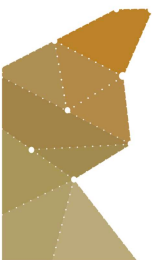




**B. Tech Computer Science and  
Engineering  
Curriculum**

**SEMESTER III**



## B. Tech Computer Science and Engineering

### SEMESTER III

Course Code	Course Name	L-T-P	Credit
MAT 211	Linear Algebra	3-0-0	3
ENV 111	Environmental Science	2-0-2	3
ENG 101	Engineering Fundamentals	3-0-0	3
PHY 211	Electricity & Magnetism	2-0-2	3
CSE 223	Data Structures and Algorithms using C	3-0-2	4
CSE 221	Digital Systems Design	3-0-2	4
CDC 211	Soft Skills III	1-0-0	1
		17-0-8	21



### Semester III

Code	Title	Core/ Elective	L-T-P	Credits
MAT 211	Linear Algebra	C	3-0-0	3

#### UNIT I: VECTOR SPACE

Elimination, LU factorization, null-spaces and other subspaces, bases and dimensions, vector spaces, complexity

#### UNIT II- FACTORIZATION

Orthogonality, projections, least-squares, QR, Gram–Schmidt, orthogonal functions

#### UNIT III: MATRICES

Eigenvectors, determinants, similar matrices, Markov matrices, ODEs, symmetric matrices, definite matrices

#### UNIT IV: ITERATIVE METHODS

Defective matrices, SVD and principal-components analysis, sparse matrices and iterative methods, complex matrices, symmetric linear operators on functions.

#### UNIT V: APPLICATIONS

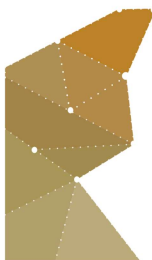
Matrices from graphs and engineering.

#### Books of Study:

1. G. Strang, Linear Algebra and Its applications, Nelson Engineering, 4th Edn., 2007
2. K. Hoffman and R. Kunze, Linear Algebra, Prentice Hall of India, 1996

#### References:

1. S. Axler, Linear Algebra Done Right, 2nd Edn., UTM, Springer, Indian edition, 2010.
2. G. Schay, Introduction to Linear Algebra, Narosa, 1997.



### Semester III

Code	Title	Core/ Elective	L-T-P	Credits
EVS 111	Environmental Science	C	2-0-2	3

#### **UNIT I: Environmental Education, Sustainability, and Ecological Systems: How ecosystems works**

Environmental Education, Concept of sustainability, Tragedy of the commons; Root causes of environmental crisis, Earth systems – atmosphere, hydrosphere, Lithosphere, and Biosphere. Ecosystem structure and function, Ecological systems and major biomes, Water and nutrients cycles - Water cycle, phosphorous cycle, nitrogen cycle, Case study – Cape Town water crisis.

#### **UNIT II: Biodiversity and its conservation**

Biodiversity:-Why do we care? (Values of biodiversity); Threats to biodiversity; Saving Biodiversity – sustainable approaches; Case Study-The Last White Rhino; GMO; Technological advancement and biodiversity conservation.

#### **UNIT III: Environmental Pollution and its role on global climate change and human health**

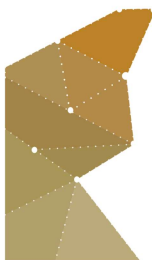
Pollution – air, water, and soil pollution. Air pollution: Composition of air, Sources of air pollution, Primary and secondary pollutants, Air quality index (AQI), Effects of air pollution, Air pollution and infant mortality, Air pollution control: Sustainable strategies Greenhouse gases; Carbon cycle; Global warming and climate change; Renewable and Non-renewable Energy sources Water pollution: Surface water, Groundwater, and Ocean pollution; Point and Non-points sources; Organic and inorganic nutrients pollution; Eutrophication; Microbial contamination; Oil pollution in the seas -Exxon Valdez Oil spill; Plastic pollution Soil Pollution: Chemical contamination, Major contributors of soil pollution (Coal ash, sewerage, Pesticides and herbicides, etc.)

#### **UNIT IV: Environmental Microbiology and Biotechnology**

Environmental Microbiology: Microbes in our daily lives; Microbial life in air, water, and soil; Indicator microorganisms; Microbial interactions, signalling, biotransformation, and bioremediation; Molecular Ecology: The rare Biosphere; Microbial contribution to global climate change – Methane, and Nitrous oxide emissions; Global warming and microbial infectious disease.

#### **UNIT V: Environmental ethics, Economics, policy development**

Environmental ethics for a sustainable society; Economics of pollution control, Carbon credits, taxes, and role in environmental protection; Environmental movements; Environmental protection acts in India; Sustainable Economic Developments: Challenges of developing nations, Political decision making for Environmental Protections. Case study- Chinese Environmental Protection Tax, Water resource tax, CNG vehicles in Delhi/Delhi odd-or-even rule.

