Indian Institute of Information Technology Senapati, Manipur

B.Tech Course Curricula and Syllabus

2020 Batch onwards

Semester-I, Branch: CSE & ECE

Sem	Subject Code	Course Name	L	T	P	C
I	MA101	Mathematics I	3	1	0	8
I	CS101	Computer Programming	3	0	0	6
I	CS111	Computer Programming Lab	0	0	3	3
I	EC101	Digital Design	3	0	0	6
I	EC111	Digital Design Lab	0	0	3	3
I	EC102	Electrical Circuit Analysis	3	1	0	8
I	SC101	Physics I	3	0	0	6
I	HS101	English Language Skills I	1	0	2	4
I	GE101	Induction Programme (Audit)	1	0	3	0
		Total	**17**	**2**	**11**	**44**
		Contact Hours / Week	**30**			

Course	Humanities & Social Science (HS)	Basic Science (BS)	Basic Engineering (BE)	Professional Core (PC)	Professional Elective (PE)	Open Elective (OE)	Internship / Project
Credit	4	14	26	--	--	--	--

MA101	**Mathematics I**	**3-1-0-8**

Syllabus:

Linear Algebra: Systems of linear equations and their solutions; vector space Rn 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. G. Strang, *Linear Algebra and Its Applications*, 4th Edition (South Asian Edition), Wellesley- Cambridge Press, 2009(ISBN: 9788175968110).

2. S. R. Ghorpade and B. V. Limaye, *An Introduction to Calculus and Real Analysis*, Springer India, 2006 (ISBN: 9788181284853).

References:

1. D. Poole, *Linear Algebra: A Modern Introduction*, 2nd Edition, Brooks/Cole, 2005.

2. K. Hoffman and R. Kunze, *Linear Algebra*, 2nd Edition, Prentice Hall India, 2009.

3. R. G. Bartle and D. R. Sherbert, *Introduction to Real Analysis*, 3rd Edition, Wiley India, 2007.

CS101	Computer Programming	3-0-0-6

Syllabus:

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, McGraw Hill, Third edition (ISBN: 9780070145900).

References:

1. Horowitz, Sahni, and Anderson-Freed, Fundamentals of Data Structures in C, Universities Press, Second edition (ISBN: 9788173716058).

2. Kernighan and Ritchie, The C Programming Language, PHI, Second edition, (ISBN:9788120305960).

CS 111	Computer Programming Lab	0-0-3-3

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

EC101	Digital Design	3-1-0-8

Syllabus:

Number System: Introduction to number systems, binary, Integer and floating-point- numbers, octal, hexadecimal and decimal number system and their conversion.

Arithmetic Operations: Binary addition & subtraction; 1's and 2's complement, subtraction using 2's complement; binary codes, addition and subtraction operations on binary-coded numbers; Algorithms for performing multiplication and division.

Combinational Circuits: Basic Logic Operations, AND, OR, NOR, NAND, EX-OR, EX-NOR Gates, boolean expressions and their minimization using algebraic identities; Karnaugh map representation and minimization of Boolean functions using K-map; Don't care conditions, NAND and NOR logic implementations, two-level realizations using gates -- AND-OR, OR-AND, NAND-NAND and NOR-NOR structures.

Combinational Circuits using MSI Modules: Adders, subtractors, BCD arithmetic, serial adder, carry look-ahead adder, Multi-bit adder, Multiplexers, De-multiplexers, Decoders, 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, Finite state machines, propagation delay, setup and hold time, critical path delay.

Memories and Programmable Logic: ROM, SRAM, DRAM, PLA, PAL

Texts:

1. M. Morris Mano, Digital Logic and Computer Design, 11th Edition, Pearson Education, 2009.

References:

2. Ronald J Tocci, Neal S Wisdmer and Gregory L. Moss, Digital Systems: Principle and Applications, 10th Edition, Pearson Education, 2011.

3. Albert Paul Malvino, Donald P Leach and Gautam Saha, Digital Principles and Applications 7th Edition, Tata McGraw - Hill Education, 2011.

EC 111	**Digital Design Lab**	**0-0-3-3**

Familiarization with digital IC family 74LS00 and 74HS00. Familiarization with laboratory equipment – 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, De-multiplexers, 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

EC102	**Electrical Circuit Analysis**	**3-1-0-8**

Syllabus:

Basic components and circuit analysis: 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, independent sources, voltage and current division; Basic nodal and mesh analysis: nodal analysis, super-node, mesh analysis, super-mesh; Network theorems: linearity and superposition, source transformations, Thevenin's theorem, Norton's theorem, reciprocity, maximum power transfer;

Magnetically coupled circuits: mutual inductance, energy considerations, linear transformer, ideal transformer;

Poly-phase circuits: Poly-phase systems, single-phase three-wire systems, three-phase Y-Y connection, wye-delta transformation, power measurement in three-phase systems;

Time and frequency domain analysis of linear circuits: Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.

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;

Two-port networks: one-port networks, linear 2-port network parameters, admittance parameters, impedance parameters, hybrid parameters, transmission parameters.

Texts:

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

References:

2. Bruce Carlson, Circuits: Engineering Concepts and Analysis of Linear Electric Circuits, 2nd Reprint, Thomson Asia Pvt. Ltd., 2006.

3. R. A. De Carlo and P. M. Lin, Linear Circuit Analysis, 2nd Edition, Oxford University Press, 2001.

SC101	Physics I	3-0-0-6

Syllabus:

Special Theory of Relativity: Michelson-Morley experiment, Postulates of STR. Galilean transformation. Lorentz transformation. Simultaneity. Length Contraction. Time dilation. Relativistic addition of velocities. Energy momentum relationships.

