



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
**KAKINADA-533003, Andhra Pradesh, India**  
**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

## **COURSE STRUCTURE AND SYLLABUS**

**For**

**B.TECH – ELECTRICAL AND ELECTRONICS ENGINEERING**

*(Applicableforbatchesadmittedfrom2020-2021)*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
**KAKINADA-533003, Andhra Pradesh, India**



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**I B.Tech – I SEMESTER**

Sl. No	Course Components	Subjects	L	T	P	Credits
1	HSMC	Communicative English	3	0	0	3
2	BSC	Mathematics-I (Calculus and Differential Equations)	3	0	0	3
3	BSC	Mathematics-II (Linear Algebra and Numerical Methods)	3	0	0	3
4	ESC	Programming for Problem Solving Using C	3	0	0	3
5	ESC	Engineering Drawing & Design	1	0	4	3
6	HSMC	English Communication Skills Laboratory	0	0	3	1.5
7	BSC	Electrical Engineering Workshop	0	1	3	1.5
8	ESC	Programming for Problem Solving Using C Lab	0	0	3	1.5
<b>Total Credits</b>			<b>19.5</b>			

**I B.Tech – II SEMESTER**

Sl. No	Course Components	Subjects	L	T	P	Credits
1	BSC	Mathematics-III (Vector Calculus, Transforms and PDE)	3	0	0	3
2	BSC	Applied Physics	3	0	0	3
3	ESC	Data Structures Through C	3	0	0	3
4	ESC	Electrical Circuit Analysis-I	3	0	0	3
5	ESC	Basic Civil and Mechanical Engineering	3	0	0	3
6	BSC	Applied Physics Lab	0	0	3	1.5
7	ESC	Basic Civil and Mechanical Engineering Lab	0	0	3	1.5
8	ESC	Data Structures through C Lab	0	0	3	1.5
9	Mandatory Course	Constitution of India	2	0	0	0
<b>Total Credits</b>			<b>19.5</b>			



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<b>I Year II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MATHEMATICS-III (Vector Calculus, Transforms and PDE)</b>					

**Course Objectives:**

- To familiarize the techniques in partial differential equations
- 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

- interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L5)
- apply the Laplace transform for solving differential equations (L3)
- find or compute the Fourier series of periodic signals (L3)
- know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- identify solution methods for partial differential equations that model physical processes(L3)

**UNIT –I: Vector calculus:****(10 hrs)**

Vector Differentiation: Gradient– Directional derivative – Divergence– Curl– Scalar Potential

Vector Integration: Line integral – Work done – Area– Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and problems on above theorems.

**UNIT –II: Laplace Transforms:****(10 hrs)**

Laplace transforms – Definition and Laplace transforms of some certain functions– Shifting theorems – Transforms of derivatives and integrals – Unit step function –Dirac’s delta function Periodic function – Inverse Laplace transforms– Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

**UNIT –III: Fourier series and Fourier Transforms:****(10 hrs)**

Fourier Series: Introduction– Periodic functions – Fourier series of periodic function – Dirichlet’s conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties (article-22.5 in text book-1)– inverse transforms – Convolution theorem (without proof) – Finite Fourier transforms.

**UNIT –IV: PDE of first order:****(8 hrs)**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.



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**UNIT – V: Second order PDE and Applications: (10 hrs)**

Second order PDE: Solutions of linear partial differential equations with constant coefficients –non-homogeneous term of the type  $e^{ax+by}$ ,  $\sin(ax + by)$ ,  $\cos(ax + by)$ ,  $x^m y^n$ .

Applications of PDE: Method of separation of Variables– Solution of One-dimensional Wave, Heat and two-dimensional Laplace equation.

**Text Books:**

1. B. S. Grewal, Higher Engineering Mathematics, 44<sup>th</sup> Edition, Khanna Publishers, 2018.
2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata McGraw Hill Education.

**Reference Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, Wiley-India. 2015.
2. Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3<sup>rd</sup> Edition, CRC Press, 2010.
3. Peter O' Neil, Advanced Engineering Mathematics, 7<sup>th</sup> edition, Cengage, 2011..
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press, 2015.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>APPLIED PHYSICS</b>					

**(For All Circuital Branches like ECE, EEE, CSE etc)**

**Unit-I: Wave Optics**

**12hrs**

**Interference:** Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton’s Rings- Determination of wavelength and refractive index.

