

B.TECH. 4 YEAR PROGRAMME

INFORMATION TECHNOLOGY

SYLLABUS 2020-21

(1st, 2nd, 3rd, 4th, 5th, 6th, 7th & 8th Semester)

Detailed Syllabus for B.Tech. IT

B.Tech. IT (First Semester)

MTH 101 Engineering Mathematics I

Calculus of Functions of One Variable: Linear and Quadratic approximations, Error estimates, Taylor's Theorem, Infinite series, Tests of convergence, Absolute and Conditional convergence, Taylor and Maclaurin series.

Calculus of Functions of Several Variables: Partial derivatives, Chain rules, Implicit differentiation, Gradient, Directional derivatives, Total differential, Tangent planes and Normal's, Maxima, Minima and Saddle points, Constrained maxima and minima, Curve sketching, Geometric applications of Integrals, Double Integrals, Applications to areas and volumes, Change of variables.

Ordinary Differential Equation: Differential Equation of First Order and Higher Degree, Linear Differential Equation. with Constant Coefficient of Higher Order, Cauchy's Differential Equation, Method of Variation of Parameter, Simultaneous Differential Equation.

Graph Theory: Introduction, terminology, representation, isomorphism, connectivity, Wars hall's algorithm, Euler and Hamilton path, and shortest path tree.

REFERENCES:

1. Higher Engineering Mathematics : - B.S. Grewal
2. Advanced Engineering Mathematics : - H.K. Das
3. Differential calculus :- Schaum's series
4. Graph Theory with Applications :- Narsingh Dev
5. Higher Engineering Mathematics : - B. V. Ramana

PHY 101 Engineering Physics-I

Part A:

Electrostatic: Coulomb's Law, Electric field & electrostatic potential, Work and Energy in electrostatic field, Gauss law & its applications, Curl of E, Laplace's and Poisson's equations, Dipoles & multipoles, Force and torque on dipoles, Polarization, Bound charges & electric displacement.

Magnetostatics: Electric Current, Magnetic field & Current density, Ampere's law & its applications, Biot-Savart law, Curl and divergence of **B**, Magnetic dipoles, Magnetization, Magnetic susceptibility, Ferro-, para- and dia- magnetism, Faraday's law, Energy in magnetic field.

Electrodynamics: Lorentz force, Maxwell's equations. Poynting theorem, Electromagnetic potentials, Electromagnetic (EM) waves & their propagation in different media.

Part B:

Introduction to quantum mechanics, Planck's theory, Thermal radiation (Black bodies, Stefan Boltzmann etc), Photoelectric effect, Compton effect, Dual nature of EM radiation,

matter waves, de Broglie waves, wave-particle duality, Uncertainty principle, Heisenberg microscope, Properties of matter (phase and group velocity). Schrodinger equation, probabilistic interpretation of wave function, admissibility conditions for wave function. One dimensional problems: particle in a box, potential well, potential barrier and quantum tunneling. Periodic potential in one dimension.

REFERENCES:

1. INTRODUCTION TO ELECTRODYNAMICS: D.J. GRIFFITHS
2. APPLIED ELECTRODYNAMICS THEORY:
ANALYSIS, PROBLEMS AND APPLICATIONS: NAIR AND DEEPA
3. QUANTUM PHYSICS: EISBERG & RESNICK
4. CONCEPT OF MODERN PHYSICS: BEISER

CS 101 Fundamentals of Computer Programming

Concept of Programming Languages, A quick overview of OS-Windows/Linux, Writing, compiling and running the program on Linux/Windows, The Compiler, Program Builder, Debugging: types of errors and debugging techniques, Problem solving aspects, Introduction to Algorithms and flow charts, C programming Data structures , Variables, Variables names, I/O, The standard Input/output file, Formatted inputs/Output, Expressions and Operators, connectors, control statements, Functions: Scope of Function variable, Modifying function arguments, Pointers, Array, String, Structures and Unions, file handling, File redirection, file pointers, advantages of using multi files, Organization of data in each file, compiling multi-file programs, The Preprocessor, Library Functions and Low level programming.

Textbooks:

1. Balgurusamy, Programming in ANSI C, Mc Graw Hill, 2015
2. Rajaraman V., COMPUTER PROGRAMMING IN C, Printice Hall of India, 2004.
3. The C Programming language, Kernigham & Ritchie
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 2004

EE 101 Fundamentals of Electrical & Electronics

D.C. Circuits and AC Fundamentals:

Ohm's law, Kirchoff's laws, Nodal Analysis, Mesh Analysis, Superposition Theorem, Source Transformations, Thevenin's and Norton's Theorems, star/delta transformation, maximum power transfer theorem, transients.

A.C. Fundamentals:

Single phase EMF generation, average and effective values of sinusoids, Solution of series and Parallel Circuits, power and power factor, Resonance in series and parallel circuits, steady state analysis for sinusoidal excitation: Sinusoids, Three phase connections: star and delta.

Magnetic Circuit:

Mmf, Magnetising force, Magnetic flux and flux density, permeability, Reluctance and permeance, B-H curve, Simple magnetic circuits, Hysteresis and eddy current loss.

Transformer:

Single-phase transformer Construction, principle of operation, EMF equation, phasor diagram on no-load and full-load, losses and efficiency, open and short circuit test, auto transformer.

D. C. Machines:

D. C. Generator: Construction, EMF equation, various types and characteristics

D. C. Motor: Principle, torque and speed formula, types and their characteristics, Speed control

Semiconductor Diode and BJT

Semiconductor Diode and its V-I characteristics, Rectifier circuit, Various types of diodes, Zener diode, PIN Diode, Light emitting diode, gun diode, Working principle, Transistors in CC, CE, and CB configurations, transistor biasing, V-I characteristics and load line concept with Quiescent point, Transistor H-parameter.

Textbooks:

1. Toro, Del V., Electrical Engineering Fundamentals, Printice Hall of India, 1994.
2. Millman, Jacob and Halkias, Christos C., Integrated Electronics: Analog and Digital Circuits and Systems, Mc Graw Hill, 2004
3. Boylestad, Robert L., and Nashelsky, Louis, Electronics Device and Circuit Theory, Ninth Edition, Printice Hall of India, 2005

HUM 101 Effective Communication and soft skills

Concept of communication, communication cycle, barriers of communication, verbal v/s non-verbal communication, 7 Cs of Communication, Concept of word formation, introduction to colloquial language, Common Errors in Writing, Writing Practices: Reading and comprehension, Summary Writing, Business Letter Writing (Inquiry, Complaint), Critical thinking and analysis, Technical writing (definition and description), Listening Comprehension: Pronunciation Intonation Stress and Rhythm, Public speaking; Non-verbal aspects of speaking: Accent, Pronunciation, Intonation etc, Preparation of Curriculum Vitae/Resume; Interviews; Essentials of Group Discussions /Presentation.

IT 101 Engineering Workshop

E1: Study of Cathode Ray Oscilloscope (CRO) – Measuring Voltage and Current

E2: Study of Function Generator – Configure Output for Varying Signals

E3: Study of Digital Multi-Meter – AC/DC Voltage, Current, Resistance, Parameters of Diode & Transistor

E4: Study of Programmable DC Power Supply – Ripple and Noise, Setting Resolution and Accuracy

E5: Introduction and identification of basic electronic components.

E6: Calculation and verification of equivalent resistance using bread board and multi-meter.

E7: Calculation and verification of equivalent capacitance using bread board and multi-meter.

E8: Testing of pn junction diode and LED using multimeter.

E9: Testing of pnp and npn transistor using multimeter.

E10: Design and construction of half wave and full wave rectifiers.

Detailed Syllabus for B.Tech. IT

B.Tech. IT (Second Semester)

MTH 102 Engineering Mathematics II

Linear Algebra: Review of Matrices Algebra, Solution of Matrices Equation, Row reduced Echelon form, Vector spaces, subspaces, basis, Orthogonal basis, Gram-Schmidt, orthogonalization, Linear Operators, Matrix representation, Rank, Solution of Linear equations using matrices (invertibility, null space etc.), Eigenvalues, eigenvectors.

Complex Analysis: Functions of a Complex Variable, Analytical functions, Cauchy-Reimann equations, Elementary functions, Contour integrals, Cauchy's Theorem, Residue Theorem, Power series, Taylor and Laurent series, zeros, poles, essential singularities, evaluation of integrals.

Vector Calculus: Vector fields, Divergence and Curl, Line Integrals, Green's Theorem, Surface Integrals, Divergence Theorem, Stoke's Theorem and applications.

Partial Differential Equation: Linear & Non-Linear P.D.E of First Order, Homogeneous & Non-Homogeneous Linear P.D.E with constant coefficient of Higher Order, Separation of Variables.