Quantum Mechanics: Two---slit experiment. De Broglie's hypothesis. Uncertainty Principle, wave function and wave packets, phase and group velocities. Schrödinger Equation. Probabilities and Normalization. Expectation values. Eigenvalues and eigen functions. particle in a box, potential barrier, harmonic oscillator

Solid State Physics: Crystal lattices and symmetry groups, reciprocal lattice, Brillouin zone, Miller indices, crystal structure by X-ray diffraction; free electron theory, electrons in a periodic potential, Bloch's theorem, Kronig-Penny model, formation of bands, effective mass, holes, classification of metal, insulator and semiconductor, intrinsic and extrinsic semiconductors, law of mass action, Hall effect; Curie law, concepts of ferro, ferri, and anti-ferro magnetism

Texts:

1. Kenneth S. Krane, Mondern Physics, John Wiley &Sons, Inc, 3rd Edition, 2012
2. C. Kittel, Introduction to Solid State Physics, John Wiley & Sons, 2005.

References:

1. Beiser, Concepts of Modern Physics, Tata McGraw-Hill, New Delhi, 1995.
2. A.J. Dekker, Solid State Physics, Mcmillan, 1986.

HS101	English Language Skills I	1-0-2-4

Syllabus:

Basic Grammar: articles, quantifiers, punctuation, use of tenses, gerunds and infinitives, present participles, subject verb concord, adverbs, nouns, pronouns, prepositions, use of connectives, use of adjectives and adverbs; common errors; Lexicon- Enriching vocabulary through one-word substitutes, synonyms, antonyms, etc.

Spoken English: importance for effective communication; linguistic aspects of mishearing; fluency; speaking to multicultural/multidisciplinary audience; standard varieties of spoken English; understanding vowels, consonants and syllable in English; tempo of speech & phrasal pause in English; English rhythm; stress on simple and derived words in English; practice and learning to improve pronunciation of numbers, units of weights, distance, etc.

Aspects of Theatre in Spoken Communication: grooming, eye contact, body language, amplitude.

Preparing a Presentation: charts, graphs, drawings, maps, diagrams, tables, etc.; using power point slides and other presentation aids; making presentations and self-evaluation.

Texts:

1. Shreesh Chaudhary. *Better Spoken English*, New Delhi: Vikas Publishing. (1992/2004)
2. J. D. O'Connor. *Better English Pronunciation, Cambridge* University Press. (1980)
3. F.T. Wood. *A Remedial English Grammar for Foreign Students*. New Delhi: Macmillan. (1965)

References:

1. Marilyn Anderson, Pramod K. Nayar, and Madhucchanda Sen. *Critical Reasoning, Academic Writing and Presentation Skills*. Rev. ed. New Delhi: Longman-Pearson. (2010)
2. Oxford Advanced Learner's Dictionary of English, Ninth Edition. (2016)
3. Michael Swan and Catherine Walter. *Oxford English Grammar Course: Advanced*. Oxford: OUP. (2011)
4. Allan Pease and Barbara Pease. *The Definitive Book of Body Language*. New Delhi: Manjul Publishing House. (2005)

GE101	**Induction Programme (Audit)**	**1-0-3-0**

- Physical activity
- Creative Arts
- Universal Human Values
- Literary
- Proficiency Modules
- Lectures by Eminent People
- Visits to local Areas
- Familiarization to Dept./Branch & Innovations

Semester-II, Branch: CSE & ECE

Sem	Subject Code	Course Name	L	T	P	C
II	MA102	Mathematics II	3	1	0	8
II	CS102	Data Structures	3	0	0	6
II	CS112	Data Structures Lab	0	0	3	3
II	CS103	Computer Organization and Microprocessors	3	1	0	8
II	EC103	Basic Electronic Circuits	3	0	0	6
II	EC112	Basic Electronics Lab	0	0	3	3
II	SC102	Physics II	3	0	0	6
II	HS102	English Language Skills II	1	0	2	4
		Total	**16**	**2**	**8**	**44**
		Contact Hours / Week	**26**			

Course	Humanities & Social Science (HS)	Basic Science (BS)	Basic Engineering (BE)	Professional Core (PC)	Professional Elective (PE)	Open Elective (OE)	Internship / Project
Credit	**4**	**14**	**26**	--	--	--	--

MA102	**Mathematics II**	**3-1-0-8**

Syllabus:

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's 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*, 9th Edition, Pearson Education India, 1996.
2. S. L. Ross, *Differential Equations*, 3rd Edition, Wiley India, 1984.

References:

1. H. Anton, I. C. Bivens and S. Davis, *Calculus*, 10th Edition, Wiley, 2011.
2. T. M. Apostol, *Calculus*, Volume 2, 2nd Edition, Wiley India, 2003.
3. W. E. Boyce and R. C. Di Prima, *Elementary Differential Equations and Boundary Value Problems*, 9th Edition, Wiley India, 2009.
4. E. A. Coddington, *An Introduction to Ordinary Differential Equations*, Prentice Hall India, 1995.

CS102	Data Structures	3-0-0-6

Syllabus:

Performance of algorithms: space and time complexity, asymptotic; 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.

Text:

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

References:

1. M A Weiss, Data Structures and Problem-Solving Using Java, Addison-Wesley, 1997.
2. A M Tannenbaum, Y Langsam and M J Augenstein, Data Structures Using C++, Prentice Hall India, 1996.
3. A H Aho, J E Hopcroft and J Ullman, Data Structures and Algorithms, Addison-Wesley, 1987.
4. Robert Sedgewick, Algorithms in C++ Parts 1-4, Pearson Education, Third Edition, 1998.
5. Robert Sedgewick, Algorithms in C++ Part 5, Pearson Education, Third Edition, 2002.

CS111	Data Structure 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.

CS103	Computer Organization and Microprocessors	3-1-0-8

Syllabus:

Fundamentals of Microprocessors: Fundamentals of microprocessor architecture, 8-bitmicroprocessor and microcontroller architecture, Internal block diagram, CPU, ALU, address, data and control bus, working registers, SFRS, clock and reset circuits, stack and stack pointer, program counter, i/o ports, memory structures, data and program memory, timing diagrams and execution cycles. Comparison of 8-bit, 16-bit and 32-bit microcontrollers.

