

Indian Institute of Information Technology, Bhagalpur
B. Tech Course Curricula and Syllabus (First Year)

B. Tech Semester I

Sem	Number	Course Name	L	T	P	C
I	MA101	Mathematics I	3	1	0	8
I	CS101	Computer Programming	3	1	0	8
I	CS110	Computer Programming Lab	0	0	3	3
I	EC101	Digital Design	3	1	0	8
I	EC110	Digital Design Lab	0	0	3	3
I	EC102	Electrical Circuit Analysis	3	1	0	8
I	HS101	English	2	0	0	4
I		NCC /NSO/NSS	0	0	2	0
		Total	14	4	6	42

MA101 (Mathematics I)

3-1-0-8

Linear Algebra: Systems of linear equations and their solutions; vector space R^n and its subspaces; spanning set and linear independence; matrices, inverse and determinant; range space and rank, null space and nullity, eigenvalues and eigenvectors; diagonalization of matrices; similarity; inner product, Gram-Schmidt process; vector spaces (over the field of real and complex numbers), linear transformations.

Single Variable Calculus: Convergence of sequences and series of real numbers; continuity of functions; differentiability, Rolle's theorem, mean value theorem, Taylor's theorem; power series; Riemann integration, fundamental theorem of calculus, improper integrals; application to length, area, volume and surface area of revolution.

Texts:

1. D. Poole, Linear Algebra: A Modern Introduction, 4th Edition, Brooks Cole, 2014.
2. S. R. Ghorpade and B. V. Limaye, A Course in Calculus and Real Analysis, 1st Edition, Springer India, 2006.

References:

1. G. Strang, Linear Algebra and Its Applications, 4th Edition, Brooks Cole, 2006.
2. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 4th Edition, Wiley India, 2011.

CS101 (Computer Programming)

3-1-0-8

Procedural programming through Language 'C': Basic Syntax and Semantics; Variables; Types; Expressions; Assignment statements; Conditional and Iterative Control Structures; Simple I/O; Functions and parameter passing; Strings and string processing; Pointers and References; Structures; Recursion.

Algorithm development: Techniques of problem solving; Stepwise Refinement; Simple numerical examples; algorithms for searching and sorting; merging order lists. Examples taken from real-world applications involving data manipulation.

Texts:

1. Bryon Gottfried, Programming with C, 3rd edition, McGraw Hill, 2010.

References:

1. Horowitz, Sahni, and Anderson-Freed, Fundamentals of Data Structures in C, 2nd edition, Universities Press, 2011.
2. Kernighan and Ritchie, The C Programming Language, 2nd edition, PHI, 2012.

CS110 (Computer Programming Lab)

0-0-0-3

Programming assignments on: Basic Assignment Statement; Conditional and Iterative Control Structures; Some Numerical Examples; Functions and parameter passing; Array and String; Pointer; Structure; Recursion; Dynamic Memory Allocation; File Handling; Linked List; Sorting; Command Line Arguments.

Binary Arithmetic: Representation of integers, fractions and signed numbers in different codes; Addition and subtraction operations on binary-coded numbers; Algorithms for performing multiplication and division.

Combinational Circuits: Boolean expressions and their minimization using algebraic identities; Karnaugh map representation and minimization of Boolean functions using K-map; Two-level realizations using gates -- AND-OR, OR-AND, NAND-NAND and NOR-NOR structures.

Combinational Circuits using MSI Modules: Multifunction gates, Multi-bit adder, Multiplexers, Demultiplexers, Decoders, Programmable ALU; Multiplexer-based realization of K-maps; Combinational circuit design using multiplexers and gates.

Sequential Circuits: Latches and Flip-flops; Ripple counters using T flip-flops; Synchronous counters; Shift Registers; Ring and MLS counters; Sequence generator using J-K / D flip-flops.

Memories, Microprocessors and Microcomputer Organization: RAM, ROM, PAL, PLA, Introduction to microprocessor and microcomputer organization; Central processing unit (CPU), memory and input/output devices.

Texts:

1. M. Morris Mano, Digital Logic and Computer Design, 11th edition, Pearson Education, 2009.
2. R. S. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, 6th edition, Penram International Publishing, 2013.

References:

1. Ronald J Tocci, Neal S Wisdmer and Gregory L. Moss, Digital Systems: Principle and Applications, 10th edition, Pearson Education, 2011.
2. Albert Paul Malvino, Donald P Leach and Gautam Saha, Digital Principles and Applications, 7th edition, Tata McGraw - Hill Education, 2011.
3. C. H. Roth Jr., Fundamentals of Logic Design, 4th edition, Jaico Publishers, 2002.
4. J. F. Wakerly, Digital Design - principles and practices, 4th edition, Pearson Education; 2006.