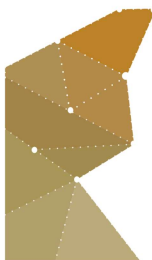


**Books of Study:**

1. Basu. M, Xavier. S. “Fundamentals of Environmental Studies”, 1st edition, Cambridge University Press, 2016.
2. Raina. M. Maier, Ian L. Pepper, Charles. P. “Environmental Microbiology” 2nd edition, Academic Press, 2004.

**References:**

1. Danial. D. C. “Environmental Science”, 8th edition, Jones and Barlett Publishers, MA,2010.



### Semester III

Code	Title	Core/ Elective	L-T-P	Credits
ENG 101	Engineering Fundamentals	C	3-0-0	3

#### Unit I

Sources of Energy, Types of Prime Movers, Force, Mass, Pressure, Work, Power, Energy, Heat, Temperature, Internal Energy, Enthalpy, Efficiency, Zeroth Law, First Law, Thermodynamic System, Different Types of Fuels, Non Conventional Energy - Wind, Solar, Bio, Global Warming.

#### Unit II

Introduction - Fluids, Physical Properties of Fluids, Relationship Between Stress and Strain-Rate For Newtonian and Non-Newtonian Fluids, Description of Fluid Flow, Classification of Flows- Laminar and Turbulent Flows, Measurement of Flow.

#### Unit III

Heat Engines - External, Internal, Carnot, Rankine, Otto, Diesel Cycles; Steam Boilers - Fire Tube, Water Tube Boilers, Valves; IC Engine - Components, 2 Stroke, 4 Stroke, Engine Performance, Efficiency.

#### Unit IV

Pumps- Reciprocating, Rotary, Pump Efficiency; Air Compressors-Reciprocating/Rotary; Refrigeration and Air Conditioning- Principles of Working; Brakes, Clutches and Couplings, Drives- Transmission of Power- Belt Drive, Gear Drive, Chain Drive.

#### Unit V

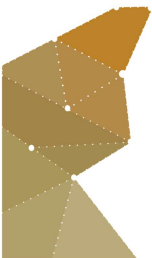
Mechanics of Materials- Engineering Materials, Material Properties- Tensile Strength, Toughness, Malleability, Hardness, Ductility, Stiffness, Brittleness, Elasticity, Plasticity, Creep, Fatigue, Failure, Stress-strain plots, failures

#### Books of Study:

1. Elements of Mechanical Engineering, S Trymbak Murthy, IK International Publishing, 2010.
2. Elements of Mechanical Engineering, R K Rajput, Laxmi Publications Ltd, 2005.

#### References:

1. Elements of Mechanical Engineering, V.K . Manglik, PHI Publications, 2013.
2. Elements of Mechanical Engineering, B. L. Theraja, S.Chand Ltd. 1999.
3. Elements of Mechanical Engineering, Sadhu Singh, S.Chand and Company Ltd. 2013.



### Semester III

Code	Title	Core/ Elective	L-T-P	Credits
PHY 211	Introduction to Electricity & Magnetism	C	2-0-2	3

#### UNIT I: INTRODUCTION TO VECTOR ALGEBRA

Gradient, Divergence and curl and their physical significances, Gauss and Stokes theorems, Vector operators in different coordinate (Curvilinear, Cartesian, Cylindrical and spherical) systems

#### UNIT II: ELECTROSTATICS

Coulomb's law, Gauss law, Electric field, Electrostatic Potential, Potential energy of system of charges, Boundary Value problems in electrostatics-solution of Laplace equation in Cartesian system, Method of image charge.

#### UNIT III: DIELECTRICS AND POLARIZATION

Electric dipole and dipole moment, Electric potential due to dipole, Electric field intensity due to dipole, Polarization P, Electric displacement D, Electric susceptibility and dielectric constant, Bound volume and surface charge densities, Electric field at an exterior and interior point of dielectric.

#### UNIT IV: MAGNETOSTATICS

Biot-Savart law, Ampere's law for force between two current carrying loops, Ampere's circuital law, Equation of continuity, Magnetic vector potential A, Energy density in magnetic field, magnetization of matter (B, H, M)

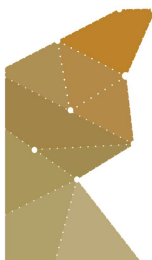
Magnetic susceptibility and permeability, Hysteresis loss, B-H curve, Diamagnetic, paramagnetic and ferromagnetic substances.