REFERENCES:

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|---|-----------------|
| 1. Higher Engineering Mathematics : - | B.S. Grewal |
| 2. Advanced Engineering Mathematics : - | H.K. Das |
| 3. Linear Algebra :- | Schaum's series |
| 4. Complex Analysis :- | Schaum's series |
| 5. Higher Engineering Mathematics : - | B. V. Ramana |

PHY 102 Engineering Physics II

Laser and Fiber Optics:

Laser: Stimulated and Spontaneous processes, Einstein's A & B Coefficients, Transition probabilities, Characteristics of laser, Optical Resonators, Principles and Working of Ruby and He-Ne laser with energy level diagram and applications.

Fiber Optics: Fundamental idea about optical fiber, Types of fibers, Acceptance angle & cone, Numerical Aperture, V-number, Propagation of Light through step index fiber, Pulse dispersion, Attenuation, Losses and applications.

Solid State and Semi Conductor Physics:

Semi Conductor Physics: Effective mass, Energy bands in solids, Electron and hole mobility, Fermi level for intrinsic and extrinsic semiconductors, Zenor diode, PN junction transistor, Transistor parameters, Photo diode, solar cell and Hall effect.

Superconductivity: Meissner effect, Type I and Type II superconductors, Dielectric polarization and Dielectric losses.

Wave Optics:

Interference: Interference in Thin Films (due to reflected and transmitted light), Newton's ring and Michelson's Interferometer.

Diffraction: Diffraction at single, double and n-slit

Applied Nuclear Physics: Properties of Nucleus, Nuclear Forces, Fission & Fusion, Particle accelerators (Cyclotron and Betatron), Geiger- Muller (GM) Counter.

Theory of Relativity: Frame of reference, Postulates of Special Theory of Relativity, Lorentz Transformation, Length Contraction, Time Dilation, Einstein's Mass Energy Relation.

REFERENCES:

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| 1. OPTICS: | GHATAK |
| 2. PRINCIPLES OF OPTICS: | BRIJLAL SUBRAMANYAM |
| 3. CONCEPT OF MODERN PHYSICS: | BEISER |
| 4. ENGINEERING PHYSICS: | M.N. AVADHANULU and P.G. KSHIRSAGAR |
| 5. MODERN PHYSICS: | MANI & MEHTA |

EG 101 Engineering Graphics

Lines, Lettering, Sketching, Principle of Dimensioning, Orthographic Projection: Projection of Points, Lines, Planes, Auxiliary Views, Projection of Solids, Sections of Solids, Intersections of solids and development of lateral surfaces of simple solids, Isometric Projections, Oblique and Perspective Projection.

CS 102 Data Structures and Algorithms

Notion of Algorithm, Space and Time Complexity, Analyzing algorithms Static & Dynamic Memory Management, Arrays, Stacks, Queues, Linked Lists Trees, Binary Trees, Tree Traversals, Applications of Binary Trees Graphs and their representations, Graph Traversal Algorithms, Minimum Spanning Tree, Shortest Paths

Searching Algorithms: Sequential Search, Binary Search

Sorting Algorithms: Quick sort, Merge sort, insertion sort, Selection sort, Heap & Heap sort Binary Search Tree, Balanced Tree, AVL Tree Files

Indexing: Hashing,

Tree Indexing: B-tree

Basic Algorithm Design Paradigms: Divide & Conquer, Greedy method, Dynamic Programming, Back tracking, Branch and Bound [Discussion with the help of some example which are already discussed].

Text/ References Book:

1. Horowitz, Sahni, Fundamentals of Data Structures, Computer Science Press-2013.
2. Cormen et al., Introduction to Algorithms, Second Edition, Printice Hall of India 2014.
3. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sartaj Sahni, Rajasekaran-Universities Press-2008.
4. Data Structures Using C And C++, 2 Edition, Augenstein Moshe j., Tenenbaum Aaron M., Langsam Yedidyah, Publisher: Prentice-Hall India-2009

HUM 102 Culture & Human Values

The syllabus comprises of excerpts from the writings of great masters like Swami Vivekananda, Mahatma Gandhi, Chanakya, Rabindranath Tagore, Dr. S. Radhakrishnan, H.E. Dr. APJ Kalam, Carl Sagan, Gurunanak Dev, Wordsworth, O. Henry, Maupassant and many others. The wisdom of the philosophical texts would be brought to them through the Reading Material prepared specifically for the students. It is expected that their English communication and general awareness would improve through this discursive and interactive method.

IT 102 Programming Lab

AutoCAD:

Introduction to 3D Wireframe/Solid Modeling, Modeling of Primitive 3D Solids, Modeling of unique 3D Solids by Extrusion, Revolution, Sweeping and Lofting, 3D Operations and Solid Editing

Matlab:

Basics: Mathematics, Data Analysis, Programming, Graphics, Creating GUI
Toolboxes - Curve Fitting: Data fitting, Preprocessing data, post processing data, Using library functions for Data fitting, Symbolic Math: Calculus, Linear Algebra, Simplifications, Solutions of Equations, Matlab Compiler: Programs involving control statements, data structure etc., User defined functions, Simulink: building a model, run.

Detailed Syllabus for B.Tech. IT

B.Tech. IT (Third Semester)

Course Name: Mathematics-III

Code: MTH 211

Linear Algebra: Review of Matrices Algebra, Solution of Matrices Equation, Row reduced Echelon form, Vector spaces, subspaces, basis, Orthogonal basis, Gram-Schmidt, orthogonalization, Linear Operators, Matrix representation, Rank, Solution of Linear equations using matrices (invertibility, null space etc.), Eigenvalues, eigenvectors.

Complex Analysis: Functions of a Complex Variable, Analytical functions, Cauchy-Reimann equations, Elementary functions, Contour integrals, Cauchy's Theorem, Residue Theorem, Power series, Taylor and Laurent series, zeros, poles, essential singularities, evaluation of integrals.

Vector Calculus: Vector fields, Divergence and Curl, Line Integrals, Green's Theorem, Surface Integrals, Divergence Theorem, Stoke's Theorem and applications.

Partial Differential Equation: Linear & Non-Linear P.D.E of First Order, Homogeneous & Non-Homogeneous Linear P.D.E with constant coefficient of Higher Order, Separation of Variables.

Text/ Reference Books:

1. Elementary Numerical Analysis, 3rd edition, McGraw-Hill Book Company S.D Conte,
2. Numerical Solution of differential Equations, 2nd edition, New Age publisher, M.K. Jain
3. Introduction to Finite Element Method, East-West Student Edition, Desai & Abel
4. Numerical Recipes in C, 2nd edition Cambridge University press by William H. Press

Course Name: Discrete Structure

Code: IT 212

Sets, relations, and functions: Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. Arbitrary union, intersection and product.

Propositional Logic: Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory -- set theory, axiom of choice. Size of a set: Finite and infinite sets, countable and uncountables, Cantor's diagonal argument and power set theorem, non-computability of all number theoretic functions.

Partially ordered sets: Complete partial ordering, chain, lattice. Complete, distributive, modular, and complemented lattices. Boolean and pseudo-Boolean lattices. Different sublattices, monotone map and morphisms, quotient structures, filters. Tarski's fixed points

theorem. Algebraic Structures: Algebraic structures with one binary operation -- semigroup, monoid and group. Congruence relation and quotient structures. Morphisms. Free and cyclic monoids and groups. Permutation group. Substructures, normal subgroup. Error correcting code. Algebraic structures with two binary operations- ring, integral domain and field. Boolean algebra and Boolean ring.

Introduction to Counting: Basic counting techniques -- inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating function. Introduction to Graph: Graphs and their basic properties -- degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, graph colouring, planar graph, trees.

Text/ Reference Books:

1. Element of Discrete Mathematics By C. L. Liu.
2. Discrete Mathematics by Rosen

Course Name: Digital Logic and Design

Code: IT 213

Number system & Boolean algebra, number systems: Binary, Arithmetic, octal, Hexadecimal & radix conversion. Binary codes: BCD, excess three, gray display ASCII, EBCDIC, Parity check codes, code conversion, Boolean algebra: theorems, Introduction to logic gates, NAND, NOR realization, Boolean laws & theorems. Simplification of Boolean expression, sum of product & product of sum forms, concept of min terms & max terms, minimization techniques, karnaugh's MAP method, Tabulation method.

Combinational circuits & flip flops half adder, full adder, subtractor, BCD adder, multiplexer & demultiplexer, encoder & decoder ckts. FLIP-FLOPS: RS, clocked RS, T, D, JK, master slave JK. Sequential ckts, elements of sequential switching ckts, synchronous & asynchronous systems, binary ripple, counter, BCD counter, up-down counter, Shift Registers, series parallel shift registers shift left & shift right operation, Johnson & ring counter.

Design of sequential ckts. State diagram, state table, state assignment, characterizing equation & definition of synchronous sequential machines, Mealy & More model machines, state table & transition diagram, Introduction to logic families, RTL, DTL, TTL, ECL, NMOS, NCMOS, logic, etc.

Text/ Reference Books:

1. Digital logic and computer design by Moris Mano
2. Digital principles & application A.Paul Malvino & Donald. P. Leach

Digital Electronics - Lab Experiments

1. Experiment to study and implement all the logic gates and to verify their outputs.
2. Experiment to study and implement NAND gate as universal gate.
3. Experiment to study and implement NOR gate as universal gate.

4. Experiment to study and implement XOR gate.
5. Experiment to study and implement binary code conversion to grey code conversion.
6. Experiment to study and implement grey code to binary code conversion.
7. Experiment to study and implement HALF-ADDER circuit.
8. Experiment to study and implement FULL-ADDER circuit.
9. Experiment to study and implement HALF –subtractor circuit.
10. Experiment to study and implement JK-Flip Flop.
11. Experiment to study about the working of multiplexer and its operation as a logic level generator.
12. Study of logic gates using ICs and discrete components.
13. Verify 8:1 MUX and 1:8 DEMUX
14. Study of RAM using IC 7489
15. Study of CMOS Inverter
16. Interface CMOS to TTL and viceversa
17. Study of FFs – RS, D, T and JK
18. Study of decade counter IC 7490
19. Study of 4-bit ripple counter IC 7493
20. Study of shift register IC 74194/195
21. Study of 4-bit comparator IC – 7485
22. Working project made by the student at the end of Lab.

Course Name: Object Oriented Programming

Code: IT 214

Objects, objects as software modules, objects interaction, classes, method lookup, hierarchies of classes, inheritance, polymorphism, abstract classes. Identifying objects and classes, representation of objects, association with objects, aggregate components of objects. Object oriented programming languages class declarations object declaration, mandatory profiles message sending association recursive association, many to many association .argument passing.

Inherited methods, redefined methods, the protected interface, abstract base classes. Public and protected properties, private operations disinheritance, multiple inheritance. Overview of C++ as object oriented programming language, loops, decision, structures and functions, arrays and pointers, virtual function, files and stream.

Text/ Reference Books:

1. Object Oriented Programming in C++ by Robert Lafore
2. How to program C++ by Details and Details.
3. Object oriented design with C++ by Ken Barclay

Course Name: Design and Analysis of Algorithms

Code: IT 215

Concepts of algorithm, asymptotic complexity, examples of analysis use of recurrence relation in analysis of algorithms, removal of recursion, heap and heap sort, disjoint set structure. Divide and conquer technique, analysis and design of algorithms base on this technique for binary search, merge sort, quick sort, selection problem, matrix multiplication.

Study of greedy strategy, solutions based on greedy strategy for knapsack problem, minimum spanning trees, scheduling problem, shortest paths optimal merge patterns. Concept of dynamic programming and problems based on this approach such as 0/1 knapsack problem, multi-stage graphs, shortest paths, traveling sales person problem, reliability design problem.

Depth-first search, breadth first search, bi-connected components. Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle problem, introduction to branch & bound and its examples like 8 piece puzzle problem traveling sales-person problem.

Binary search trees, height balanced trees, AVL trees, 2-3 trees, B-trees hashing. Introduction to lower-bound theory introduction to NP-Complete and NP Hard problems, examples of NP complete problem like Hamiltonian path and circuits, eulerian paths and circuits etc.

Text/ Reference Books:

1. Computer Algorithms: Horowitz by Sartaj Shani & Sanguthevar Rajasekaran
2. Design and Analysis of Computer Algorithms by V. Aho, J. E. Hopcroft, and J. D. Ullman .
3. Introduction to Algorithms by Cormen, Leiserson & Rivest

Course Name: Information Technology Workshop

Code: IT 216

JAVA

Introduction to Java programming, Object-oriented programming with Java Classes and Objects Fields and Methods, Constructors, Inheritance , Exception handling, The Object class, Working with types: Wrapper classes Enumeration interface, Packages , Applets, Basics of AWT and Swing Layout Managers, Threads Synchronization, The I/O, Basic concepts of networking Working with URLs, Concepts of URLs, Sockets, Database connectivity with JDBC

PYTHON

Introduction, Conditional Statements, Looping, Control Statements, String Manipulation Lists , Tuple, Dictionaries, Functions, Modules, Input-Output, Exception Handling, OOPs concept, Regular expressions, CGI, Database, Networking (Socket, Socket Module, Methods, Client and server Internet modules), Multithreading, GUI Programming, Sending email.

Text/ Reference Books:

1. Core Python Programming by R. Nageswara Rao
2. How to program Java by Details and Details
3. Java the Complete Reference by Herbert Schildt

Detailed Syllabus for B.Tech. IT

B.Tech. IT (Fourth Semester)

Course Name: Analog & Digital Communication

Code: IT 221

Basic blocks in a communication system: transmitter, channel and receiver; baseband and passband signals and their representations; concept of modulation and demodulation. Continuous wave (CW) modulation: AM, DSB/SC, SSB, VSB, methods of generation; Demodulation techniques of CW modulation: coherent and non-coherent; Nonlinear modulation techniques: FM and PM, narrowband FM, wideband FM, methods of generation; FM spectrum; Demodulation techniques for FM; Frequency Division Multiplexing (FDM); Radio transmitters and receivers. Performance of analog modulation schemes in AWGN : CNR, post-demodulation SNR and figure of merit for AM, DSB/SC, SSB, FM, threshold effect in FM, pre-emphasis and de-emphasis in FM, FMFB. Noise in receivers; Noise figures; Radio link design.

Signal analysis and analog modulation: Analog signal, digital, convolution correlation, autocorrelation, of analog modulation, amplitude and angle modulation, spectral analysis and relation, noise source, band pass noise, noise performance of AM and FM signal. Pulse Modulation: Natural sampling, flat top sampling, sampling theorem, PAM, bandwidth, pulse time modulation method of generation and detection of PAM, and PPM, time division multiplexing, Noise in pulse modulation system.

Pulse code modulation: Quantization of signal, quantization errors, PCM, PCM system, comp multiplexing PCM system, differential PCM, delta modulation, adaptive delta modulation, noise in PCM system. Information theory and Coding: Unit of information, entropy, Joint and conditional entropy, information rate mutual information, channel capacity of BSC, BEC and binary channel theorem Shannon Harte'y theorem, bandwidth S/N trade off, average length of code control coding, Hamming distance block code, convolution code.

Digital Communication: Differential phase shift keying (DPSK), quadrature phase shift k (QPSK), M- ray PSK, Binary frequency shift keying (BESK), comparison of DPSK QPSK, M-ray FSK, duo binary encoding, base band signal reception, probability of optimum filter, matched filter.

Text/ Reference Books:

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| 1. Modern Digital and Analog Communication Systems | B.P.Lathi, |
| 2. Communication Systems | Simon Haykins |
| 3. Communication Systems | A. B. Carlson |
| 4. Analog & Digital Communication | R.P. Singh & Sapre |
| 5. Communication Engineering | Rao |

Analog Communication Lab Experiments

- 1) Double side band AM Generation.
- 2) Double side band AM Reception.
- 3) Single side band AM Generation.
- 4) Receiver Characteristics (Selectivity, Sensitivity, Fidelity).

- 5) Frequency Modulation using Reactance Modulator.
- 6) Frequency Modulation using Varactor Modulator.
- 7) Quadrature Detector.
- 8) Operation of Phased locked loop Detector.
- 9) Operation of Foster – Seeley loop Detector.
- 10) Operation of Ratio Detector.

Course Name: Computer Organization and Architecture Code: IT 222

Introduction to computer organizations and architecture, computer system components, bus organized computer, memory address register, data register, program counter, accumulator, instruction register. Instructions fetch. Decoding and execution. Instruction formats and addressing modes, instruction set design issues, micro operations. Register transfer language. Control unit organization. Instruction sequencing, instruction interpretation. Hardwired control and micro programmed control organization, control memory, address sequencing, microinstruction formats, micro program sequencer, microprogramming, microinstruction encoding, horizontal and vertical micro instructing.

Arithmetic and logic unit design. Addition and subtraction algorithm. Multiplication algorithm. Division algorithm. Floating point arithmetic. Processor. Configuration, instruction pipelining, branch handling, CISC and RISC architecture features, superscalar architecture. Input- output organization, programmed I.O. I/O addressing , I/O instruction. Synchronizations. I/O interfacing, standard I/O interfaces interrupt mechanism, DMA I/O processors and data communication.

Memory organization and multiprocessing basic concepts and terminology. Memory hierarchy, semiconductor memories (RAM ROM) virtual memory. Cache memory, Associative memory, memory allocation and management policies, structure of multiprocessor.

Text/ Reference Books:

1. Computer Organization and Architecture Design and Performance by Willam Stalling
2. Computer Architecture and Organization by John P. Hayes
3. Computer Architecture and Organization by M. Morris Mano

Course Name: Software Engineering

Code: IT 223

The Software Product and Software Process Software Product and Process Characteristics, Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model, Evolutionary Process Models like Incremental Model, Spiral Model, Component Assembly Model, RUP and Agile processes. Software Process customization and improvement, CMM, Product and Process Metrics. Requirement Elicitation, Analysis, and Specification Functional and Non-functional requirements, Requirement Sources and Elicitation Techniques, Analysis Modeling for Function-oriented and Object-oriented software development, Use case Modeling, System and Software Requirement Specifications, Requirement Validation, Traceability.

Software Design: Software Design Process, Design Concepts and Principles, Software Modeling and UML, Architectural Design, Architectural Views and Styles, User Interface Design, Function-oriented Design, SA/SD Component Based Design, Design Metrics. Software Analysis and Testing Software Static and Dynamic analysis, Code inspections, Software Testing, Fundamentals, Software Test Process, Testing Levels, Test Criteria, Test Case Design, Test Oracles, Test Techniques, Black-Box Testing, White-Box Unit Testing and Unit, Testing Frameworks, Integration Testing, System Testing and other Specialized, Testing, Test Plan, Test Metrics, Testing Tools. , Introduction to Object-oriented analysis, design and comparison with structured Software Engineering.

Software Maintenance & Software Project Measurement Need and Types of Maintenance, Software Configuration Management (SCM), Software Change Management, Version Control, Change control and Reporting, Program Comprehension Techniques, Re-engineering, Reverse Engineering, Tool Support. Project Management Concepts, Feasibility Analysis, Project and Process Planning, Resources Allocations, Software efforts, Schedule, and Cost estimations, Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance (SQA). Project Plan, Project Metrics.

Text/ Reference Books:

1. Software Engineering by Roger S Pressman
2. Software Engineering by Lan Sommerville

Course Name: Database Management System

Code: IT 224

Introduction to DBMS concepts and architecture: file organization techniques, database approach v/s traditional file accessing approach, advantages of database systems, data models, schemas and instances, database languages and interface, initial conceptual design of database, DBMS Architecture database system utilities, data independence, functions of DBA and designer.

Entities attributes, entity types, value sets, key attributes, relationships, defining the E-R design of database. Relational data models: Domains, tuples, attributes, relations, characteristics of relations, key attributes of relations, relational database, schemas, integrity constraints, update operations on relations. Hierarchical data model: Hierarchical database structures, Integrity constraints, data definition and manipulation in hierarchical model. Network data model: Records, record types and data items, set types and set instances, constraint on set membership, representation of set instances, special types of sets, DBTG proposal and implementation.

Relational algebra and relational calculus: Relational algebra operations like select, project, join, division, outer join, outer union etc., insertion, deletion and modification anomalies. Data definition in SQL, queries, update statements and views in SQL. QUEL and QBE, data and storage definition, data retrieval queries and update statements etc.

Introduction to normalization, normal forms, functional dependency, decomposition, dependency preservation and lossless join, problems with null valued and dangling tuples, multivalued dependencies, inclusion and template dependencies. Distributed databases, protection, security and integrity constraints, concurrent operations on databases, recovery,

transaction processing, database machines. Comparison of various database models, comparison of some existing DBMS.

Text/ Reference Books :

1. Fundamentals of Database System by Navathe
2. Fundamentals of Database System by Korth
3. Database Management System by Raghu Ramakrishnan

Course Name: Information Theory and Coding

Code: IT 225

Information and entropy information measures, Shannon's concept of information. Channel coding, channel mutual information capacity (BW) , theorem for discrete memory less channel, information capacity theorem , error detecting and error correcting codes, types of codes : block codes, hamming and Lee metrics, description of linear block codes ,parity check codes ,cyclic code, masking techniques. Compression : loss less and lossy, Huffman codes, LZW algorithm, Binary image compression schemes, run length encoding, CCITT group 3 1-D compression, CCITT group 3 2D compression, CCITT group 4 2D Compression. Convolution codes, sequential decoding. Video image compression: CITT H 261 Video coding algorithm, audio (speech) compression. Cryptography and cipher.

Text/ Reference Books:

1. R Bose, —Information Theory, Coding and Cryptography, TMH 2007
2. Multimedia system Design by Prabhat K Andleigh and KiranThakrar(PHI Publications).
3. Multimedia Communications by Fred Halsall(Pearson Publications).

Course Name: Entrepreneurship Development

Code: IT 226

Entrepreneurship Development – Concept and Importance, function of Enterpriser, Goal determination – Problems Challenges and solutions.

Project Proposal- Need and Objects; Nature of organization, Production Management; Financial Management; Marketing Management; Consumer Management.

Role of Regulatory Institutions; Role of Development Organizations; Self Employment Oriented Schemes; Various grant schemes.

a. Production management; b. Marketing management – Sales and the art of selling, understanding the market and market policy; Consumer management, time management.

Role of regulatory institutions-district industry centre, pollution control board, special study of electricity development and municipal corporation; Role of development organization, khadi & villages commission/Board; Self-employment-oriented schemes, Prime minister's employment schemes.

References:

- Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.
- Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition Dream tech, 2005.
- Rajeev Roy, 'Entrepreneurship' 2nd Edition, Oxford University Press, 2011.

Detailed Syllabus for B.Tech. IT

B.Tech. IT (Fifth Semester)

Course Name: Data Communication and Networks

Code: IT 311

Data Communication, Networks, Internet, Protocols and Standards, Network Models: OSI, TCP/IP, Analog and Digital data, Periodic Analog Signal, Digital Signal, Transmission Impairments, Data Rate Limits, Performance. Signal Conversion: digital-to-digital, Analog-to-Digital, Analog-to-Analog, Digital-to-Analog Conversion.

Multiplexing, Spread Spectrum, Guided Media and Unguided media. Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks, Structure of Switch. Types of Errors, Redundancy, Detection Vs Correction, FEC Vs Retransmission, Coding, Modular Arithmetic, Block Coding, Linear Block Codes, Cyclic Codes, Checksum, Hamming Code.

Framing, Flow Control and Error Control Protocols, Protocols: stop-and-wait, Go-Back-N, Selective-Repeat, Piggybacking, HDLC, PPP. Medium Access, Ethernet and LAN: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization, IEEE standards, different Ethernets, Connecting devices, Backbone networks, VLAN.

Text/Reference Books

1. B. A. Forouzan, "Data Communications and Networking", 5th Edition, Tata McGraw-Hill.
2. Alberto Leon Garcia and IndraWidjaja, "Communication Networks, Fundamental Concepts and Key Architectures", 2nd Edition, Tata McGraw-Hill.
3. William Stallings, "Data and computer Communication", 7th Edition, Pearson Education, ISBN81-297-0206-1
4. A S Tanenbaum, "Computer Networks", 4th Edition, Pearson Education, ISBN 9788177581652

Course Name: Digital Image Processing

Code: IT 312

Introduction to Image Processing Systems, Digital Image Fundamentals:- Image model, Relationship between Pixels, Imaging geometry, Camera model, Image Sensing and Acquisition, Sampling and quantization, Image Enhancement and in spatial Domain: Point processing, Neighbourhood Processing, High pass filtering, High boost filtering, zooming. Image Enhancement based on Histogram modelling, Image Enhancement in frequency domain: 1D & 2D Fourier transform, Low pass frequency domain filter, High pass frequency domain filters, Homomorphic filtering, Image Segmentation, Detection of discontinuation by point detection, line detection, edge detection, Edge linking and boundary detection Local analysis, global by graph, theoretic techniques, Thresh-holding, Morphology, Representation and description, Discrete image transform, Image Compression, Wavelet transformation, Image geometry, Image restoration.

Text/ Reference Books:

1. Digital Image Processing Gonzalez & Wood
2. Digital Image Processing A.K. Jain .Image Processing Dhananjay K.

Course Name: Micro-Processors and Micro-Controllers Code: IT 313

Microprocessors (8085) - internal architecture, instruction set. Introduction to 8086 microprocessor, internal architecture, pin description, memory segmentation, addressing modes, instruction set and assembly language programming.

Basic interfacing devices: Memory interfacing, 8255, 8253, 8259, 8257, and 8251. Salient features of advanced microprocessors: 80286,386,486, Pentium.

Introduction to 8051 microcontrollers, its architecture, pin description, I/O configuration, interrupts, addressing modes, an overview of 8051 instruction set, Microcontroller applications.

Text/ Reference Books:

1. 8085 Microprocessor Ramesh Goenkar, Prentice Hall
2. Microprocessor and Interfacing D. V. Hall
3. The 8051 Microcontroller Kenneth J Aya
4. THE INTEL MICROPROCESSORS BARRY B. BREY, Pearson Prentice Hall

Micro Processor & Micro Controller-Lab

1. Write C program to interface stepper motor.
2. Write C program to interface DC motor.
3. Write C program to interface traffic light controller.
4. Write C program to interface Elevator.
5. Write C program to interface temperature controller.
6. Write a program to add two 8-bit BCD numbers.
7. Write a program to add 'n' 8-bit BCD numbers.
8. Write a program to add two 'n' byte BCD numbers.
9. Write a program to perform 8-bit binary subtraction.
10. Write a program to perform 8-bit binary subtraction by 1's compliment method.
11. Write a program to perform 8-bit binary subtraction by 2's compliment method.
12. Write a program to perform 8-bit binary subtraction by 9's compliment method.
13. Write a program to perform 8-bit binary subtraction by 10's compliment method.
14. Write a program to perform two 'n' byte binary subtractions.

Course Name: Object Oriented Design & Modeling Code: IT 314

Object oriented programming concepts, Object Orientation, OMT Methodology, Object and Class, Link and Association, Generalization, Aggregation, Multiple Inheritance, Packages. Object Meta modeling, Functional Modeling. Analysis: Object Model, Data Dictionary, Dynamic Model, Functional Model, Interaction Modeling-Use case model, Sequence model,

and Activity models, State Charts, System Design, Object Design, Implementation using programming language and Database, UML Modeling.

Text/Reference Book

1. Object-Oriented Modeling and Design Michael Blaha / William Premerlani
2. Object Oriented Software Engineering Using UML Patterns and Java by Bruegge and Dutoit Pearson Publications

Course Name: Operating System

Code: IT 315

The Evolution of operating Systems (OS); Fundamental goals of operating systems overview of important features of OS operation.

Overview of OS: multiprogramming, Batch, interactive, time sharing, distributed operating systems and real time systems; Concurrency and parallelism.

Process management and scheduling: Concept of process and process synchronization, process states, process state transitions, the process control block, operations on processes, suspend and resume, interrupt processing, mutual exclusion, the producer/consumer problem, the critical section problem, semaphores, classical problems in concurrency, inter process communication; Issues in user service and system performance.

Synchronization primitives and problems, deadlocks (essential topics: peterson's algorithm, monitors), detection and prevention of deadlocks, dynamic resource allocation.

Memory Management: Memory fragmentation and techniques for memory reuse paging, virtual memory management using paging, Segmentation, Distributed and Multiprocessor Systems.

File Management: File systems, implementation of file Operations. Protection of files.

Text/ Reference Books:

1. Modern Operating Systems, Andrew S Tanenbaum and Herbert Bos, Fourth Edition, Pearson Education, 2014.
2. Operating Systems Concepts, Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Wiley, 2012.
3. Dhamdhare, D. M., Operating Systems---A concept-based approach, Second edition, McGraw-Hill Education India, New Delhi, 2006.
4. Stallings, W., Operating Systems---Internals and Design Principles, Fifth edition, Pearson Education, New York, 2005.

Detailed Syllabus for B.Tech. IT

B.Tech. IT (Sixth Semester)

Course Name: Cryptography and Information Security

Code: IT 321

Overview of Information Security: confidentiality, integrity, and availability, User authentication, Information Security for Server Systems, Information Security for Client devices

Understanding the Threats: Malicious software (Viruses, trojans, rootkits, worms, botnets), Memory exploits (buffer overflow, heap overflow, integer overflow, format string).

Information Security and Cryptography, Mathematics of Cryptography, Ciphers: Substitution and Transposition, Symmetric Encryption and Message Confidentiality, Integrity of Data, Hash Function, Digital Signature.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Stream Cipher and Block Cipher, Random Number Generator, One-time Pad.

Groups, Rings, Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields Of Form $GF(p)$ And $GF(2^n)$. Polynomial Arithmetic, Prime Numbers, Fermat's And Euler's Theorem, Testing For Primality, The Chinese Remainder Theorem, Discrete Logarithms.

Block Cipher Principles, Data Encryption Standard (DES), Multiple Encryption, Triple DES, Advanced Encryption Standard (AES), Principles of Public Key Cryptosystems, The RSA Algorithm, Key Management, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

Text/ Reference Books:

1. William Stallings and Lawrie Brown. 2014. Computer Security: Principles and Practice (3rd ed.). Prentice Hall Press, Upper Saddle River, NJ, USA.
2. Behrouz A. Forouzan. 2007. Cryptography & Network Security (1 ed.). McGraw-Hill, Inc., New York, NY, USA.
3. M. Stamp, —Information Security: Principles and Practice,|| 2st Edition, Wiley, ISBN: 0470626399, 2011.
4. M. E. Whitman and H. J. Mattord, —Principles of Information Security,|| 4st Edition, Course Technology, ISBN: 1111138214, 2011.
5. "Designing Security Architecture Solutions", Jay Ramachandran,Wiley.
6. "Web Application Security, A Beginner's Guide" Bryan Sullivan, Vincent Liu, McGraw Hill.

Course Name: Internet of Things**Code: IT 322**

Introduction to Internet of Things, definition and characteristics of IoT, Overview of the syllabus; Architecture of Internet of Things, Physical and logical design of IoT, IoT enabling technologies, IoT levels and deployment templates; Domain specific IoTs, home automation, cities, environment, Domain specific IOTs, Energy, retail, agriculture, industry, health and lifestyle.

IoT AND M2M COMMUNICATION: M2M, diff. between IoT and M2M, ETSI M2M Architecture, system architecture; ETSI M2M SCL resource structure, Security in ETSI M2M framework, SDN and NFV for IoT, IoT system management, need for IoT system management; SNMP, Network operator requirements, NETCONF YANG, IoT management with NETCONF YANG, IoT Design methodology case study on IoT for Weather Monitoring IoT PLATFORMS:

Int. to Hardware used for IoT: Microcontrollers, Microprocessors, SoC, Sensors; Int. to Arduino, Pi, Spark, Intel Galileo IoT technical standards and protocols: RF Protocols: RFID, NFC; IEEE 802.15.4: ZigBee, Z-WAVE, THREAD; Bluetooth Low Energy (BLE), IPv6 for Low Power and Lossy Networks (6LoWPAN) and Routing Protocol for Low power and lossy networks (RPL); CoAP, XMPP, Web Socket, AMQP, MQTT, WebRTC, PuSH; Architectural Considerations in Smart Object Networking.

DEVELOPING INTERNET OF THINGS: IoT platforms design methodology, IoT Physical devices and endpoints; IoT Systems: Logical design using Python, IoT physical servers and cloud offerings.

Text/Reference Book

1. Arshdeep Bahga, Vijay Madisetti, Internet of Things, A Hands -on Approach, 1st Ed. 2015, University Press
2. Oliver Hersent, David Boswarthick, Omar Elloumy, The Internet of Things, 2015
3. Michael Miller, —The Internet of Things, How Smart TVs, Smart Cars, Smart Homes, Smart Cities are changing the World, 1st ed., 2015, Pearson
4. Raj Kamal, Internet of Things Architecture and Design Principles, McGraw Hill Education (India) Private Lim., 2017

Course Name: TCP/IP and Web Technologies**Code: IT 323**

Introduction to TCP/IP network model, IP: Internet Protocol- IP header, IP Routing Principal, IP Fragmentation, Checksum, IP options. Subnetting, Subnet masks, Supernetting, CIDR Directly/indirectly connected machines, IP addresses. Ethernet, framing, ARP, ARP Cache, ARP Packet Format, RARP, Serial Links, Bridges, Spanning Tree algorithm, ICMP- ICMP message type, ICMP address mask request and reply, ICMP Query and Error message, determining the path MTU. RARP and ARP. Transport layer protocols: TCP and UDP: TCP and UDP header, Connection Establishment and Termination, TCP State Transition diagram, Segmentation, Maximum Segment Size. ISN and sequence numbers. TCP data transfer -- sliding windows, slow start, congestion avoidance, fast retransmit, fast recovery. TCP – Timeout and Retransmission. Sockets. Web Technology: DNS, IGMP, FTP, POP, SMTP, HTTP, HTML, XML Basic concept of client/server computing.

Text/Reference Book

1. W Richard Stevens, TCP/IP Illustrated Vol. I: The Protocols, Pearson Education Asia.
2. Computer Networking: A Top down Approach James F. Kurose, Keith W. Ross, Pearson.

Course Name: Artificial Intelligence**Code: IT 324**

Meaning and definition of artificial intelligence, Production systems: types, characteristics, study and comparison search techniques: BSF, DSF, hill climbing, best first search, A* algorithm, AO* algorithm etc, types of control strategies. Knowledge representation: Problems faced, propositional and predicate logic, resolution and refutation, deduction, theorem proving. Reasoning: introduction, reasoning methods, Baye's theorem, Bayesian network, fuzzy logic. Slot and filler structures: semantic networks, frames, conceptual dependency, scripts etc. Game playing and its techniques, planning techniques, study of blocks world problem in robotics, understanding, natural language processing and common sense. Learning and its techniques, neural networks and its applications, expert systems.

Text/Reference Book

1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 2nd Ed, Prentice Hall, 2003;
2. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill

List of Electives Level -1 (Any One Subject for VI Semester)

Data Engineering & Computing Stream		Computer Vision & Information Processing Stream		Robotics & Artificial Intelligence Stream		Computer System Architecture Stream	
IT 501	Advances in Database Management System	IT 502	Computer Graphics & Multimedia	IT 503	Soft Computing & Intelligent Systems	IT 504	Embedded Systems

SYLLABUS OF ELECTIVES LEVEL-1

Course Name: Advances in Database Management System Code: IT 501

Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability- Lock –Based Protocols – Timestamp Based Protocols- Validation-Based Protocols – Multiple Granularity.

Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of non-volatile storage-Advance Recovery systems- Remote Backup systems.

Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.

Text/Reference Book

- 1.Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.

Course Name: Computer Graphics & Multimedia**Code: IT 502**

Introduction to raster & random graphics fundamentals, Display devices & comparison Point plotting, line drawing & circle drawing & their algorithm like DDA & Bresenham's, Video Basics- Graphics input/ output devices techniques, Mouse, tablets, stylus, light pen, valuators, digitizers, and plotter Devices independent graphics systems, positioning constraints, rubber band technique, dragging, inking& Painting, Data Structure of Computer Graphics, 2-D Transformation, Clipping, Windowing, View port, 3-D transformation, clipping, viewing transformations, projection, curve generation methods. Graphics packages, segmented files, Geometric models, Picture Structure. Raster graphics, Character Displaying, Natural images Solid Area. Scan Conversion, Raster display hardware, Filling areas, aliasing & anti-aliasing Hidden surface elimination, Shading, Application to Simple Engineering Problem. Multimedia : Characteristics of a multimedia presentation , Uses of Multimedia, Text –Types, Unicode Standard ,text Compression, Text file formats, Audio- Components of an audio system, Digital Audio, Digital Audio processing, Sound cards, Audio file formats ,Audio Processing software ,Video-Video color spaces, Digital Video, Digital Video processing, Video file formats.

Text/Reference Book

1. Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill
2. Donald Hearn and M.P. Becker “Computer Graphics” Pearson Pub.
3. Parekh “Principles of Multimedia” Tata McGraw Hill
4. Pakhira,”Computer Graphics, Multimedia & Animation”,PHI learning
5. Andleigh, Thakral , “Multimedia System Design “ PHI Learning

Course Name: Soft Computing & Intelligence Systems**Code: IT 503**

Introduction to neural networks, Working of an artificial neuron, Perceptron, Back propagation algorithm, Adalines and Madalines. Supervised and unsupervised learning, Counter-propagation networks, Adaptive Resonance Theory, Kohonen's Self Organizing Maps, Neocognitron, Associative memory, Bidirectional Associative Memory. Introduction to fuzzy logic and fuzzy sets, fuzzy relations, fuzzy graphs, fuzzy arithmetic and fuzzy if-then rules, Process control using fuzzy logic, Decision-making fuzzy systems, Applications of fuzzy logic, Hybrid systems like neuro-fuzzy systems. Evolutionary Computation: Population-based Search: genetic algorithms and evolutionary computation, Swarm optimization, Ant colony optimization. Search techniques like Simulated Annealing, Tabu search etc.

Text/Reference Book

1. Soft Computing and Intelligent Systems Design by F.O.Karray and C.DeSilva,Pearson Publication
2. Neural Networks, Fuzzy Logic and Genetic Algorithms by Rajsekaran and Pai, PHI Publication

Course Name: Embedded Systems**Code: IT 504**

Introduction, Hardware & electronics fundamentals, Peripherals Program Design and Analysis, Processes and Operating system, Real time Operating system. Memory, Interfacing Examples of Embedded systems: Digital Camera Examples, Smart card application, embedded database applications, etc. State Machine and Concurrent Process Models, Control Systems Verilog programming, Programming of mobile and Hand-held devices IC Technology Full-Custom (VLSI) IC Technology, Semi-Custom (ASIC) IC Technology, Programmable Logic Device (PLD) IC Technology, FPGA Hardware Software Partitioning, Hardware/Software Co-Simulation, Intellectual Property Cores, Low Power design.

Text/Reference Book:

1. Embedded system Design, Frank Vahid, Tony Givargis
2. Computer as Components, Wayne Wolf
3. 8051 Microcontroller & Embedded Systems, Rajiv Kapadia
4. The 8051 Microcontroller & Embedded Systems, Mazidi & Mazida

Detailed Syllabus for B.Tech. IT

B.Tech. IT (Seventh Semester)

Course Name: Data Science and Analytics

Code: IT 411

Data Science content: Introduction to data science Exploratory data analysis Introduction to machine learning Linear regression and regularization Model selection and evaluation Classification: kNN, decision trees Classification: SVM Ensemble methods: random forests Intro to probability: Naïve Bayes and logistic regression Feature engineering and selection Clustering: k-means, hierarchical clustering Dimensionality reduction: PCA and SVD Text mining and information retrieval Network Analysis Recommender systems Relational databases, SQL Big data storage and retrieval: NoSQL, Graph DB Big data distributed computing: map-reduce, spark RDD

Text/Reference Book:

1. James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer, 2013.
2. Han, J., Kamber, M., Pei, J. Data mining concepts and techniques. Morgan Kaufmann, 2011.
3. Hastie, T., Tibshirani, R., Friedman, J. The Elements of Statistical Learning, 2nd edition. — Springer, 2009.
4. Murphy, K. Machine Learning: A Probabilistic Perspective. - MIT Press, 2012. Supplementary: “Practical Data Science with R”. Nina Zumel, John Mount. Manning, 2014 “Data Science for business”, F. Provost, T Fawcett, 2013.

Course Name: Information Retrieval & Extraction

Code: IT 601

Introduction: Goals and history of IR. The impact of the web on IR. The role of artificial intelligence (AI) in IR. Basic IR Models: Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity. Basic Tokenizing Indexing. Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors. Query Operations and Languages: Relevance feedback; Query expansion; Query languages. Text Representation: Word statistics; Zipf's law; Porter stemmer; morphology; index term selection. Metadata and markup languages (SGML, HTML, XML). Text Categorization and Clustering: Categorization algorithms: naive Bayes; decision trees; and nearest neighbor. Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM). Applications to information filtering; organization; and relevance feedback. Information Extraction and Integration: Extracting data from text; XML; semantic web; collecting and integrating specialized information on the web.

Introduction to computer crimes, evidence, legal issues, digital forensics, Computer forensics, mobile device forensics, network forensics, and forensics data analysis. Digital Devices with rudimentary computing power. Sources of Digital Evidence. Stages of Forensic: acquisition or imaging of exhibits, extraction, preservation, analysis and reporting standards. Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008. Overview of hardware operating systems: structure of storage media/devices; windows/Macintosh/ Linux -- registry, boot process, file systems, file metadata. Study of File Systems: FAT, NTFS, EXT 2/3/4, ReFS file Systems, etc. File systems parsing. Event Analysis: \$MFT, registry hives, prefetch, superfetch, shortcuts, jumplists, etc. Storage drive forensics: Big data challenge of digital forensics. Acquisition and analysis of volatile and non-volatile memory. Recovery of deleted files. Digital Forensic tools: Encase, FTK, Autopsy, Sleuth kit, WinHex, Linux dd, dd_rescue, dcfldd, scalpel, foremost, and other open source tools. Database forensics: forensic study of databases and their metadata. Investigative use of database contents and system log files to build a time-line or recover relevant information; Network forensics: Collecting and analyzing network-based evidence, email activity, intrusion detection, tracking offenders, etc. Introduction to IoT Forensics. Mobile device forensics: recovery of digital evidence or data from a mobile device. Introduction to Social Network Analysis, Reverse Engineering, and Malware Analysis.

Text/Reference Book:

1. Brain Carrier, "File System Forensics Analysis", Addison-Wesley Professional, 1st Edition, 2005
2. Kanellis, Panagiotis, "Digital Crime and Forensic Science in Cyberspace", IGI Publishing, ISBN 1591408733.
3. Computer Forensics and Cyber Crime: An Introduction (3rd Edition) by Marjie T. Britz, 2013.

Reference Book:

1. Digital Forensics with Open Source Tools. Cory Altheide and Harlan Carvey, ISBN: 978-1-59749-586-8, Elsevier publication, April 2011
2. Network Forensics: Tracking Hackers Through Cyberspace, Sherri Davidoff, Jonathan Ham Prentice Hall, 2012
3. Guide to Computer Forensics and Investigations (4th edition). By B. Nelson, A. Phillips, F. Enfinger, C. Steuart. ISBN 0-619-21706-5, Thomson, 2009.
4. Computer Forensics: Hard Disk and Operating Systems, EC Council, September 17, 2009
5. Computer Forensics Investigation Procedures and response, EC-Council Press, 2010
6. EnCase Computer Forensics., 2014
7. NIST Computer Forensic Tool Testing Program (www.cfft.nist.gov/)
8. Computer Forensics: Investigating Data and Image Files (Ec-Council Press Series: Computer Forensics) by EC-Council (Paperback - Sep 16, 2009)
9. Digital Evidence and Computer Crime, Third Edition: Forensic Science, Computers, and the Internet by Eoghan Casey, 2011.

10. The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory. Michael

Course Name: Natural Language Processing

Code: IT 603

Regular Expressions and Automata, N-grams, Part-of-Speech Tagging, Hidden Markov and Maximum Entropy Models, Formal Grammars of English, Syntactic Parsing, Statistical Parsing, Features and Unification, Language and Complexity, The Representation of Meaning, Computational Semantics, Computational Lexical Semantics, Information Extraction, Question Answering and Summarization, Machine Translation.

Text/Reference Book:

1. "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", C. D. Jurafsky and J. Martin.
2. "Foundations of Statistical Natural Language Processing", Manning and H. Schütze.
3. "Computational Approaches to Morphology and Syntax (Oxford Surveys in Syntax & Morphology)" 1st Edition, Roark & Sprout.

Course Name: Computational Complexity

Code: IT 604

Introduction: Turing machines, equivalence of reasonable models of computation, non-determinism, algorithms, decision versus optimization problems, reduction between problems. Time complexity: The complexity classes P, NP, Co-NP and Exp, completeness for NP, Cook's theorem, some well-known NP-complete problems, classes FP, FNP, TFNP and FNP-Complete, approximation algorithms. Space Complexity: Classes PSPACE, NSPACE and PSPACE-complete, Savitch's theorem, logarithmic space, classes PolyL, L, NL, Co-NL and NL-complete. Intractability: Space and time hierarchy, EXSPACE-completeness, alternating Turing machines and the polynomial hierarchy, relativization and oracle Turing Machines. Randomized computation: Classes RP, ZPP, PP and BPP. Parallel computation: Circuit complexity, classes NC and RNC, P-completeness. Cryptography: One-way functions, public-key cryptography, interactive protocols.

Text/Reference Book:

1. Bernard M E Moret, The Theory of Computation, Addison-Wesley, 1998.
2. Christos H Papadimitriou, Computational complexity, Addison-Wesley, 1994.
3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing Company 1997.

Course Name: Mobile Computing**Code: IT 605**

Introduction to Mobile Communications and Computing, novel applications, GSM: Mobile services, System architecture, and new data services. (Wireless) Medium Access Control :Motivation for a specialized MAC, DMA, FDMA, TDMA, CDMA. Mobile Network Layer: Mobile IP, IP packet delivery, Dynamic Host Configuration Protocol (DHCP). Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP. Database Issues: client server computing with adaptation, transactional models, and quality of service issues. Mobile Ad hoc Networks (MANETs): Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs. Protocols and Tools: Wireless Application Protocol-WAP. Bluetooth and J2ME.

Text/Reference Book:

1. Mobile Communications Jochen Schiller.
2. Handbook of Wireless Networks and Mobile Computing Stojmenovic and Cacute.
3. Fundamentals of Mobile and Pervasive Computing Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren

Course Name: Ethical Hacking**Code: IT 606**

Ethical hacking Overview, TCP/IP Concepts Review, network and computer Attacks, Network enumeration and Foot printing- DNS query, Whois query, OS finger printing, Banner grabbing Programming for security professionals- Web application vulnerabilities, Buffer overflow attack, Session hijacking, Code injection attacks- Cross Site Scripting attack, SQL injection attack

Password hacking, windows hacking, network hacking, anonymity and email hacking. Web servers hacking, session hijacking, Surveillance, desktop and server OS Vulnerabilities, Database attacks, hacking wireless networks, cryptography, network protection systems, Trojan and backdoor applications, legal resources, virtualization and Ethical Hacking.

Text/Reference Book:

1. Ethical Hacking and Network Defense. Michael T. Simpson, Kent Backman, James Corley

References:

1. Hacking Exposed—Network Security Secrets & Solutions, Stuart McClure Joel Scambray, GeorgeKurtz

Course Name: Introduction to Robotics**Code: IT 607**

Robot kinematics: position analysis, differential motions and velocities. Trajectory planning. Actuators, sensors and simple sensor processing algorithms. Visual servoing. Robot programming and control architectures. Selected topics from mobile robotics (localization, mapping, navigation and motion planning).

Text/Reference Book:

1. Robotics modeling, planning and control by B. Siciliano, L. Sciavicco, L. Villani, G. Oriolo.

Course Name: Real Time Systems**Code: IT 608**

Introduction, Real - Time System Characteristics, Few Basic Issues, Modelling Timing Constraints, Basics of Real - Time Task Scheduling, Cyclic Scheduler, Event - Driven Scheduling, Rate Monotonic Scheduler, RMA Scheduling : Further Issues, Deadline Monotonic Scheduling and Other Issues, Resource Sharing Among Real-Time Tasks, Real-Time Task Scheduling on Multiprocessors and Distributed Systems, Clock Synchronization in Distributed Real-Time Systems, A Few Basic Issues in Real-Time Operating Systems,

Text/Reference Book:

1. A Few Basic Issues in Real-Time Operating Systems P. Narayanan, Intellectual Property Law, Eastern Law House.

Course Name: Quantum Computing**Code: IT 609**

Introduction to Quantum Computation: Quantum bits, Bloch sphere representation of a qubit, multiple qubits. ChurchTuring thesis.

Circuit model of computation, Quantum physics and Computation, State of a quantum system, Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits. States and general quantum operations, Quantum gates, Universal sets of quantum gates.

Quantum Algorithms: Superdense coding, quantum teleportation, probabilistic versus quantum algorithms, phase kick-bac, the Deutsch algorithm, Quantum phase estimation and Quantum Fourier Transform , Shor's algorithm for order finding, Quantum search algorithm.

Quantum computational complexity and error: Computational complexity, Black-box model, Lower bounds for searching, General black-box lower bounds, Classical error correction , Fault-tolerant computation, Quantum error correction.

Text/Reference Book:

1. Quantum Computing, V. Sahni, McGraw Hill Education 2007.
2. Quantum Computing for computer scientists, Noson S. Yanofsky, Mirco A. Mannucci, Cambridge University Press 2008.
3. An Introduction to Quantum Computing Algorithms, Pittenger A. O., Birkhäuser Basel 2000.

Course Name: Human Computer Interface**Code: IT 610**

Introduction: Course objective and overview, Historical evolution of the field, Interactive system design (theory and practice): Concept of usability definition and elaboration, HCI and software engineering, GUI design and aesthetics, Prototyping techniques, Model-based Design and evaluation: Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts' law and Hick Hyman's law, Model-based design, case studies. Guidelines in HCI: Shneiderman's eight golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with example of its use, Heuristic evaluation, Contextual inquiry, Cognitive walkthrough. Empirical research methods in HCI: Introduction (motivation, issues, research question formulation techniques), Experiment design and data analysis (with explanation of one-way ANOVA). Task modeling and analysis: Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT). Dialog Design: Introduction to formalism in dialog design, design using FSM (finite state machines), State charts and (classical) Petri Nets in dialog design. Cognitive architecture: Introduction to CA, CA types, relevance of CA in IS design, Model Human Processor (MHP). Object Oriented Programming: OOP- Introduction, OOM- Object Oriented Modeling of User Interface Design. Design-Case Studies: Case Study 1- MultiKey press Hindi Text Input Method on a Mobile Phone, Case Study 2 - GUI design for a mobile phone based Matrimonial application. Case Study 3 Employment Information System for unorganised construction workers on a Mobile Phone.

Text/Reference Book:

1. Dix A., Finlay J., Abowd G. D. and Beale R. Human Computer Interaction, 3rd edition, Pearson Education, 2005.
2. Preece J., Rogers Y., Sharp H., Baniyon D., Holland S. and Carey T. Human Computer Interaction, Addison-Wesley, 1994.
3. B. Shneiderman; Designing the User Interface, Addison Wesley 2000 (Indian Reprint).
4. Yvonne Rogers, Helen Sharp, Jennifer Preece; Interaction Design 3rd Edition Wiley 2011
5. Frank Bentley, Edward Barrett Building Mobile Experiences MIP Press Cambridge 2012
6. Selected research papers (details will be provided at the end of relevant materials).
7. Jacob Nielsen; Useability Engineering; Morgan Kaufmann, Academic Press, London, 1993

Course Name: Web Search & Mining**Code: IT 611**

Introduction to World Wide Web, Basic Concepts of Information Retrieval, Information Retrieval Models, Boolean Model, Vector Space Model, Statistical Language Model. Text and Web Page Pre-Processing, Stopword Removal, stemming, index compression, Web Spamming, Social network Analysis and its parameters: Centrality and Prestige.

Text/Reference Book:

1. Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, 2nd Edition, Springer July 2011, Bing Liu. <http://www.cs.uic.edu/~liub/WebMiningBook.html>
2. Mining the Web: Discovering Knowledge from Hypertext Data by SoumenChakrabarti
3. Introduction to Information Retrieval, Cambridge University Press, 2008. Christopher D. Manning, PrabhakarRaghavan and HinrichSchutze <http://nlp.stanford.edu/IR-book/>

Course Name: High Performance Computing**Code: IT 612**

Overview of parallel system organization; Introduction to message passing and MPI programming; Embarrassingly parallel problems; Problem decomposition, graph partitioning, and load balancing; Introduction to shared memory and OpenMP programming; Examples of scientific computing; Parallel Languages.

Text/Reference Book:

1. Parallel Programming for Multicore and Cluster Systems by Thomas Rauber and Gudula Runger.
2. Scientific Parallel Computing by Scott, Clark, and Bagheri.
3. Using OpenMP: Portable Shared Memory Parallel Programming by Chapman, Jost, and van der Pas.

Course Name: Machine Learning**Code: IT 613**

Supervised Learning-Feature Selection, Cross Validation, Bootstrapping, Normalization Classification: Naïve Bayes, Bayesian Network, C4.5, ID3, Support Vector Machine, Extreme Learning Machine, Neural Network, VC Dimension, Regularization, Regression: Linear, Polynomial, Multiple Linear Regression, Support Vector Regression. Committee Machines/ Ensemble Learning: Bagging, Boosting. Unsupervised Learning- Clustering: K-Nearest Neighbour, K-Means, Fuzzy K-Means, Hierarchical Clustering, Single Linkage, Complete Linkage, Average Linkage, Non Spherical Clustering Algorithms. Statistical Testing Methods, Probabilistic Inference, Neural Network, Deep Learning Neural Network, Evolutionary Algorithms. Machine Learning Applications: Text Classification, Disease Diagnosis, Biometric Systems, Real Valued Classification.

Text/Reference Book:

1. Foundations of Machine Learning, Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, MIT Press, 2012. ISBN978-0-262-01825-8.
2. Machine Learning, Mitchell, T. (1997). McGraw Hill. ISBN0-07-042807-7.
3. Pattern Recognition and Machine Learning, Bishop, C. M. (2006), Springer, ISBN 0-387-31073-8

Course Name: Environmental Science**Code: IT 701**

Natural Resources: Study of various natural resources like forest, minerals, atmosphere, soil and water conservation.

Ecosystem: structure, function and classification of ecosystem, biogeochemical cycle, hydrological cycle, carbon cycle, nitrogen cycle, oxygen cycle, food chain, food web, and energy flow in ecosystem.

Biological diversity and its conservation, Global Environmental Issues, Case studies of environmental disasters like Bhopal Gas Tragedy, Chernobyl Nuclear Accident, and Concept of sustainable development.

Environmental Pollution, pollutants and their classification, impact of pollution on environment. Types of pollution such as water, air, solid waste, noise, radioactive etc: sources, impact, Pollution control and environmental management, Basic concepts of Life Cycle analysis, Environmental Impact Assessment.

Text/ Reference Books:

1. Environment engineering and management Suresh K Dhaneja, S. K. Kataria & Sons
2. Environment science S.C.Santra, New Central Book Agency (P) Ltd
3. Environment studies J.P.Sharma, Pinnacle Technology
4. Waste water treatment: B.C.Punmia, Laxmi Publications

Course Name: Technical Communication**Code: IT 702**

Technical vocabulary, Using words in contexts-Use of suffixes to form nouns from verbs and adjectives-Articles Conjunctions and prepositions. Tenses-Active and Passive voices, Degrees of comparison.

Reading text: Skimming for general information. Notemaking, Listening and transferring of information from text to graphic forms-bar charts, flow charts-Paragraph writing. Role play - Conversational Techniques, discussions-Oral reporting. Vocabulary items: Paragraph writing- Using notes-Giving suitable headings, sub-headings for paragraphs. Discussing creative ideas. Compound nouns - negative prefixes - Antonyms - Use of modal verbs. Making sentences using phrases.

Tenses: Simple past and present perfect, Reported Speech. Reading and guessing meanings in context, Listening and Note-taking. Channel conversation from text to chart, Making recommendations.

Discussion- Role play explaining and convincing. Expanding nominal compounds-words with multiple meanings moderate verbs-error correction-compound adjectives. Simple past and present perfect tense Reading – Prediction of content-Understanding advertisements. Scanning the text and comprehension check, Listening for details-Listening comprehension. Writing Definitions - Expression of views and purpose. Role play-Discussion-Speculating about future. Formation of nouns, verbs and adjectives from root words.

Text/ Reference Books:

1. P.K. Dutt, G.Rajeevan and C.L.N. Prakash "A course in communication skills", Cambridge University Press, India, 2007.
2. Edgar Thorpe, Showick Thorpe, "Objective English", Second edition, Pearson education, 2007.
3. Hyperlinks: www.uefap.co.uk

Course Name: System Biology

Code: IT 703

Introduction to cellular biology and biochemistry with engineering perspective Basic concepts of systems biology,. Cellular networks: metabolic, transcriptional, and signaling networks, Stoichiometric matrix: fundamental subspaces. Introduction to concept of constraints, Reconstruction of biochemical reaction networks. Overview of existing constraint-based reconstruction methods, Modeling biochemical reconstructions. Applications of constraint-based metabolic models. Overview of existing human metabolic networks, and cell-specific constraint-based metabolic models.

Text/ Reference Books:

1. Alon, Uri. *An Introduction to Systems Biology: Design Principles of Biological Circuits*. Chapman & Hall / CRC, 2006. ISBN: 9781584886426.
2. An introduction to bioinformatics algorithms by Neil C. Jones, PavelPevzner. MIT Press.2004
3. Biological sequence analysis: Probabilistic models of proteins and nucleic acids by Richard Durbin, Eddy, Anders Krogh, 1998
4. Algorithms for Molecular Biology by Ron Shamir Lecture, Fall Semester, 2001
5. Neural Networks: A Systematic Introduction by Raul Rojas. Springer. 1996

Course Name: Intellectual property Right

Code: IT 704

Basics of Intellectual Property, The Intangible Economy, Patents—from ball pens to biologics, Trade Marks, Copyright—Is it right to copy.

Unconventional IP—The expanding scope, Enforcement of IP—Protecting your rights; IP for Business-A profit making asset class ; IP, Research, and Universities.

IP for the Creative and Entertainment Industries; Governments Role in Fostering IP; Teaching IP—Let everyone learn IP

Text/ Reference Books:

1. D.P. Mittal (Taxman Publication), Indian Patents Law and Procedure
2. B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications.
3. P. Narayanan (Eastern Law House), Intellectual Property Law
4. N.S. Gopalakrishnan& T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow

Detailed Syllabus for B.Tech. IT**B.Tech. –IT (Eight Semester)****Course Name: Pattern Recognition****Code: IT 614**

Introduction to Pattern Recognition, Regular Pattern, Irregular Pattern, Approaches to Pattern Recognition, Parametric, Non-Parametric Approaches. Parzen window method for density estimation, Feature selection, Search methods, Pattern Recognition Applications., Discriminant functions, Decision surfaces, Classification algorithms: Naive Bayes, Random Tree, Random Forest, Classification using SVM. Classifier Ensembles, , Linear Regression, Types of Clustering, K-Mean Clustering, Iso-data Clustering, Clustering Metrics, Clustering applications, Fuzzy K-Mean, Clustering tendency, Semi Supervised learning. Fuzzy variants of classification and clustering algorithms, Neural networks fundamentals, Genetic Algorithms, Neural and Genetic based approaches for Pattern recognition, Self organizing maps, Advantages/Disadvantages of Neural based approaches for Pattern Recognition.

Text/ Reference Books:

1. Pattern recognition and image processing Earl Gose
2. Pattern classification Duda, Hart, stork.

Course Name: Sensor Network**Code: IT 615**

Introduction of ad-hoc/sensor networks: key definitions, advantages, unique constraints and challenges, applications, and wireless communications/radio characteristics. Media Access Control and routing protocols for Ad-Hoc wireless networks: issues, classification and protocols. Networking Sensors: features, deployment of sensor networks, sensor tasking and control. Sensor Network platforms and tools: Berkley Motes ,Sensor network programming challenges ,Embedded Operating System. Transport layer, QoS issues and security protocols for ad hoc and sensor networks. Simulators for wireless ad hoc and sensor networks. Applications of Ad-Hoc/Sensor Network and Future Directions.

Text/ Reference Books:

1. Ad hoc Wireless Networks C. Siva Ram Murthy & B. S.Manoj.
2. Wireless Sensor Networks: Information Processing Approach Feng Zhao and Leonidas J.Guibas.

Course Name: Big Data Analytics**Code: IT 616**

Overview of Big Data: Introduction, history, elements, related knowledge, big Data in Businesses, and types of big data analytics. Technologies for Handling Big Data: Understanding Hadoop Ecosystem, Big Data Architecture, Hadoop& its Features, Hadoop 2.x Core Components Preview, Hadoop Storage: HDFS (Hadoop Distributed File System), Hadoop Processing: MapReduce Framework, Different Hadoop Distributions, HDFS, Map Reduce YARN, HBase, HBase architecture, Hive, Hive architecture, different modes of hive, Pig, Pig architecture, different modes of Pig, difference between hive and pig, Sqoop, