

## **B.E. /B.Tech in Computer Science & Business Systems**

### **Semester 1**

TCS

# Computer Science & Business Systems

Semester 1 Curriculum

## B.E. /B.Tech in Computer Science & Business Systems

### Semester 1

#### DISCRETE MATHEMATICS

**Boolean algebra:** Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.

**Abstract algebra:** Set, relation, group, ring, field.

**Combinatorics:** Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, pigeonhole principle.

**Graph Theory:** Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, trees; Planar graphs, Euler's formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem.

**Logic:** Propositional calculus - propositions and connectives, syntax; Semantics - truth assignments and truth tables, validity and satisfiability, tautology; Adequate set of connectives; Equivalence and normal forms; Compactness and resolution; Formal reducibility - natural deduction system and axiom system; Soundness and completeness.

#### Text Books:

1. *Topics in Algebra*, I. N. Herstein, John Wiley and Sons.
2. *Digital Logic & Computer Design*, M. Morris Mano, Pearson.
3. *Elements of Discrete Mathematics*, (Second Edition) C. L. LiuMcGraw Hill, New Delhi.
4. *Graph Theory with Applications*, J. A. Bondy and U. S. R. Murty, Macmillan Press, London.
5. *Mathematical Logic for Computer Science*, L. Zhongwan, World Scientific, Singapore.

#### Reference Books:

1. *Introduction to linear algebra*. Gilbert Strang.
2. *Introductory Combinatorics*, R. A. Brualdi, North-Holland, New York.
3. *Graph Theory with Applications to Engineering and Computer Science*, N. Deo, Prentice Hall, Englewood Cliffs.
4. *Introduction to Mathematical Logic*, (Second Edition), E. Mendelsohn, Van-Nostrand, London.

## B.E. /B.Tech in Computer Science & Business Systems

### Semester 1

#### INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS

**Introduction to Statistics:** Definition of Statistics. Basic objectives. Applications in various branches of science with examples. Collection of Data: Internal and external data, Primary and secondary Data. Population and sample, Representative sample. Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - central tendency and dispersion. Bivariate data. Summarization, marginal and conditional frequency distribution.

**Probability:** Concept of experiments, sample space, event. Definition of Combinatorial Probability. Conditional Probability, Bayes Theorem. Probability distributions: discrete & continuous distributions, Binomial, Poisson and Geometric distributions, Uniform, Exponential, Normal, Chi-square, t, F distributions. Expected values and moments: mathematical expectation and its properties, Moments (including variance) and their properties, interpretation, Moment generating function.

**Calculus:** Basic concepts of Differential and integral calculus, application of double and triple integral.

#### Text Books:

1. *Introduction of Probability Models*, S. M. Ross, Academic Press, N.Y.
2. *Fundamentals of Statistics*, vol. I & II, A. Goon, M. Gupta and B. Dasgupta, World Press.
3. *Higher Engineering Mathematics*, B. S. Grewal, Khanna Publication, Delhi.

#### Reference Books:

1. *A first course in Probability*, S. M. Ross, Prentice Hall.
2. *Probability and Statistics for Engineers*, (Fourth Edition), I. R. Miller, J.E. Freund and R. Johnson, PHI.
3. *Introduction to the Theory of Statistics*, A. M. Mood, F.A. Graybill and D.C. Boes, McGraw Hill Education.
4. *Advanced Engineering Mathematics*, (Seventh Edition), Peter V. O'Neil, Thomson Learning.
5. *Advanced Engineering Mathematics*, (Second Edition) M. D. Greenberg, , Pearson Education.
6. *Applied Mathematics*, Vol. I & II, P. N. Wartikar and J. N. Wartikar, Vidyarthi Prakashan.

## B.E. /B.Tech in Computer Science & Business Systems

### Semester 1

#### FUNDAMENTALS OF COMPUTER SCIENCE + Lab

**General problem Solving concepts:** Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

**Imperative languages:** Introduction to imperative language; syntax and constructs of a specific language (ANSI C)

- Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation.
- Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, goto labels, structured and un- structured programming.
- Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Pre-processor, Standard Library Functions and return types.
- Pointers and Arrays: Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.
- Structures: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral structures, Table look up, typedef, unions, Bit-fields
- Input and Output: Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions.
- Unix system Interface: File Descriptor, Low level I/O – read and write, open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator.

**Programming Method:** Debugging, Macro, User Defined Header, User Defined Library Function, makefile utility.

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#### FUNDAMENTALS OF COMPUTER SCIENCE + Lab (continued)

##### Laboratory

1. Algorithm and flowcharts of small problems like GCD
2. Structured code writing with:
  - i. Small but tricky codes
  - ii. Proper parameter passing
  - iii. Command line Arguments
  - iv. Variable parameter
  - v. Pointer to functions
  - vi. User defined header
  - vii. Make file utility
  - viii. Multi file program and user defined libraries
  - ix. Interesting substring matching / searching programs
  - x. Parsing related assignments

##### Text Books:

1. *The C Programming Language*, (Second Edition) B. W. Kernighan and D. M. Ritchi, PHI.
2. *Programming in C*, (Second Edition) B. Gottfried, Schaum Outline Series.

##### Reference Books:

1. *C: The Complete Reference*, (Fourth Edition), Herbert Schildt, McGraw Hill.
2. *Let Us C*, Yashavant Kanetkar, BPB Publications.