**Diffraction:** Introduction - Fresnel and Fraunhofer diffraction - 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 Outcomes:** The students will be able to

- **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- **Identify** engineering applications of interference (L3)
- **Analyze** the differences between interference and diffraction with applications (L4)
- **Illustrate** the concept of polarization of light and its applications (L2)
- **Classify** ordinary polarized light and extraordinary polarized light (L2)

**Unit-II: Lasers and Fiber optics**

**8hrs**

**Lasers:** Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein’s coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

**Fiber optics:** Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

**Unit Outcomes:** The students will be able to

- **Understand** the basic concepts of LASER light Sources (L2)
- **Apply** the concepts to learn the types of lasers (L3)
- **Identifies** the Engineering applications of lasers (L2)
- **Explain** the working principle of optical fibers (L2)
- **Classify** optical fibers based on refractive index profile and mode of propagation (L2)
- **Identify** the applications of optical fibers in various fields (L2)



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**Unit III: Quantum Mechanics, Free Electron Theory and Band theory** **10hrs**

**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– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

**Band theory of Solids:** Bloch’s Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - V vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

**Unit Outcomes:**

**The students will be able to**

- **Explain** the concept of dual nature of matter (L2)
- **Understand** the significance of wave function (L2)
- **Interpret** the concepts of classical and quantum free electron theories (L2)
- **Explain** the importance of K-P model
- **Classify** the materials based on band theory (L2)
- **Apply** the concept of effective mass of electron (L3)

**Unit-IV: Dielectric and Magnetic Materials**

**8hrs**

**Dielectric Materials:** Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation- Piezoelectricity.

**Magnetic Materials:** Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

**Unit Outcomes:** The students will be able to

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Clausius-Mosotti relation in dielectrics(L2)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic data storage devices (L3)



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**Unit – V: Semiconductors and Superconductors**

**10hrs**

**Semiconductors:** Introduction- 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 effect – Hall coefficient –Applications of Hall effect.

**Superconductors:** Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs High  $T_c$  superconductors – Applications of superconductors.

**Unit Outcomes:** The students will be able to

- **Classify** the energy bands of semiconductors (L2)
- **Interpret** the direct and indirect band gap semiconductors (L2)
- **Identify** the type of semiconductor using Hall effect (L2)
- **Identify** applications of semiconductors in electronic devices (L2)
- **Classify** superconductors based on Meissner’s effect (L2)
- **Explain** Meissner’s effect, BCS theory & Josephson effect in superconductors (L2)

**Text books:**

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy” A Text book of Engineering Physics”- S.Chand Publications, 11<sup>th</sup> Edition 2019.
2. Engineering Physics” by D.K.Bhattacharya and Poonam Tandon, 1<sup>st</sup> edition, Oxford press, 2015.
3. Applied Physics by P.K.Palanisamy 3<sup>rd</sup> edition, SciTech publications, 2013.

**Reference Books:**

1. Fundamentals of Physics – Halliday, Resnick and Walker, 10<sup>th</sup> edition, John Wiley & Sons, 2013.
2. Engineering Physics by M.R.Srinivasan, New Age international publishers, 2009.
3. Shatendra Sharma, Jyotsna Sharma, “ Engineering Physics”, 1<sup>st</sup> edition, Pearson Education, 2018.
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, 1<sup>st</sup> edition, University Press, 2010.
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, 3<sup>rd</sup> edition, Mc Graw Hill, 2003.
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, 1<sup>st</sup> edition, Cengage Learning, 2013.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DATA STRUCTURES THROUGH C</b>					

**Preamble:**

This course is core subject developed to help the student understand the data structure principles used in power systems, machines and control systems. This subject covers linear data structures, linked lists, trees, graphs, searching and sorting.

**Course Objectives:**

- Operations on linear data structures and their applications.
- The various operations on linked lists.
- The basic concepts of Trees, Traversal methods and operations.
- Concepts of implementing graphs and its relevant algorithms.
- Sorting and searching algorithms.

**Unit-1: Linear Data Structures: Arrays, Stacks and Queues**

Data Structures -Operations-Abstract Data Types-Complexity of Algorithms-Time and Space-Arrays-Representation of Arrays-Linear Arrays-Insertion–Deletion and Traversal of a Linear Array-Array as an Abstract Data Type-Multi-Dimensional Arrays-Strings-String Operations-Storing Strings-String as an Abstract Data Type

Stack -Array Representation of Stack-Stack Abstract Data Type-Applications of Stacks: Prefix-Infix and Postfix Arithmetic Expressions-Conversion-Evaluation of Postfix Expressions-Recursion-Towers of Hanoi-Queues-Definition-Array Representation of Queue-The Queue Abstract Data Type-Circular Queues-Dequeues-Priority Queues.