Instruction Set and Programming: Addressing modes: introduction, instruction syntax, data types, subroutines immediate addressing, register addressing, direct addressing, indirect addressing, relative addressing, indexed addressing, bit inherent addressing, bit direct addressing. 8085 & 8051 instruction set, instruction timings. Data transfer instructions, arithmetic instructions, logical instructions, branch instructions, subroutine instructions, bit manipulation instruction, assembly language programs.

Computer Organization: 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.
2. R. S. Gaonkar, ", Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing, 1996
3. M. A. Mazidi, J. G. Mazidi and R. D. McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson Education, 2007.

References:

K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning, 2004.

EC103	**Basic Electronic Circuits**	**3-0-0-6**

Syllabus:

Course Topics - Examples of Electronic Systems: Music System, Radio, Television

Diodes and Applications: Semiconductor diode - ideal versus practical, resistance levels, diode equivalent circuits, load line analysis; diode as a switch, diode as a rectifier, half wave and full wave rectifiers with and without filters; clipping circuits, clamper circuits, breakdown mechanisms, zener diode – operation and applications; regulated d-c power supply.

Transistor Characteristics: Bipolar junction transistor (BJT) – construction, operation, amplifying action, common base, common emitter and common collector configurations, operating point, voltage divider bias configuration; Differential Amplifier.

Operational Amplifiers and Applications: Introduction to op-amp, characteristics of ideal op-amp, 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, concept of virtual ground; op-amp operations, integrator and differentiator, frequency response of op-amp and op-amp based amplifiers. CMRR, PSRR, slew rate; pin configuration of 741 op-amp

Filters: 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.

Oscillators: 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.

Data Converters: Sample and hold circuits, 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.

Texts:

1. Albert Malvino and David Bates, Electronic Principles, McGraw Hill Education; 2015.

References:

1. R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 11th ed., Pearson Education, 2013.
2. Jacob Millman, Christos Halkias, Chetan Parikh, Millman's Integrated Electronics - Analog and Digital Circuit and Systems, McGraw Hill Education; 2nd edition, 2017
3. Adel S. Sedra, Kenneth C. Smith & Arun N. Chandorkar, Microelectronic Circuits, International Version 6th Edition, 2013, Oxford University Press India

EC 112	**Basic Electronics Lab**	**0-0-0-3**

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.

SC102	**Physics II**	**3-0-0-6**

Syllabus:

Vector Calculus: Gradient, Divergence and Curl, Line, Surface, and Volume integrals, Gauss's divergence theorem and Stokes' theorem in Cartesian, Spherical polar and cylindrical polar coordinates, Dirac Delta function.

Electrostatics: Gauss's law and its applications, Divergence and Curl of Electrostatic fields, Electrostatic Potential, Boundary conditions, Work and Energy, Conductors, Capacitors, Laplace's equation, Method of images, Boundary value problems in Cartesian Coordinate Systems, Dielectrics, Polarization, Bound Charges, Electric displacement, Boundary conditions in dielectrics, Energy in dielectrics, Forces on dielectrics.

Magnetostatics: Lorentz force, Biot---Savart and Ampere's laws and their applications, Divergence and Curl of Magnetostatic fields, Magnetic vector Potential, Force and torque on a magnetic dipole, Magnetic materials, Magnetization, Bound currents, Boundary conditions.

Electrodynamics: Ohm's law, Motional EMF, Faraday's law, Lenz's law, Self and Mutual inductance, Energy stored in magnetic field, Maxwell's equations, Continuity Equation, Poynting Theorem, Wave solution of Maxwell Equations.

Electromagnetic waves: Polarization, reflection & transmission at oblique incidences.

Texts:

1. Introduction to Electrodynamics by D. J. Griffiths, 3rd Ed., Prentice Hall of India, 2005.

2. Elements of Electromagnetics by M. N. O. Sadiku, Oxford, 2006.

References:

1. C. A. Balanis, Advanced Engineering Electromagnetics, 2nd Edition, John Wiley, 2012.
2. The Feynman Lectures on Physics, Vol.II by R. P. Feynman, R. B. Leighton and M. Sands, Narosa Publishing House, 1998.

HS102	**English Language Skills II**	**1-0-2-4**

Syllabus:

Introduction to Communication: need for effective communication; the process of communication; significance of technical communication; barriers to communication.

Listening Skills: listening as an active skill; listening for specific information; developing effective listening skills; barriers to effective listening skills.

Reading Skills: skimming; scanning; understanding the gist of an argument; identifying the topic sentence; inferring lexical and contextual meaning.

Writing Skills: sentence formation; use of appropriate diction; paragraph and essay writing; coherence and cohesion; technical writing; letter writing; job application; report writing.

Speaking Skills: non-verbal communication; group discussion; presentation skills; technology-based communication.

Texts:

1. V.N. Arora and Lakshmi Chandra. *Improve Your Writing*. New Delhi: OUP, 1981.
2. Marilyn Anderson, Pramod K. Nayar, and Madhucchanda Sen. *Critical Reasoning, Academic Writing and Presentation Skills*. Rev. ed. New Delhi: Longman-Pearson, 2010.
3. Allan Pease and Barbara Pease. The Definitive Book of Body Language. New Delhi: Manjul Publishing House, 2005.

References:

1. F.T. Wood. A Remedial English Grammar for Foreign Students. New Delhi: Macmillan, 1965.
2. Nitin Bhatnagar and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson. (2010)
3. N. Krishnaswami and T. Sriraman. Current English for Colleges. Chennai: Macmillan, 1990.
4. N. Krishnaswami and T. Sriraman. Creative English for Communication. 2nded. New Delhi: Macmillan, 2009.
5. Michael Swan. Practical English Usage. 3rd ed. Oxford: OUP, 2005.
6. Michael Swan and Catherine Walter. Oxford English Grammar Course: Advanced. Oxford: OUP, 2011.