#### UNIT V: INTRODUCTION TO ELECTRODYNAMICS

Time varying fields: Faradays law of induction, generalization of Amperes' law, Maxwell's equation (Differential and Integral form), Wave equation and plane waves in free space

#### Books of Study:

1. MIT-- 8.02X online course material
2. Introduction to Electrodynamics (4rd Edition) - David J. Griffiths (Publisher - PHI Learning, Eastern Economy Editions, 2012)
3. Electricity and Magnetism (Reprints 2007, 1st Edition 2001) A. S. Mahajan, A. A. Rangwala, (Publisher - McGraw-Hill Education)



**References:**

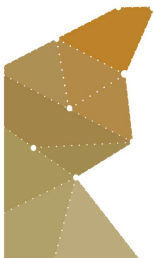
1. Electricity and magnetism Edward M Purcell, David J Morin, 3rd edition, Cambridge University, 2013
2. Classical Electrodynamics (3rd Edition ) - John David Jackson (Publisher – Wiley)

**LIST OF EXPERIMENTS**

Sl.No	Experiment name	Objectives
1	Determination of susceptibility of paramagnetic material	To determine susceptibility of paramagnetic sample by using Quinck's tube method
2	Dielectric Constant	<ol style="list-style-type: none"> <li>To determine the capacitance of a parallel plate capacitor by the measurement of charge.</li> <li>To measure the capacitance as a function of area and distance between the plates.</li> <li>To determine the dielectric constant of different dielectric materials.</li> </ol>
3	Four-probe Resistivity Measurement	Measurement of resistivity of a semiconductor by Four-probe method and determination of Energy Band Gap.
4	Biot-Savart's Law	<ol style="list-style-type: none"> <li>To study the magnetic field along the axis of a current carrying circular loop.</li> <li>To study the dependency of magnetic field on the diameter of coil.</li> </ol>
5	Faraday's Law & Induced E.M.F	<ol style="list-style-type: none"> <li>Measurement of the induced voltage impulse as a function of the velocity of the magnet.</li> <li>Calculation of the magnetic flux induced by the falling magnet as a function of the velocity of the magnet.</li> </ol>
6	Magnetic Field in Helmholtz Coil	<ol style="list-style-type: none"> <li>To investigate the spatial distribution of magnetic field between coils and determine the spacing for uniform magnetic field.</li> <li>To demonstrate the superposition of the magnetic fields of the two individual coils.</li> </ol>



7	Determination of magnetic property of a given material	To demonstrate Dia-Para-Ferro magnetism in a given material using an inhomogeneous magnetic field
8	Study of B-H-Curve	To study permeability curve of a given material
9	Franck Hertz Experiment	To observe the neon spectral bands formation in Franck-Hertz tube and record the Franck-Hertz characteristic curve for neon.
10	Hall effect Experiment	To determine the type of charge carrier, carrier density and Hall coefficient of a given semiconductor.



## Semester III

Code	Title	Core/ Elective	L-T-P	Credits
CSE 223	Data Structures and Algorithms using C	C	3-0-2	4

### Unit I

Introduction to C programming, identifiers, basic data types, constants, variables, keywords, operators: arithmetic, relational and logical, increment and decrement operators, conditional operator, assignment operators, Instruction: type declaration, Input-output, conditional, loop control, Arrays, Functions, pointers, dynamic memory management functions Derived types- structures- declaration, definition and initialization of structures, accessing member of structure, arrays of structures, structures and functions, pointers to structures, self referential structures.

### Unit II

Introduction to data structures, Stacks and Queues: representation and application, implementation of stack and queue operations using C. Linked lists: Single linked lists, implementation of link list and various operation using C, Double linked list, circular list.

### UNIT III

Trees: Tree terminology, Binary tree, Binary search tree, infix to post fix conversion, postfix expression evaluation. General tree, AVL Tree, Complete Binary Tree representation.

### UNIT IV

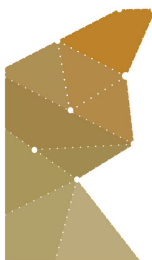
Graphs: Graph terminology, Representation of graphs, Path matrix, BFS (breadth first search), DFS (depth first search), topological sorting, Shortest path algorithms.

### UNIT V

Sorting and Searching techniques – Bubble sort, selection sort, Insertion sort, Quick sort, merge sort, Heap sort, Radix sort, implementation using C. Linear and binary search methods, implementation using C, Hashing techniques and hash functions.