## B.E. /B.Tech in Computer Science & Business Systems

### Semester 1

#### PRINCIPLES OF ELECTRICAL ENGINEERING + Lab

**Introduction:** Concept of Potential difference, voltage, current, Fundamental linear passive and active elements to their functional current-voltage relation, Terminology and symbols in order to describe electric networks, voltage source and current sources, ideal and practical sources, concept of dependent and independent sources, Kirchhoff's laws and applications to network solutions using mesh and nodal analysis, Concept of work, power, energy, and conversion of energy.

**DC Circuits:** Current-voltage relations of the electric network by mathematical equations to analyze the network (Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem) Simplifications of networks using series-parallel, Star/Delta transformation. Superposition theorem.

**AC Circuits:** AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3 phase Balanced AC Circuits ( $\lambda$ - $\Delta$  &  $\lambda$ - $\lambda$ ).

**Electrostatics and Electro-Mechanics:** Electrostatic field, electric field strength, concept of permittivity in dielectrics, capacitor composite, dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors, Electricity and Magnetism, magnetic field and Faraday's law, self and mutual inductance, Ampere's law, Magnetic circuit, Single phase transformer, principle of operation, EMF equation, voltage ratio, current ratio, KVA rating, efficiency and regulation, Electromechanical energy conversion.

**Measurements and Sensors:** Introduction to measuring devices/sensors and transducers (Piezoelectric and thermo-couple) related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems (Current & Single-phase power). Electrical Wiring and Illumination system: Basic layout of the distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Safety devices & system.

**For Further Reading -** Principle of batteries, types, construction and application, Magnetic material and B-H Curve, Basic concept of indicating and integrating instruments.

## B.E. /B.Tech in Computer Science & Business Systems

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#### PRINCIPLES OF ELECTRICAL ENGINEERING + Lab (continued)

##### Laboratory

1. Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits
2. Determination of resistance temperature coefficient
3. Verification of Network Theorem (Superposition, Thevenin, Norton, Maximum Power
4. Transfer theorem)
5. Simulation of R-L-C series circuits for  $X_L > X_C$  ,  $X_L < X_C$
6. Simulation of Time response of RC circuit
7. Verification of relation in between voltage and current in three phase balanced star and delta connected loads.
8. Demonstration of measurement of electrical quantities in DC and AC systems.

##### Text Books:

1. *Electric Machinery*, (Sixth Edition) A. E. Fitzgerald, Kingsely Jr Charles, D. Umans Stephen, Tata McGraw Hill.
2. *A Textbook of Electrical Technology*, (vol. I), B. L. Theraja, Chand and Company Ltd., New Delhi.
3. *Basic Electrical Engineering*, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
4. *Theory and problems of Basic Electrical Engineering*, (Second Edition), J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd.

##### Reference Books:

1. *Basic of Electrical Engineering*, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press.  
T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. *Introduction to Electrodynamics*, D. J. Griffiths, (Fourth Edition), Cambridge University Press.
3. *Engineering Circuit Analysis*, William H. Hayt & Jack E. Kemmerly, McGraw-Hill Book Company Inc.
4. *Fundamentals of Electrical and Electronics Engineering*, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.

## B.E. /B.Tech in Computer Science & Business Systems

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#### PHYSICS FOR COMPUTING SCIENCE + Lab

**Oscillation:** Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple spring-mass system. Resonance-definition, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators.

**Interference-principle of superposition-Young's experiment:** Theory of interference fringes-types of interference-Fresnel's prism-Newton's rings, Diffraction-Two kinds of diffraction-Difference between interference and diffraction - Fraunhofer diffraction at single slit-plane diffraction grating. Temporal and Spatial Coherence.

**Polarization of light:** Polarization - Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster's law, double refraction.

**Basic Idea of Electromagnetisms:** Continuity equation for current densities, Maxwell's equation in vacuum and non-conducting medium.

**Quantum Mechanics:** Introduction- Planck's quantum theory- Matter waves, de-Broglie wavelength, Heisenberg's Uncertainty principle, time independent and time dependent Schrödinger's wave equation, Physical significance of wave function, Particle in a one dimensional potential box, Heisenberg Picture.

**Crystallography:** Basic terms-types of crystal systems, Bravais lattices, miller indices, d spacing, Atomic packing factor for SC, BCC, FCC and HCP structures, X-ray diffraction

**Semiconductor Physics:** Conductor, Semiconductor and Insulator; Origin of Band Theory, Basic concept of Band theory,

**Laser and Fiber optics:** Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO<sub>2</sub> and Neodymium YAG (Neodymium-doped Yttrium Aluminum Garnet); Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering. Fiber optics and Applications, Types of optical fibers.

**Thermodynamics:** Zero-th law of thermodynamics, first law of thermodynamics, brief discussion on application of 1st law, second law of thermodynamics and concept of Engine, entropy, change in entropy in reversible and irreversible processes.

Clear demarcation between qualitative and quantitative topics,

Clear indication of number of hours dedicated to the course.

#### Laboratory

- 1) Magnetic field along the axis of current carrying coil – Stewart and Gee
- 2) Determination of Hall coefficient of semi-conductor



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- 3) Determination of Plank constant
- 4) Determination of wave length of light by Laser diffraction method
- 5) Determination of wave length of light by Newton's Ring method
- 6) Determination of laser and optical fiber parameters
- 7) Determination of Stefan's Constant.

Text Books:

1. Concepts of Modern Physics, (Fifth Edition) A Beiser, McGraw Hill International.
2. Fundamentals:
  1. Optics, (Fifth Edition) Ajoy Ghatak, Tata McGraw Hill.
  2. Sears & Zemansky University Physics, Addison-Wesley.
  3. Fundamentals of Optics, (Third Edition) Jenkins and White, McGraw-Hill.