Semester-III, Branch: CSE

Sem	Code	Course Name	L	T	P	C
III	MA201	Mathematics III	3	0	0	6
III	CS201	Discrete Mathematics	3	0	0	6
III	CS202	Design and Analysis of Algorithms	3	0	0	6
III	CS203	Object Oriented Programming	3	0	0	6
III	CS204	Operating Systems	3	0	0	6
III	EC201	Signal and Systems	3	0	0	6
III	EC211	Signal and Systems Lab	0	0	3	3
III	CS211	Object Oriented Programming Lab	0	0	3	3
III	CS212	Operating Systems Lab	0	0	3	3
		Total	**18**	**0**	**9**	**45**
		Contact Hours / Week	**27**			

Course	Humanities & Social Science (HS)	Basic Science (BS)	Basic Engineering (BE)	Professional Core (PC)	Professional Elective (PE)	Open Elective (OE)	Internship / Project
Credit	**--**	**6**	**9**	**30**	**--**	**--**	**--**

CS201	**DISCRETE MATHEMATICS**	**3-0-0-6**

Syllabus:

Set theory: sets, relations, functions, countability.

Logic: formulae, interpretations, methods of proof, soundness and completeness in propositional and predicate logic.

Number theory: division algorithm, Euclid's algorithm, fundamental theorem of arithmetic, Chinese remainder theorem, special numbers like Catalan, Fibonacci, harmonic and Stirling Combinatorics: permutations, combinations, partitions, recurrences, generating functions Graph Theory:- paths, connectivity, subgraphs, isomorphism, trees, complete graphs, bipartite graphs, matchings, colourability, planarity, digraphs

Algebraic Structures: semigroups, groups, subgroups, homomorphisms, rings, integral domains, fields, lattices and Boolean algebras.

Texts:

1. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
2. K. H. Rosen, Discrete Mathematics and its Applications, 7th Ed., Tata McGraw-Hill, 2009.

References:

1. 1. J. P. Tremblay and R. P. Manohar, Discrete Mathematical structures with Applications to Computer Science, Tata McGraw-Hill, 2001.
2. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.
3. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., Addison-Wesley, 1994.
4. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Ed., Jones and Bartlett, 2010.

CS212	OPERATING SYSTEMS LAB	0-0-3-3
The CSE department will decide the programming time to time		

Common Courses (ECE &CSE disciplines):

MA201	MATHEMATICS III	3-0-0-6

Syllabus:

Introduction to probability: mathematical background - sets, set operations, sigma and Borel fields; classical, relative-frequency and axiomatic definitions of probability; conditional probability, independence, total probability, Bayes rule; repeated trials;

Random variables: Cumulative distribution function, continuous, discrete and mixed random variables, probability mass function, probability density functions; functions of a random variable; expectation - mean, variance and moments; characteristic and moment-generating functions; Chebyshev, Markov and Chernoff bounds; special random variables-Bernoulli, binomial, Poisson, uniform, Gaussian and Rayleigh; joint distribution and density functions; Bayes rule for continuous and mixed random variables; joint moments, conditional expectation; covariance and correlation- independent, uncorrelated and orthogonal random variables; function of two random variables; sum of two independent random variables; random vector- mean vector and covariance matrix, multivariate Gaussian distribution; Vector-space representation of Random variables, laws of large numbers, central limit theorem;

Random process: discrete and continuous time processes; probabilistic structure of a random process; mean, autocorrelation and autocovariance functions; stationarity- strict-sense stationary and wide-sense stationary (WSS) processes: autocorrelation and cross-correlation functions; time averages and ergodicity; spectral representation of a real WSS process-power spectral density, cross-power spectral density, Wiener Khinchin theorem, linear time-invariant systems with WSS process as an input time and frequency domain analyses; spectral factorization theorem;

Examples of random processes: white noise, Gaussian, Poisson and Markov processes, Basics of Queuing Theory, Characteristics of queuing systems.

Texts:

1. Papoulis and S.U. Pillai, Probability Random Variables and Stochastic Processes, 4/e, McGraw-Hill, 2002.
2. A. Leon Garcia, Probability and Random Processes for Electrical Engineering, 2/e, Addison-Wesley, 1993.

References:

1. H. Stark and J.W. Woods, Probability and Random Processes with Applications to Signal Processing, 3/e, Prentice Hall, 2002.
2. John J. Shynk, Probability, Random Variables, and Random Processes: Theory and Signal Processing Applications, 1/e, Wiley publications, 2012.

CS202	DESIGN AND ANALYSIS OF ALGORITHMS	3-0-0-6

Syllabus:

Models of Computation: space and time complexity measures, lower and upper bounds; Design techniques: the greedy method, divide-and-conquer, dynamic programming, backtracking, branch and bound; Lower bound for sorting; Selection; Graph Algorithms: connectivity, topological sort, shortest paths, minimum spanning

trees, network flow; The disjoint set union problem; String matching; NP-completeness; Introduction to approximate algorithms and Randomized algorithms.

Texts:

1. T H Cormen, C E Leiserson, R L Rivest and C Stein, Introduction to Algorithms, MIT Press, 2001.

References:

1. Jon Kleinberg and Eva Tardos, Algorithm Design, Addison Wesley, 2005
2. A Aho, J E Hopcroft and J D Ullman, The Design and Analysis of Computer Algorithms, Addison-Wesley, 1974.
3. S Sahni, Data Structures, Algorithms and Applications in C++, McGraw-Hill, 2001.
4. M T Goodrich and R Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, John Wiley & Sons, 2001.

CS203	**OBJECT ORIENTED PROGRAMMING**	**3-0-0-6**

Syllabus:

Review of programming practices and code-reuse; Object model and object-oriented concepts: Data Abstraction: Class, object, constructors, destructors, memory allocations for objects, member functions, friend functions, templates. Inheritance: Single & multiple inheritance, virtual base class. Polymorphism: Compile time polymorphism: operator overloading, function overloading, static binding. Run-time polymorphism: Virtual function, pure virtual function, abstract class, dynamic binding. Exception handling. Object-oriented programming languages and implementation. File handling.

Texts:

1. E Balaguruswamy : Object Oriented Programming with C++, McGraw Hill
2. Grady Booch: Object Oriented Analysis and Design, Pearson Education.