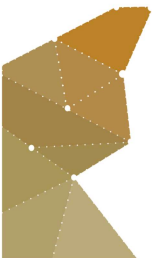
### Books of Study:

1. "Data structure using C", Aaron M. Tenenbaum, Y Langsam and Mosche J. Augenstein, Pearson publication.
2. Data structures and Algorithm Analysis in C , Mark Allen Weiss, Pearson publications, Second Edition
3. Programming in C. P. Dey and M Ghosh , Second Edition, Oxford University Press.
4. Programming with C, Byron Gottfried, Mcgrawhill Education, Fourteenth reprint, 2016



**References:**

1. “Fundamentals of data structure in C” Horowitz, Sahani & Anderson Freed, Computer Science Press.
2. “Fundamental of Data Structures” , (Schaums Series) Tata-McGraw-Hill.
3. G. A. V. Pai: “Data Structures & Algorithms; Concepts, Techniques & Algorithms”Tata McGraw Hill.
4. Gilberg and Forouzan, “Data Structure- A Pseudo code approach with C” by Thomson publication



## Semester III

Code	Title	Core/ Elective	L-T-P	Credits
CSE 221	Digital Systems Design	C	3-0-2	4

### UNIT I

Digital Systems and Binary Numbers: Digital Systems – Number systems and base conversions – Representation of signed Binary Numbers – Binary codes – Logic gates.

### UNIT II

Boolean Algebra : Introduction to Boolean Algebra – Axioms and Laws of Boolean Algebra – Boolean functions – Canonical and Standard Forms. Gate – Level Minimization : Introduction – Two, Three, Four Variable K-map's – Don't Care Conditions – NAND and NOR implementation.

### UNIT III

Combinational Logic: Introduction to combinational logic circuits – Binary adder and subtractor – Look Ahead Carry Adder - Magnitude comparator – Decoders – Encoders – Multiplexers – Demultiplexers.

### UNIT IV

Synchronous Sequential Logic: Introduction to sequential circuits – Latch – Flip Flop – SR, JK, T, D Flip Flops – Flip Flop excitation tables. Analysis of clocked sequential circuit, Registers and Counters: Registers – Shift registers – Ripple counters – Synchronous counters – Other counters.

### UNIT V

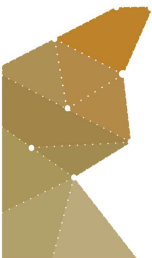
Memory and Programmable Logic: Introduction to Programmable Logic Devices(PLD's) – Programmable ROM(PROM) – Programmable Logic Array(PLA) – Programmable Array Logic(PAL).

### Books of Study:

1. Digital Design With an Introduction to the Verilog HDL by M. Moris Mano and Michael D. Ciletti, 5th Edition.
2. Digital Principles and Applications by Leach, Paul Malvino, 5th Edition.

### References :

1. Fundamentals of Digital Logic Design by Charles H.Roth, Jr. 5th Edition, Cengage
2. Digital Electronics by G.K. Kharate, Oxford University Press 3. Switching Theory and Logic Design by A. Anand Kumar, PHI, 2nd Edition.



### Semester III

Code	Title	Core/ Elective	L-T-P	Credits
CDC 211	Soft Skills III	C	1-0-0	1

**OBJECTIVE:** A grasp over numeric skills enable an individual to apply the mathematical techniques to situations that call for the interpretation or evaluation of quantitative information. The logical ability is sharpened through the practice of quantitative reasoning. Emotional intelligence on the other hand enables the development of intra and interpersonal relationship skills. Both these disciplines are aimed at enhancing the professional and personal effectiveness of the students.

#### UNIT I: QUANTITATIVE REASONING

Number properties, Percentage, Ratio and proportion, Profit and loss, Simple and compound interest, Speed, Time and work, Powers and roots, Linear equations, Quadratic equations, Pipes, cisterns.

#### UNIT II: VERBAL REASONING

Proposition, Premise: Syllogism: Verbal Analogies, Verification of truth of the statement, Assertion and reason, Situation reaction test, Decision making, Alpha-numerical sequence puzzle.

#### UNIT III: NON-VERBAL REASONING

Symbols and their relationships, Arithmetical Decision making, Analytical functions, Space Visualization, Blood Relations, Seating Arrangement, Coding-Decoding, Input- Output.

#### UNIT IV: DATA ANALYSIS AND INTERPRETATION

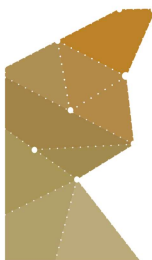
Statistics: Average, Median, Mode, Range, Standard deviation, Graphical and Numerical Methods for Describing Data, Interpretation of data in tables and graphs, Permutations and Venn diagrams Counting Methods, Probability, Distributions of Data, Random Variables, and Probability Distributions.

#### UNIT V: EMOTIONAL INTELLIGENCE

Self-Awareness, Self-Regulation, Social Skills, Empathy and Motivation.

#### Books of Study:

1. R.S. Agarwal, A Modern Approach to Verbal & Non Verbal Reasoning, S. Chand Publication
2. P. Anand, Quantitative Aptitude, Wiley, 2015



**References:**

1. The Games People Play, Eric Berne; Grove Press; 1964
2. Of Human Interaction; Joseph Luft; Mayfield Publishing. 1969
3. Emotional Intelligence; Daniel Goleman; Bantam Books, 1995