**Unit-II: Linked Lists**

Pointers-Pointer Arrays-Linked Lists-Node Representation-Single Linked List-Traversing and Searching a Single Linked List-Insertion into and Deletion from a Single Linked List-Header Linked Lists-Circularly Linked Lists-Doubly Linked Lists-Linked Stacks and Queues-Polynomials-Polynomial Representation-Sparse Matrices.

**Unit-III: Trees**

Terminology-Representation of Trees-Binary Trees-Properties of Binary Trees-Binary Tree Representations-Binary Tree Traversal-Preorder-In-order and Post-order Traversal-Threads-Thread Binary Trees-Balanced Binary Trees-Heaps-Max Heap-Insertion into and Deletion from a Max Heap-Binary Search Trees-Searching-Insertion and Deletion from a Binary Search Tree-Height of Binary Search Tree, m-way Search Trees, B-Trees.





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**Unit-IV: Graphs**

Graph Theory Terminology-Graph Representation-Graph Operations-Depth First Search-Breadth First Search-Connected Components-Spanning Trees-Biconnected Components-Minimum Cost Spanning Trees-Kruskal's Algorithm-Prism's Algorithm-Shortest Paths-Transitive Closure-All-Pairs Shortest Path-Warshall's Algorithm.

**Unit-V: Searching and Sorting**

Searching -Linear Search-Binary Search-Fibonacci Search-Hashing-Sorting-Definition-Bubble Sort-Insertion sort-Selection Sort-Quick Sort-Merging-Merge Sort-Iterative and Recursive Merge Sort-Shell Sort-Radix Sort-Heap Sort.

**Course Outcomes:**

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

- data structures concepts with arrays, stacks, queues.
- linked lists for stacks, queues and for other applications.
- traversal methods in the Trees.
- various algorithms available for the graphs.
- sorting and searching in the data retrieval applications.

**Text Books:**

1. Fundamentals of Data Structures in C, 2<sup>nd</sup> Edition, E.Horowitz, S.Sahni and Susan Anderson Freed, Universities Press Pvt. Ltd.
2. Data Structures with C, Seymour Lipschutz, Schaum's Outlines, Tata McGraw Hill.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>ELECTRICAL CIRCUIT ANALYSIS -I</b>					

**Preamble:**

This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes single phase circuits, magnetic circuits, network theorems, transient analysis and network topology.

**Course Objectives:**

- To study the concepts of passive elements, types of sources and various network reduction techniques.
- To understand the applications of network topology to electrical circuits.
- To study the concept of magnetic coupled circuit.
- To understand the behavior of RLC networks for sinusoidal excitations.
- To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
- To understand the applications of network theorems for analysis of electrical networks.

**UNIT-I****Introduction to Electrical Circuits**

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchhoff'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****Magnetic Circuits**

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****Single Phase A.C Systems**

Periodic waveforms (determination of rms, average value and form factor), concept of phasor, phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations. node and mesh analysis.

Steady state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power.

**UNIT-IV****Resonance - Locus Diagrams**

series and parallel resonance, selectively band width and Quality factor, locus diagram- RL, RC, RLC with R, L and C variables.



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**UNIT-V**

**Network theorems (DC & AC Excitations)**

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

**Course Outcomes:**

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

- Various electrical networks in presence of active and passive elements.
- Electrical networks with network topology concepts.
- Any magnetic circuit with various dot conventions.
- Any R, L, C network with sinusoidal excitation.
- Any R, L, network with variation of any one of the parameters i.e., R, L, C and f.
- Electrical networks by using principles of network theorems.

**Text Books:**

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, 6<sup>th</sup> edition McGraw Hill Company, 2012.
2. Network Analysis: Van Valkenburg; Prentice-3<sup>rd</sup> edition, Hall of India Private Ltd, 2015.