References:

1. Herbert Schild : The Complete Reference to C++, Osborne Mc Graw Hill.
2. Bertrand Meyer, Object Oriented Software Construction, Prentice-Hall.
3. Bjarne Stroustrup: The C++ Programming Language, Addison Wesley
4. Rambaughet al. : Object Oriented Modeling and Design, PHI(EEE).

CS211	**OBJECT ORIENTED PROGRAMMING LAB**	**0-0-3-6**

The CSE department will decide the programming time to time

CS204	**OPERATING SYSTEMS**	**3-0-0-6**

Syllabus:

Process Management: process, thread, scheduling; Concurrency: mutual exclusion, synchronization, semaphores, deadlocks; Memory Management: allocation, protection, hardware support, paging, segmentation; Virtual Memory: demand paging, allocation, replacement, swapping, segmentation, TLBs; File Management: naming, file operations and their implementation; File Systems: allocation, free space management, directory management, mounting; I/O Management: device drivers, disk scheduling, Basics of Security.

Texts:

1. Silberschatz, A. and Galvin, P.B. Operating System Concepts, Wileys

References:

1. Stalling,W.OperatingSystems:InternalsandDesignPrinciples,Pearson
2. Tanenbaum,A. S. Modern Operating System, Pearson
3. Dhamdhere, D.M. Operating Systems A Concept Based Approach, Mc Graw Hill

EC201	SIGNALS AND SYSTEMS	3-0-0-6

Syllabus:

Signals: Signal Basics, Elementary signals, classification of signals; signal operations: scaling, shifting and inversion; signal properties: symmetry, periodicity and absolute integrability; Sampling and Reconstruction, Sampling and Nyquist theorem, aliasing, signal reconstruction: ideal interpolator, zero-order hold, first-order hold; Sinc function, Practical reconstruction, group delay, phase delay.

Systems: classification of systems; Time-Domain Analysis of Continuous-Time Systems; system properties: linearity, time/shift-invariance, causality, stability; continuous-time linear time invariant (LTI) and discrete-time linear shift invariant (LSI) systems: impulse response and step response; response to an arbitrary input: convolution; circular convolution; system representation using differential equations; Eigen functions of LTI/ LSI systems, frequency response and its relation to the impulse response; correlation and cross correlation of two sequences.

Signal representation: signal space and orthogonal basis; continuous-time Fourier series and its properties; continuous-time Fourier transform and its properties; Parseval's relation, time-bandwidth product; discrete time Fourier series; discrete-time Fourier transform and its properties; relations among various Fourier representations. Linear Convolution using DFT. Fast Fourier Transform (FFT); Laplace transform and properties, Inverse Laplace Transform by Partial Fraction and Z-transform: definition, region of convergence, properties; transform-domain analysis of LTI/LSI systems, system function: poles and zeros; stability, inverse Z-Transform by Partial Fraction.

Text:

1. M. J. Roberts," Fundamentals of Signals and Systems", 1st Edition, Tata McGraw Hill, 2007.
2. A.V. Oppenheim, A.S. Willsky and H.S. Nawab," Signals and Systems", 2nd Edition Prentice Hall of India, 2006.

References:

1. R.F. Ziemer, W.H. Tranter and D.R. Fannin," Signals and Systems - Continuous and Discrete", 4th Edition, Prentice Hall, 1998.
2. Simon Haykin, Barry van Veen," Signals and Systems", 2nd Edition, John Wiley and Sons, 1998.
3. TarunRawat, "Signals and Systems", Oxford University Press.

EC211	SIGNALS AND SYSTEMS LAB	0-0-3-3

Syllabus:

Introduction to computation platforms: GNU Octave, SciLab, MATLAB.

Signals: Generation of Continuous and Discrete time signals (Unit step, Impulse, Ramp, Exponential and Sinusoidal etc.); simulation of basic operations on signals (Folding, scaling, shifting, addition, subtraction, multiplication etc.); finding the even and odd parts of a signal; computing whether the given system is linear or not; computation of Sampling theorem;

Systems: Computation of output response of two sequences x(n) and h(n) using: a) Linear Convolution, b) Circular Convolution, c) Circular Convolution with zero padding; computation of Cross correlation of two sequences;

Signal representation: Fourier Series Evaluation for Square Wave Function; Discrete Time Fourier Transform (DTFT); DFT and IDFT of the sequences x(n) and X(k); computation of L-transform transfer function for a given input; computations of Z-transform transfer function for a given input.
Reference: 1. V. K. Ingle and J. G. Proakis, "Digital Signal Processing with MATLAB", Cengage, 2008.

Semester-III, Branch: ECE

Sem.	Course Code	Course Name	L	T	P	C
III	MA201	Mathematics III	3	0	0	6
III	EC201	Signals and Systems	3	0	0	6
III	EC211	Signals and Systems Lab	0	0	3	3
III	EC202	Analog Circuits	3	0	0	6
III	EC212	Analog Circuits Lab	0	0	3	3
III	CS204	Operating Systems	3	0	0	6
III	CS202	Design and Analysis of Algorithms	3	0	0	6
III	CS203	Object Oriented Programming	3	0	0	6
III	CS211	Object Oriented Programming lab	0	0	3	3
		Total	**18**	**0**	**9**	**45**
		Contact Hours / Week	**27**			

Course	Humanities & Social Science (HS)	Basic Science (BS)	Basic Engineering (BE)	Professional Core (PC)	Professional Elective (PE)	Open Elective (OE)	Internship / Project
Credit	**--**	**6**	**21**	**18**	**--**	**--**	**--**

EC202	**ANALOG CIRCUITS**	**3-0-0-6**
Syllabus: Review of working of BJT, JFET and MOSFET and their small signal equivalent circuits both for low and high frequencies; Different types of biasing for BJT and MOSFET, Bias Compensation, Thermal Stabilization; Single stage amplifiers CE-CB-CC and CS-CG-CD; **Multistage amplifiers:** RC Coupled, Direct Coupled amplifier and their frequency responses; **Differential amplifiers:** DC and small signal analysis, CMRR, current mirrors, active load and cascade configurations, frequency response; case study: 741 op-amp – DC and small signal analysis, frequency response, frequency compensation, GBW, phase margin, slew rate, offsets; Feedback amplifiers: basic feedback topologies and their properties, analysis of practical feedback amplifiers, stability;		
Text: 1. Adel S. Sedra, Kenneth C. Smith &Arun N. Chandorkar, Microelectronic Circuits, International Version 6th Edition, Oxford University Press India, 2013.		
References: 1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson Education, 2015.		