Familiarization with digital IC family 74LS00 and 74HS00; Familiarization with laboratory equipments – voltage generator, function generator, oscilloscope; Study of digital IC characteristics – input voltage, input current, output voltage, output current, fan out, noise margin and propagation delay.

Combinational logic circuits: Implementation of Boolean functions using logic gates; Arithmetic operations using logic gates; Implementation of Multiplexers, Demultiplexers, Encoders, Decoders; Implementation of Boolean functions using Multiplexers/Decoders.

Study of sequential logic circuits: Implementation of flip flops; Implementation of counters; Implementation of sequence generators.

Microprocessor: Programming in 8085 microprocessor.

Basic components and electric circuits: charge, current, voltage and power, voltage and current sources, Ohm's law;

Voltage and current laws: nodes, paths, loops and branches, Kirchoff's current law, Kirchoff's voltage law, dependent and independent sources, voltage and current division;

Basic nodal and mesh analysis: nodal analysis, supernode, mesh analysis, supermesh;

Network theorems: linearity and superposition, source transformations, Thevenin and Norton equivalent circuits, maximum power transfer;

RL and RC circuits: source-free RL circuit, source-free RC circuit, unit-step function, driven RL circuits, natural and forced response, driven RC circuits;

RLC circuit: source-free parallel circuit, overdamped parallel RLC circuit, critical damping, underdamped parallel RLC circuit, source-free series RLC circuit, complete response of the RLC circuit;

Sinusoidal steady-state analysis: forced response to sinusoidal functions, complex forcing function, phasor, phasor relationship for R, L and C, impedance, admittance, phasor diagrams, instantaneous power, average power, apparent power and power factor, complex power;

Polyphase circuits: polyphase systems, single-phase three-wire systems, three-phase Y-Y connection, delta connection, power measurement in three-phase systems; Magnetically coupled circuits: mutual inductance, energy considerations, linear transformer, ideal transformer;

Frequency response: parallel and series resonance, Bode plots, Filters;

Two-port networks: one-port networks, admittance parameters, impedance parameters, hybrid parameters, transmission parameters.

Texts:

1. W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, 7th / 8th edition, Tata-McGraw-Hill Publishing Company Limited, 2010/ 2012.

References:

1. Bruce Carlson, Circuits: Engineering Concepts and Analysis of Linear Electric Circuits, 2nd Reprint, Thomson Asia Pvt. Ltd., 2006.
2. R. A. De Carlo and P. M. Lin, Linear Circuit Analysis, 2nd edition, Oxford University Press, 2001.
3. Nagrath I.J. and D. P. Kothari, Basic Electrical Engineering, 3rd edition, Tata McGraw Hill, 2009.
4. Ae Fitzgerald David E Higginbotham Arvin Grabel , Basic Electrical Engineering, 5th edition, Tata McGraw Hill Publishing Co Ltd., 2009.

Prose:

- “Letter to my Daughter” by Jawaharlal Nehru.
- “An Astrologer’s Day” by R.K. Narayan.

Poem :

- “Pied Beauty” by Gerard Manley Hopkins
- “Sonnet CXVI” by William Shakespeare.
- “The Charge of the light Brigade” by Alfred Tennyson.

Remedial grammar:

Articles, Subject-verb Agreement, Preposition, Time and tense, Active and Passive Voice, Phrasal Verbs, Degree of Comparison.

Technical Writing:

Notice, agenda, minutes of a meeting, memo, cv/resume, report writing, circular, business letters, technical description, brochures, newsletter, banners, job interviews: purpose and process, how to prepare for interviews, language and style to be used in interview, type of interview questions and how to answer them, group discussion: structure and dynamics, techniques of effective participation discussion, preparing for group discussion.

Texts:

1. Menon, Madhavi, ed. *Prose for Our Times*, 2004, Kolkata: Orient BlackSwan, 2004.
2. Sriraman, T., and N. Krishnaswami, eds. *Verses for a Multiverse: Poems for the New Generation*. Hyderabad: The English and Foreign Languages University; Orient BlackSwan, 2011.
3. Wood, F.T. *A Remedial English Grammar for Foreign Students*, New Delhi; Macmillan, 2014.
4. Arora, V.N., and Lakshmi Chandra. *Improve Your Writing*, Oxford University Press, New Delhi, 2013.
5. Anderson, Marilyn, Pramod K. Nayar, and Madhucchanda Sen. *Critical Reasoning, Academic Writing and Presentation Skills*. Rev. ed. New Delhi: Longman-Pearson, 2010.