**Reference Books:**

1. Fundamentals of Electrical Circuits by Charles K. Alexander and Mathew N.O.Sadiku, 5<sup>th</sup> edition, McGraw Hill Education (India), 2013.
2. Linear Circuit Analysis by De Carlo, Lin, 2<sup>nd</sup> edition, Oxford publications, 2001.
3. Electric Circuits – (Schaum's outlines) by Mahmood Nahvi & Joseph Edminister, Adapted by KumaRao, 5<sup>th</sup> Edition – McGraw Hill, 2017.
4. Electric Circuits by David A. Bell, 7<sup>th</sup> edition, Oxford publications, 2009.
5. Introductory Circuit Analysis by Robert L Boylestad, 13<sup>th</sup> edition, Pearson, 2015
6. Circuit Theory (Analysis and Synthesis) by A. Chakrabarthy, 7<sup>th</sup> edition, DhanpatRai&Co., 2018.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>BASIC CIVIL AND MECHANICAL ENGINEERING</b>					

**Course Objectives:**

- COB 1: To impart basic principles of stress, strain, shear force and bending moment.
- COB 2: To teach principles of strain measurement using electrical strain gauges.
- COB 3: To impart basic characteristics of building materials.
- COB 4: To familiarize the sources of energy, power plant economics and environmental aspects.
- COB 5: To make the students to understand the basics concept of Boilers & I.C. engines.

**Course Outcomes:**

At the end of this course, the student will be able to

- CO 1 : Apply Shear force diagram & Bending moment diagram principles for Cantilever and Simply supported beams.
- CO 2 : Apply concepts of Rosette analysis for strain measurements.
- CO 3 : Analyse the characteristics of common building materials.
- CO 4 : Compare the working characteristics of Internal Combustion engines.
- CO 5 : Compare the differences between boiler mountings and accessories.

**Mapping of Course Outcomes with Program Outcomes**

CO/PO	PO 1 (K3)	PO 2 (K4)	PO 3 (K5)	PO 4 (K3)	PO 5 (K3)	PO 6 (K3)	PO 7 (K2)	PO 8 (K3)	PO 9 (K2)	PO 10 (K2)	PO 11 (K3)	PO12 (K)
<b>CO1 (K3)</b>	3	2	-	-	-	-	2	-	-	-	-	-
<b>CO2 (K3)</b>	3	2	-	-	-	-	3	-	-	-	-	-
<b>CO3 (K4)</b>	3	3	-	-	-	-	3	-	-	-	-	-
<b>CO4 (K4)</b>	2	3	-	-	-	-	3	-	-	-	-	-
<b>CO5 (K4)</b>	3	3	-	-	-	-	3	-	-	-	-	-

**Mapping of Course Outcomes with Program Specific Outcomes**

CO / PSO	PSO 1(K5)	PSO 2(K5)	PSO 3(K3)
<b>CO1 (K3)</b>	-	-	-
<b>CO2 (K3)</b>	-	1	-
<b>CO3 (K4)</b>	-	2	-
<b>CO4 (K4)</b>	-	-	-
<b>CO5 (K4)</b>	-	2	-

**UNIT –I:**

Basic Definitions of Force –Stress –Strain –Elasticity. Shear force – Bending Moment Torsion . Simple problems on Shear force Diagram and Bending moment Diagram for cantilever and simply supported beams.



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**UNIT – II:**

Measurement of Strain - Electrical Capacitance and Resistance Strain gauges multi channel strain indicators. Rosette analysis Rectangular and Triangular strain rosettes.

**UNIT – III:**

Characteristics of common building materials -- Brick – Types Testing; Timber Classification Seasoning Defects in Timber; Glass Classification uses; steel and its applications in construction industry.

**UNIT IV**

**Hydraulic Turbines and Pumps:**

Introduction to Power transmission tools, Hydraulic Turbines: Classification- Difference between Impulse and Reaction Turbine.

Pumps: Classification of Pumps, Centrifugal Pump-Applications-Priming- Reciprocating Pumps, Single Acting & Double acting-Comparison with Centrifugal Pump

**UNIT V –**

**I.C Engine:** Heat Engine – Types of Heat Engine–Classification of I.C. Engine-Valve Timing Diagram, Port Timing Diagram- Comparison of 2S & 4S Engines- Comparison of Petrol Engine and Diesel Engine-Fuel System of a Petrol Engine-Ignition Systems.

**Boilers:** Classification of Boilers – Simple Vertical Boiler – Cochran Boiler – Babcock and Wilcox Boiler Benson Boiler Difference between Fire Tube and Water Tube Boilers Boiler Mountings and Accessories.