EC212	ANALOG CIRCUITS LAB	0-0-3-3

Syllabus:

Experiments using BJTs: BJT characteristics in different configurations, hybrid parameters, single-stage and multistage BJT amplifiers, effect of negative feedback; experiments using FETs: FET characteristics, FET amplifiers.

Semester-IV, Branch: CSE

Sem	Code	Course Name	L	T	P	C
IV	HS201	Engineering Economics	3	0	0	6
IV	CS205	Theory of Computing	3	0	0	6
IV	CS206	Software Engineering	3	0	0	6
IV	CS207	Computer Networks	3	0	0	6
IV	CS208	Database Management Systems	3	0	0	6
IV	EC204	Digital Signal Processing	3	0	0	6
IV	EC214	Digital Signal Processing Lab	0	0	3	3
IV	CS213	Computer Networks Lab	0	0	3	3
IV	CS214	Database Management Systems Lab	0	0	3	3
		Total	**8**	**0**	**9**	**45**
		Contact Hours/Week	**27**			

Course	Humanities & Social Science (HS)	Basic Science (BS)	Basic Engineering (BE)	Professional Core (PC)	Professional Elective (PE)	Open Elective (OE)	Internship / Project
Credit	**6**	**--**	**9**	**30**	**--**	**--**	**--**

CS205	**THEORY OF COMPUTING**	**3-0-0-6**

Syllabus:

Finite Automata – deterministic and nondeterministic, regular operations, Regular Expression, Equivalence of DFA, NFA and REs, closure properties, Non regular languages and pumping lemma, DFA Minimization, CFGs, Chomsky Normal Form, Non CFLs and pumping lemma for CFLs, PDAs, Equivalence of PDA and CFG, Properties of CFLs, DCFLs, Turing Machines and its variants, Configuration graph, closure properties of decidable languages, decidability properties of regular languages and CFLs, Undecidability, reductions, Rice's Theorem, introduction to complexity theory.

Text:

1. J. E. Hopcroft, R. Motwani, and J. D. Ullman, Introduction to Automata Theory, Languages and computation, Pearson / Addison Wesley.

References :

1. 1. Michael Sipser, Introduction to the Theory of Computation, Cengage Learning India Private Limited.
2. 2. H. R. Lewis and C. H. Papadimitriou, Elements of the Theory of Computation, PHI Learning.

CS206	**SOFTWARE ENGINEERING**	**3-0-0-6**

Syllabus:

Software Engineering Principles: Overview of the software engineering discipline, Software lifecycle models, Agile development, The Unified Process(UP)Organising development projects Requirements Engineering: Documenting requirements, user stories, use cases and scenarios Introduction to UML: Review of object-

oriented principles, UML use case, class, sequence, activity, state, component and deployment diagrams. UML models The Analysis and Design Process: User story realisation, Object- oriented modelling, Incremental refinement, Design Principles: Software architecture, Separation of concerns, Design patterns, Object-Oriented design practices, Refactoring, Testing: Unit Testing, Test-Driven Development, Functional Testing.

Text:

1. R. S Pressman, Software Engineering: A Practioner's Approach, McGraw-Hill

References:

1. Sommerville, Software Engineering, Addison-Wesley.
2. Jim Arlow, Ila Neustadt. UML and the Unified Process Addison Wesley.
3. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Addison Wesley.

CS207	**COMPUTER NETWORKS**	**3-0-0-6**

Syllabus:

Network Basics: Evolution of computer networks; Network Models, Network Media, LAN, MAN and WAN, needs and goals of networking topology, network architecture, need for protocols, OSI Reference Model, layer services, primitives and service access points Data link layer: Framing, HDLC, PPP, sliding window protocols, medium access control, Token Ring, Wireless LAN; Virtual circuit switching: Frame relay, ATM; Network Layer: Internet addressing, IP, ARP, ICMP, CIDR, routing algorithms (RIP, OSPF, BGP); Transport Layer: UDP, TCP, flow control, congestion control; Introduction to quality of service; Application Layer: DNS, Web, email, authentication, encryption.

Text:

1. Andrew S. Tanenbaum, "Computer Networks", Prentice Hall

Reference:

1. Forouzan, Data Communications and Networking, Tata Mcgraw Hill

CS213	**COMPUTER NETWORKS LAB**	**0-0-3-3**

The CSE department will decide the programming time to time

Common Courses (CSE & ECE disciplines):

HS201	**ENGINEERING ECONOMICS**	**3-0-0-6**

Syllabus:

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis – V ratio, Elementary

economic Analysis – Material selection for product Design selection for a product, Process planning.

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor – Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

Text:

1. Panneerselvam, R, "Engineering Economics", Prentice Hall India Learning Private Limited; 2nd edition, New Delhi, 2013.

References:

1. Chan S. Park, "Contemporary Engineering Economics", Prentice Hall India Learning Private Limited, 2011.
2. Donald G. Newnan, Jerome P. Lavelle and Ted G. Eschenbach "Engineering Economic analysis", Oxford University Press; 12th edition, 2013.
3. Leland Blank and Anthony Tarquin, "Engineering Economy", McGraw Hill Education; 7th edition, 2017.
4. Paul Samuelson and William Nordhaus, "Economics" McGraw Hill Education; 19th edition, 2010.
5. Robert S. Pindyck, Daniel L. Rubinfeld, "Microeconomics" Pearson Education; Eighth edition 2017.
6. Zahid A Khan, Arshad Noor Siddique, Brajesh Kumar, "Engineering Economy", Pearson Education, 2012.

