysis for linear data structures.
Searching Techniques: Linear Search, Binary Search
Sorting Techniques: Bubble sort, Selection sort, Insertion Sort, Merge Sort & Quick Sort

UNIT II
Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

UNIT III
Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, back tracking, reversing list, factorial calculation, Expression Conversions Infix to Post fix, Infix to Prefix, Evaluating of Postfix Expression.

UNIT IV
Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, circular queues, priority queues, Dequeus.

UNIT V
Trees: Introduction to Trees, basic terminology of trees, Representation of Trees Using Arrays & Linked list Binary Search Tree – Insertion, Deletion & Tree Traversals

Graphs: Introduction to Graphs, Graph Traversals (BFS & DFS)

Textbooks:
1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

Reference Books:
1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and PeterSanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E.Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

![Tirumala Engineering College header]

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

NETWORK ANALYSIS
(ECE & allied branches)

Course Objectives:
- To introduce basic laws, mesh &nodal analysis techniques for solving electrical circuits
- To impart knowledge on applying appropriate theorem for electrical circuit analysis
- To explain transient behavior of circuits in time and frequency domains
- To teach concepts of resonance
- To introduce open circuit, short circuit, transmission, hybrid parameters and their inter relationship.

Course Outcomes: At the end of this course students will demonstrate the ability to
CO1: Understand basic electrical circuits with nodal and mesh analysis.
CO2: Analyze the circuit using net works implification theorems.
CO3: Find Transient response and Steady state response of a network.
CO4:Analyze electrical networks in the Laplacedomain.
CO5:Compute the parameters of a two-port network.

UNIT I
Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality with examples.
Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion.

UNIT II
Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies.
Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dotrule of coupled circuits, conductively coupled equivalent circuits-problem solving.

UNIT III
Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens - problem solving using dependent sources also. (AC and DC Sources).

UNIT IV
Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s –plane rotation of roots.
Laplace transform: introduction, Laplace trans formation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.

UNIT V
Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Trans mission line parameters, h-parameters, Relationships Between parameter Sets, Parallel& series connection of two port networks, cascading of two port networks, problem solving using dependents ources also.
Image and it erative impedances. Image and iterative transfer constants. Insertion loss. Attenuators and pads. Lattice net work and its parameters. Impedance matching networks.

Textbooks:
1. Network Analysis– MEVanValkenburg, Prentice Hall of India, revised 3rd Edition,2019.
2. Engineering Circuit Analysis by William H.Hayt, Jack Kemmerly, Jamie Phillips, Steven M.Durbin, 9thEdition2020.
3. Network lines and Fields by John.D.Ryder2ndEdition,PHI

Reference Books:
1. D.Roy Choudhury, Networks and Systems, New Age International Publications, 2013.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 7thEdition, Tata McGraw Hill Publishing Company, New Delhi, 2017
3. Fundamental s of Electric Circuits by Charles K. Alexander and Matthew N.O. Sadiku, Mc Graw-HillEducation.

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

L	T	P	C
0	0	3	1.5

NETWORKANALYSIS LAB
(ECE & allied branches)

Course Objectives:
- To gain hands on experience in verifying Kirchoff's laws and network theorems
- To analyze transient behavior of circuits
- To study resonance characteristics
- To determine 2-port network parameters

Course Outcomes:

CO1: Verify Kirchoff's laws and network theorems.

CO2: Measure time constant of RL & RC circuits.

CO3: Analyze behavior of RLC circuit for different cases.

CO4: Design resonant circuit for given specifications.

CO5: Characterize and model the network in terms of all network parameters.

The following experiments need to be performed using both Hardware and simulation Software.
1. Study of components of a circuit and Verification of KCL and KVL.
2. Verification of mesh and nodal analysis for AC circuits
3. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit.
4. Verification of Superposition, Thevenin's & Norton theorems for AC circuits
5. Verification of maximum power transfer theorem for AC circuits
6. Verification of Tellegen's theorem for two network softhesametopology.
7. Study of DC transients in RL, RC and RLC circuits
8. To study frequency response of various1st order RL&RC networks
9. To study the transient and steady state response of a 2nd order circuit by varying its various parameters and studying their effects on responses.
10. Determination of open circuit (Z)and short circuit(Y)parameters
11. Determination of hybrid(H)and transmission(ABCD)parameters
12. To measure two port parameters of at win-T network and study its frequency response.

Hardware Requirements:

Regulated Power supplies, Analog/Digital Function Generators, Digital Multimeters, Decade Resistance Boxes / Rheostats, Decade Capacitance Boxes, Ammeters (Analogor Digital), Voltmeters (Analogor Digital), Active &PassiveElectronicComponents.

Software requirements:

Multisim / Pspice /Equivalent simulations oftware tool, Computer Systems w i t h required specifications.

References:
1. Network Analysis–ME VanValken burg , Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H.Hayt, Jack Kemmerly, Jamie Phillips, Steven M.Durbin, 9th Edition 2020.

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

UNIVERSITY GRANT
COMMISSION (UGC)

L	T	P	C
0	0	3	1.5

ENGINEERING WORKSHOP
(Common to All branches of Engineering)

Course Objectives:
To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

Course Outcomes:
CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice

SYLLABUS
1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
3. Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
4. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.

a) Tapered tray   b) Conical funnel   c) Elbow pipe   d) Brazing
1. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.

a) V-fit   b) Dovetail fit   c) Semi-circular fit   d) Bicycle tire puncture and change of two-wheeler tyre
1. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.

a) Parallel and series   b) Two-way switch   c) Godown lighting
d) Tube light   e) Three phase motor   f) Soldering of wires

1. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
2. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
3. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.
4. **Basic repairs of Two-wheeler vehicle** – Demonstration of working of two-wheeler vehicle and its repairs.

Textbooks:
1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:
1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

TIRUMALA ENGINEERING COLLEGE
(AUTONOMOUS)
Accredited by NAAC(A+) & NBA, (An ISO 9001:2015 Certified Institution)
(Approved by AICTE New Delhi & affiliated to JNTUK, Kakinada)
Jonnalagadda(V), Narasaraopet(M), Palnadu(Dt) – 522601.
web: www.tecnrt.org   email: tecnrt@gmail.com

Year and Sem	Course Code	Category	L	T	P	C	I.M	E.M	EXAM
Ist B. Tech IIndSem	R231111L	BS	0	0	1	0.5			3 Hrs

HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to All branches of Engineering)

Course objectives:
The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

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

CO1: Understand the importance of yoga and sports for Physical fitness and sound health.
CO2: Demonstrate an understanding of health-related fitness components.
CO3: Compare and contrast various activities that help enhance their health.
CO4: Assess current personal fitness levels.
CO5: Develop Positive Personality

UNIT I
Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index(BMI) of all age groups.

Activities:
  i)   Organizing health awareness programmes in community
  ii) Preparation of health profile
  iii) Preparation of chart for balance diet for all age groups

UNIT II
Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context,classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:
Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III
Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:
  i)   Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics
  ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping andrunning.

Reference Books:
1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning,2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:
1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:
- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.