**Text Books:**

1. Basic Civil and Mechanical Engineering, by Prof. V. Vijayan, Prof. M. Prabhakaran and Er. R. Viashnavi, 2<sup>nd</sup> edition, S. Chand Publication, 2010
2. Elements of Mechanical Engineering, Fourth Edition, S. Trymbaka Murthy, University Press, 2014
4. Shanmugam G and Palanichamy M S, Basic Civil and Mechanical Engineering, Tata McGraw Hill Publishing Co., New Delhi, (1996).
5. Ramamrutham S., Basic Civil Engineering, Dhanpat Rai Publishing Co. (P) Ltd. (1999).

**Reference Books:**

1. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, (2005).
2. Venugopal K. and Prahuraja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, (2000).
3. Er. R. Vaishnavi, Basic Civil and Mechanical Engineering, 2/e, S.Chand Publications (2003)

**Web Links:**

1. <http://www.umich.edu/~nppcpub/resources/compendia/ARCHpdfs/ARCHsbmIntro.pdf>
2. <http://www.hillagric.ac.in/edu/coa/agengg/lecture/243/Lecture%203%20Engine.pdf>



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>APPLIED PHYSICS LAB</b>					

(For All Circuital Branches like CSE, ECE, EEE etc.)

(Any 10 of the following listed experiments)

**List of Applied Physics Experiments**

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect .
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

**References:**

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers, 2017.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
**KAKINADA – 533 003, Andhra Pradesh, India**  
**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

<b>I Year II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>BASIC CIVIL AND MECHANICAL ENGINEERING LAB</b>					

**Preamble:****Course Objectives:**

- COB 1: To make the student learn about the constructional features and operational details of various types of internal combustion engines.
- COB 2: To make the student learn about the constructional features, operational details of various types of hydraulic turbines
- COB 3: To practice the student about the fundamental of fluid dynamic equations and its applications fluid jets.
- COB 4: To train the student in the areas of types of hydro electric power plants, estimation and calculation of different loads by considering various factors.

**Course Outcomes:**

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

- CO 1: Solve to arrive at finding constant speed and variable speed on IC engines and interpret their performance.
- CO 2: Estimate energy distribution by conducting heat balance test on IC engines
- CO 3: Explain procedure for standardization of experiments.
- CO 4: Determine flow discharge measuring device used in pipes channels and tanks.
- CO 5: Determine fluid and flow properties.
- CO 6: Solve for drag coefficients.
- CO 7: Test for the performance of pumps and turbines

**Mapping of Course Outcomes with Program Outcomes**

CO/PO	PO 1 (K3)	PO 2 (K4)	PO 3 (K5)	PO 4 (K5)	PO 5 (K3)	PO 6 (K3)	PO 7 (K2)	PO 8 (K3)	PO 9 (K2)	PO 10 (K2)	PO 11 (K3)	PO 12 (K3)
<b>CO1(K3)</b>	3	2	1	1	3	3	-	-	-	2	3	-
<b>CO2(K5)</b>	3	3	-	-	3	3	-	-	-	3	3	-
<b>CO3(K2)</b>	2	1	-	-	2	2	-	-	-	3	2	-
<b>CO4(K5)</b>	3	3	3	3	3	3	-	-	-	-	3	-
<b>CO5(K5)</b>	3	3	3	3	3	3	-	-	-	-	3	-
<b>CO6(K3)</b>	3	2	1	1	3	3	-	-	-	3	3	-
<b>CO7(K4)</b>	3	3	2	2	3	3	-	-	-	3	3	-



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**Mapping of Course Outcomes with Program Specific Outcomes**

CO/PSO	PSO 1 (K5)	PSO 2 (K5)	PSO 3 (K3)
CO1 (K3)	-	-	-
CO2 (K5)	-	-	-
CO3 (K2)	-	-	-
CO4 (K5)	-	-	-
CO5 (K5)	-	-	-
CO6 (K3)	-	-	-
CO7 (K4)	-	3	-

**Part-A**

**List of Experiments:**

**Thermal Engineering Lab:**

1. Valve time timing diagram on 4-S Diesel engine.
2. Valve time timing diagram on 4-S Petrol engine.
3. Port timing diagram on 2-S Petrol engine.
4. Study on Boiler models.
5. COP determination of Refrigeration tutor.
6. COP determination of Air conditioner tutor.

**Part-B**

**Hydraulic machinery Lab:**

1. Determination of coefficient of discharge on Impact of Jets on Vanes apparatus.
2. Performance test on Pelton wheel.
3. Performance test on Francis turbine.
4. Performance test on Kaplan turbine.
5. Performance test on Single stage Centrifugal pump.
6. Performance test on Reciprocating pump.