CS208 DATABASE MANAGEMENT SYSTEMS 3-0-0-6

Databases: Introduction, Introduction to the Relational Model, Introduction to SQL, Intermediate SQL, Advanced SQL, Formal Relational Query Languages. Database Design: ER Model, Functional Dependencies, Schema Design, Normal Forms. Data Storage and Querying: Storage and File Structure, Indexing and Hashing, Query Processing, Query Optimization. Transaction Management: Transactions, Concurrency Control, Recovery System. System Architecture: Database System Architecture, Parallel Databases, Distributed Databases. Advanced Topics: Data Warehousing and Mining, Information Retrieval, XML.

Text:

1. Database System Concepts - Silberschatz, Korth& Sudarshan, McGraw-Hill.
2. Fundamentals of Database Systems, Elmasri, Ramez; Navathe, Shamkant, Addison Wesley.

References:

1. An Introduction to Database Systems - CJ Date, Addison-Wesley.
2. 2. Database Systems: The Complete Book - Gracia-Molina, Ullman, Widom, Pearso

CS214	DATABASE MANAGEMENT SYSTEMS LAB	0-0-3-3
The CSE department will decide the programming time to time		

EC204	DIGITAL SIGNAL PROCESSING	3-0-0-6

Syllabus:

Frequency selective filters: Ideal filter characteristics, lowpass, highpass, bandpass and bandstop filters, Paley-Wiener criterion, digital resonators, notch filters, comb filters, all-pass filters, inverse systems, minimum phase, maximum phase and mixed phase systems.

Structures for discrete-time systems: Signal flow graph representation, basic structures for FIR and IIR systems (direct, parallel, cascade and polyphase forms), transposition theorem, ladder and lattice structures.

Design of FIR and IIR filters: Design of FIR filters using windows, frequency sampling, Remez algorithm and least mean square error methods; Design of IIR filters using impulse invariance, bilinear transformation and frequency transformations.

Discrete Fourier Transform (DFT): Computational problem, DFT relations, DFT properties, fast Fourier transform (FFT) algorithms (radix-2, decimation-in-time, decimation-in-frequency), Goertzel algorithm, linear convolution using DFT. Multi-dimensional DFT (M-D DFT) and its computation.

Finite word length effects in digital filters: Fixed- and floating-point representation of numbers, quantization noise in signal representations, finite word-length effects in coefficient representation, roundoff noise, SQNR computation and limit cycle.

Introduction to multirate signal processing: Decimation, interpolation, polyphase decomposition, non-integer sample rate conversion, multistage sample rate conversion; Applications of multi-rate filters in signal processing and communication.

Text:

1. S. K. Mitra," Digital Signal Processing: A Computer- Based Approach", Tata McGraw Hill, 3/e, 2006.

References:

1. Richard G. Lyons, "Understanding Digital Signal Processing", Prentice Hall, 3/e, 2011.
2. S. Salivahanan, A. Vallavaraj, C. Gnanapriya," Digital Signal Processing", Tata McGraw Hill, New Delhi, 2003.
3. J. G. Proakis and D. G. Manolakis," Digital Signal Processing: Principles, Algorithms and Applications", Pearson Education, 4/e, 2007.
4. E. Ifeachor and B. Jervis," Digital Signal Processing", Pearson, 2/e, 2006.
5. A. V. Oppenheim and R. W. Shafer, "Discrete-Time Signal Processing", Prentice Hall India, 2/e, 2004.
6. V. K. Ingle and J. G. Proakis, "Digital Signal Processing with MATLAB", Cengage, 2008.
7. M.H. Hayes, "Schaum's Outline on Digital Signal Processing", McGraw-Hill, 1999.

EC214	DIGITAL SIGNAL PROCESSING LAB	0-0-3-3

Syllabus:

Computation platforms: GNU Octave, SciLab, MATLAB.

Hardware platforms: Texas Instruments OMAP-L138/C6748 Development Kit (LCDK) with XDS100V3 Emulator.

Discrete Fourier Transform and Signal representation: n-point DFT and IDFT; Rationalization of Z- function, sketching of Pole-Zero plot and plotting of magnitude and phase response of causal system.

Generation of signals: (i) ramp signals at different sampling frequencies, (iii) multi-toned sinusoid signals, (iv) pseudo random noise sequence; Echo generation using three different delay.

Frequency selective filters: Understanding the concept of Filtering a noisy sinusoid using convolution in Time Domain and Frequency domain; Evaluation of frequency responses of filters using various window techniques.

Design of filters (Butterworth and Chebyshev LP, BP and HP): FIR filters and IIR filters (Bilinear Transformation and Impulse Invariance Method).

Audio Signal Processing: Audio loop, Audio Delay, Audio Echo.

Reference:

1. V. K. Ingle and J. G. Proakis, "Digital Signal Processing with MATLAB", Cengage, 2008.

Semester-IV, Branch: ECE

Sem.	Course code	Course Name	L	T	P	C
IV	MA202	Mathematics IV	3	0	0	6
IV	EC203	Principles of Communication	3	0	0	6
IV	EC213	Communications Lab	0	0	3	3
IV	EC204	Digital Signal Processing	3	0	0	6
IV	EC214	Digital Signal Processing Lab	0	0	3	3
IV	EC205	Semiconductor Devices	3	0	0	6
IV	HS201	Engineering Economics	3	0	0	6
IV	CS208	Database Management Systems	3	0	0	6
IV	CS214	Database Management Systems Lab	0	0	3	3
Total			**18**	**0**	**9**	**45**
Contact Hours / Week			**27**			

Course	Humanities & Social Science (HS)	Basic Science (BS)	Basic Engineering (BE)	Professional Core (PC)	Professional Elective (PE)	Open Elective (OE)	Internship / Project
Credit	**6**	**6**	**9**	**24**	**--**	**--**	**--**

MA202	MATHEMATICS IV	3-0-0-6

Syllabus:

Complex Analysis: Complex numbers and elementary properties. Complex functions - limits, continuity and differentiation. Cauchy-Riemann equations. Analytic and harmonic functions, Mobius (Bilinear) transformations.