References:

1. Mukherjee, Meenakshi. *Let’s Go Home and Other Stories*. New ed. Hyderabad: Orient BlackSwan, 2009.
2. Krishnaswami, N., and T. Sriaman, *Current English for Colleges*, Trinity Press, 2014.
3. Krishnaswami, N., and T. Sriraman. *Creative English for Commination* 2nd edition, Macmillan India Limited, 2000.
4. Swan, Michael, *Practical English Usage*, 3rd ed. Oxford University Press, 2005

B. Tech Semester II

Sem	Number	Course Name	L	T	P	C
II	MA102	Mathematics II	3	1	0	8
II	CS103	Data Structures	3	1	0	8
II	CS111	Data Structures Lab	0	0	3	3
II	CS104	Computer Organization	3	1	0	8
II	EC103	Basic Electronic Circuits	3	1	0	8
II	EC111	Basic Electronics Lab	0	0	3	3
II	HS102	Economics	3	0	0	6
II		NCC /NSO/NSS	0	0	2	0
		Total	15	4	6	44

MA102 (Mathematics II)

3-1-0-8

Multivariable Calculus: Vector functions of one variable – continuity, differentiation and integration; functions of several variables - continuity, partial derivatives, directional derivatives, gradient, differentiability, chain rule; tangent planes and normals, maxima and minima, Lagrange multiplier method; repeated and multiple integrals with applications to volume, surface area, moments of inertia, change of variables; vector fields, line and surface integrals; Green's, Gauss' and Stokes' theorems and their applications.

Ordinary Differential Equation: First order differential equations - exact differential equations, integrating factors, Bernoulli equations, existence and uniqueness theorem, applications; higher-order linear differential equations - solutions of homogeneous and non-homogeneous equations, method of variation of parameters, series solutions of linear differential equations, Legendre equation and Legendre polynomials, Bessel equation and Bessel functions of first and second kinds. Laplace and inverse Laplace transforms; properties, convolutions; solution of ODE by Laplace transform. Systems of first-order equations, two-dimensional linear autonomous system, phase plane, critical points, stability.

Texts:

1. G. B. Thomas, Jr. and R. L. Finney, Calculus and Analytic Geometry, 12th edition, Pearson Education India, 2010.
2. S. L. Ross, Differential Equations, 3rd edition, Wiley India, 2007.

References:

1. H. Anton, I. C. Bivens and S. Davis, Calculus: Early Transcendentals, 11th edition, Wiley, 2016.
2. T. M. Apostol, Calculus, Volume 2, 2nd edition, Wiley India, 2007.
3. W. E. Boyce and R. C. Di Prima, Elementary Differential Equations and Boundary Value Problems, 10th edition, Wiley India, 2012.

Performance of algorithms: space and time complexity, asymptotics; Fundamental Data structures: linked lists, arrays, matrices, stacks, queues, binary trees, tree traversals; Algorithms for sorting and searching: linear search, binary search, insertion-sort, selection sort, bubble-sort, quicksort, mergesort, heapsort, shellsort; Priority Queues: lists, heaps, binomial heaps, Fibonacci heaps; Graphs: representations, depth first search, breadth first search; Hashing: separate chaining, linear probing, quadratic probing; Search Trees: binary search trees, red-black trees, AVL trees, splay trees, B-trees; Strings: suffix arrays, tries; Randomized data structures: skip lists.

Texts:

1. Seymour Lipschutz, Data Structures with C, SCHAUM SERIES, 1st edition, Tata McGraw-Hill, 2010.

References:

1. M. A. Weiss, Data Structures and Problem Solving Using Java, 4th edition, Addison-Wesley, 2009.
2. A. M. Tannenbaum, Y. Langsam and M. J. Augenstein, Data Structures Using C++, 2nd edition, Prentice Hall India, 2007.
3. A. H. Aho, J. E. Hopcroft and J. Ullman, Data Structures and Algorithms, 1st edition, Addison-Wesley, 2002.
4. Robert Sedgewick, Algorithms in C++ Parts 1-4, 3rd edition, Pearson Education, 1998.
5. Robert Sedgewick, Algorithms in C++ Part 5, 3rd edition, Pearson Education, 2002.

CS111 (Data Structures Lab)

0-0-3-3

Programming assignments on: Using C Programming Language, Implementation of linked lists, stacks, queues, binary trees, tree traversals.

Implementation of algorithms for sorting: Insertion-sort, selection sort, bubble-sort, quicksort, mergesort, heapsort, shellsort; Implementation of algorithms for searching: linear search, binary search.