**List of Augmented Experiments:**

(Student can perform any one of the following experiments)

1. Heat balance sheet on VCR engine
2. Determination of Loss of head due to sudden contraction and sudden enlargement.
3. Heat balance sheet on Multi cylinder Petrol engine.
4. Heat balance sheet on 4-S diesel engine.
5. Determination of coefficient of discharge on Venturimeter.
6. Determination of coefficient of discharge on Orificemeter.

**Web Links:**

1. <https://www.iare.ac.in/sites/default/files/lab2/TE%2Blab.pdf>
2. <https://www.dbit.ac.in/ce/syllabus/hydraulics-and-hydraulic-machines-lab.pdf>





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<b>I Year II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>DATA STRUCTURES THROUGH C LAB</b>					

**Any 10 of the following experiments are to be conducted**

**Course Objectives:**

- To develop skills to design and analyze simple linear and non linear data structures.
- To strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.
- To gain knowledge in practical applications of data structures.

**List of Experiments:**

1. Implement operations on Strings.
2. Implement basic operations on Stacks.
3. Implement basic operations on Queue.
4. Implement basic operations on Circular Queue.
5. Implement multi stack in a single array.
6. Implement List data structure using i) array ii) singly linked list.
7. Implement basic operations on doubly linked list.
8. Implement basic operations (insertion, deletion, search, find min and find max) on Binary Search trees.
9. Implementation of Heaps.
10. Implementation of Breadth First Search Techniques.
11. Implementation of Depth First Search Techniques.
12. Implementation of Prim's algorithm.
13. Implementation of Kruskal's Algorithm.
14. Implementation of Linear search.
15. Implementation of Fibanocci search.
16. Implementation of Merge sort.
17. Implementation of Quick sort.

**Course Outcomes:**

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

- Be able to design and analyze the time and space efficiency of the data structure.
- Be capable to identify the appropriate data structure for given problem.
- Have practical knowledge on the applications of data structures.



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<b>I Year II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>CONSTITUTION OF INDIA</b>					

**Preamble:****Course Objectives:**

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative.

**UNIT-I**

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

**Learning outcomes:**

After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

**UNIT-II**

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

**Learning outcomes:** -After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

**UNIT-III**

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

**Learning outcomes:** -After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat



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**UNIT-IV**

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

**Learning outcomes:** -After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zilla panchayat block level organization

**UNIT-V**

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission, Functions of Commissions for the welfare of SC/ST/OBC and women

**Learning outcomes:** -After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

**References:**

1. Durga Das Basu, Introduction to the Constitution of India, 12th edition Prentice – Hall of India Pvt. Ltd. New Delhi 2011.
2. Subash Kashyap, Indian Constitution, 2<sup>nd</sup> edition, National Book Trust, 2011.
3. J.A. Siwach, Dynamics of Indian Government & Politics, 2<sup>nd</sup> edition, Sterling Pub Private Ltd.,1990.
4. D.C. Gupta, Indian Government and Politics, 8<sup>th</sup> edition, Vikas Publishing House Pvt Ltd., 2015.
5. H.M.Sreevai, Constitutional Law of India, 4<sup>th</sup> edition in 3 volumes (Universal Law Publication), 2015.
6. J.C. Johari, Indian Government and Politics Hans, 13th edition, Shoban Lal & Co.2012.
7. J. Raj Indian Government and Politics, 1st edition, SAGE Texts Publication, 2008.
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, 3rd edition, Lexis Nexis Publications, 2008.
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

**E-resources:**

1. [nptel.ac.in/courses/109104074/8](https://nptel.ac.in/courses/109104074/8)
2. [nptel.ac.in/courses/109104045/](https://nptel.ac.in/courses/109104045/)
3. [nptel.ac.in/courses/101104065/](https://nptel.ac.in/courses/101104065/)
4. [www.hss.iitb.ac.in/en/lecture-details](http://www.hss.iitb.ac.in/en/lecture-details)
5. [www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution](http://www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution)



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**Course Outcomes:**

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
  1. Know the sources, features and principles of Indian Constitution.
  2. Learn about Union Government, State government and its administration.
  3. Get acquainted with Local administration and Pachayati Raj.
  4. Be aware of basic concepts and developments of Human Rights.
  5. Gain knowledge on roles and functioning of Election Commission