Elementary functions. Anti-derivatives and path (contour) integrals. Cauchy-Goursat Theorem, Cauchy's integral formula, Morera's Theorem. Liouville's Theorem, Fundamental Theorem of Algebra and Maximum Modulus Principle. Taylor series. Power series. Singularities and Laurent series. Cauchy's Residue Theorem and applications.

Partial Differential Equations: First order partial differential equations; solutions of linear and nonlinear first order PDEs; classification of second-order PDEs; method of characteristics; boundary and initial value problems (Dirichlet and Neumann type) involving wave equation, heat conduction equation, Laplace's equations and solutions by method of separation of variables (Cartesian coordinates); initial boundary value problems in non-rectangular coordinates. Solving PDEs by Transforms Methods: Solution of PDE by Fourier Transform method and Laplace Transform method.

Texts:

1. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill, 2003. (or 8th Edition2008).
2. K. Sankar Rao, Introduction to Partial Differential Equations, 3rd Edition, 2011.

References:

1. J. H. Mathews and R. W. Howell, Complex Analysis for Mathematics and Engineering, 3rd Edition, Narosa, 1998.
2. I. N. Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1957.

EC203	PRINCIPLES OF COMMUNICATION	3-0-0-6

Syllabus:

Review of Signals and Systems: Signals; Periodic and Aperiodic Signals; Energy and Power Signals; Deterministic and Random Signals; Dirac Delta function; Linear time-invariant systems; Fourier-series; Fourier-transform and its properties; Auto correlation of signals; Energy spectral density; Parseval's relation; Power spectral density; Baseband and passband signals; The structure of a pass band signal; Hilbert transform;

Introduction to Communication: Basic elements of a communication system; Digital communication system; Communication channels and their characteristics; Modulation; Need of modulation;

Amplitude Modulation and Demodulation: Conventional amplitude modulation (AM); Double-sideband suppressed carrier (DSB-SC) modulation; Quadrature carrier multiplexing (QCM); Single-sideband modulation (SSB); Vestigial-sideband (VSB) modulation; Implementation of AM modulator and demodulator; Frequency division multiplexing;

Angle Modulation and Demodulation: Phase modulation (PM); Frequency modulation (FM); Spectrum of an FM signal; Bandwidth of FM signal; Narrowband FM; Wideband FM; FM generation; FM detectors; The super-heterodyne receiver; The phase-locked loop (PLL) and its application;

Noise in Analog Communication System: Thermal noise; Noise temperature; Noise figure; Effect of Noise performance of baseband system; Noise in amplitude modulated systems; Noise in angle modulated systems; Pre-emphasis and De-emphasis;

Digital Representation of Analog Signals: Introduction to sampling; Spectrum of sampled signal, Aliasing and Nyquist sampling theorem; Reconstruction of original signal from sampled signal; Pulse amplitude modulation (PAM); Pulse position modulation (PPM); Pulse width modulation(PWM); Introduction to quantization; Uniform quantizer; Mid-tread quantizer; Mid-rise quantizer; Quantization noise; Lloyd- Max quantization algorithm; Non uniform quantizers; Delta modulation; Differential pulse code modulation (DPCM).

Text:

1. John G. Proakis and MasoudSalehi, Communication Systems Engineering, 2nd Edition, Pearson Education, 2002.

References:

1. B. P. Lathi, Modern Digital and Analog Communication Systems, 3rd Edition, Oxford Univ. Press, 2006.
2. Simon Haykin, Communication Systems, 4th Edition, John Wiley, 2001.
3. UpamanyuMadhow, Introduction to Communication Systems, Cambridge University Press, 2014.

EC213	**COMMUNICATIONS LAB**	**0-0-3-3**

Syllabus:

(Both Hardware and in computation platforms like SciLab, MATLAB, Python etc.)

Understanding Signal correlation, Autocorrelation, Cross correlation and Power spectral density of signals; Generation of AM signal; Demodulation of AM signal; Modulation and Demodulation of DSB-SC, Modulation and Demodulation of SSB-SC; Modulation and demodulation of FM signals; Modulation and demodulation of PAM, PPM and PWM; QAM modulation.

Reference:

John G. Proakis, MasoudSalehi and Gerhard Bauch, Contemporary Communication Systems using MATLAB, Cengage, 3rd Edition, 2012

EC205	SEMICONDUCTOR DEVICES	3-0-0-6

Syllabus:

Brief discussion of quantum theory of solids: energy bands, electrical conduction in solids, formation of Fermi-Dirac probability function using the concepts of statistical mechanics and k-space diagram.

Semiconductors in equilibrium: charge carrier profile in intrinsic and extrinsic semiconductor, behavior of Fermi energy level with varying temperature and doping concentration.

Carrier transport in semiconductors: drift current and diffusion current, Hall Effect. Semiconductors in non-equilibrium condition: carrier generation and recombination, continuity equation, ambipolar transport.

P-N junction: under zero applied bias and reverse bias, comparative study of abrupt junction and linearly graded junction, qualitative and quantitative discussion of p-n junction current, small signal model of p-n junction, junction breakdown and Tunnel diode.

Behavior of metal semiconductor junction: Schottky barrier diode, metal-semiconductor ohmic contact.

Bipolar transistor: basic principles of operation, carrier distribution under different modes of operation, non-ideal effects, frequency limitations. Fundamentals of MOSFET, capacitance-voltage characteristics, current voltage relationship, frequency limitations

Text:

1. Donald A. Neamen, Semiconductor Physics and Devices, Tata McGraw Hill, 3rd Edition.

References:

1. Ben G. Streetman, Solid State Electronic Devices, PHI, 5/e, 2001.
2. J. Singh, Semiconductor Devices - Basic Principles; John Wiley & Sons Inc., 2001.
3. Simon M. Sze, Kwok K. Ng, Physics of Semiconductor Devices, Wiley, 3/e, 2006/7.