Assignments on Priority Queues: lists, heaps, binomial heaps, Fibonacci heaps; Graphs: representations, depth first search, breadth first search; Hashing: separate chaining, linear probing, quadratic probing.

Assignments on search Trees: binary search trees, red-black trees, AVL trees, splay trees, B-trees; Strings: suffix arrays, tries; Randomized data structures: skip lists.

CS104 (Computer Organization)

3-1-0-8

Basic Computer Architecture; ARM Instruction Set and Assembly Language Programming; Computer Arithmetic: integer addition (carry look-ahead), multiply (booth's algorithm), division (restoring and non-restoring), floating point arithmetic; Processor Design – single cycle, multi-cycle; pipelined design; memory architecture (static and Dynamic RAM; row and column addressing; interleaving, banks), cache memory (direct, set-associative, multi-level); storage basics: disks, tapes, printers, displays, flash memory; Buses (daisy chaining; synchronous and asynchronous; point-to-point; PCI, PCIe); Intel Sandy Bridge Architecture; Intel X86 instruction set introduction.

Texts:

1. David A. Patterson and John L. Hennesy, Computer Organization and Design: The Hardware Software Interface, ARM Edition, 4th edition, Elsevier India, 2010.

D-C power supply: Diode characteristics, half-wave and full wave rectifiers, shunt capacitor filter, voltage regulator, regulated D-C power supply.

Amplifier: Amplifier parameters, controlled source models, classification, the operational amplifier (OP-AMP) as a linear active device, the VCVS model of an op-amp, different amplifier configurations using op-amp, frequency response of op-amp and op-amp based amplifiers.

Filter: Concepts of low-pass, high-pass and band-pass filters, ideal (brick-wall) filter response, frequency response of simple RC filters, active RC filters using Op-amp.

Oscillator: Effects of negative and positive feedback of an amplifier, condition of harmonic oscillation, RC and LC oscillator circuits.

Comparator: Op-amp as a comparator, digital inverters (TTL/CMOS) as comparators, comparator with hysteresis, Schmitt trigger using Op-amp, 555 timer as a two dimensional comparator.

Waveform generators: Concept of bistable, monostable and astable circuits, timer and relaxation oscillator based on comparator and RC timing circuit, square wave generator using 555 timer, crystal clock generator.

Analog-Digital conversion: Digital to Analog Converter (DAC) using binary resistor scheme, R-2R ladder DAC, DAC using switched current resources, Analog to Digital converter (ADC) using capacitor charge/discharge: single-slope and dual-slope ADCs, ADC using counter and DAC, ADC using successive approximation.

Outcome - As a result of this course students become acquainted with basics of electronic circuits at least at the system integration level.

Texts:

1. Adel S. Sedra, Kenneth C. Smith & Arun N. Chandorkar, Microelectronic Circuits, International Version 6th Edition, Oxford University Press India, 2013.

Experiments using diodes: diode characteristics, design and analysis of half-wave and full-wave rectifier circuits without and with filter, clipping circuits, clamper circuits, experiments using operational amplifier: inverting amplifier, non-inverting amplifier, voltage follower, integrator, differentiator, comparators, Multivibrators, Wien's Bridge Oscillator, first-order filters, D/A and A/D converters.

Definition of economics, subject matter, scope and nature of economics; Microeconomic theory: consumer behaviour: preference, utility, indifference curve and its properties, income and prices, budget line; Derivation of demand: effects of price and income, demand elasticities, income and substitution effects, consumer's surplus; Production: output and inputs, short run and long run, law of variable proportions, returns to scale, different costs and revenues, profit maximisation and supply function, supply elasticities, opportunity cost; Markets: perfect competition, monopoly; Macroeconomic theory: national income: different aggregative concepts, methods of estimation of national income, circular flow of income; Money: definition and its function; Banking: role of central and commercial banks, money creation; Public finance: public vs. private finance, public revenue and expenditure, taxes- direct and indirect, progressive and regressive; Policy implications.

Text:

1. P. A. Samuelson and W. D. Nordhaus, Economics, 19th edition, McGraw Hill Inc., 2010.

References:

1. R. S. Pindyck, D. L. Rubinfeld and P. L. Mehta, Microeconomics, 7th edition, Pearson Education, 2009.
2. N. G. Mankiw, Principles of Macroeconomics, 6th edition, South-Western Cengage Learning, 2011.
3. S. B. Gupta, Monetary Economics: Institutions, theory and policy, 1st edition, S. Chand & Co. Ltd., 2010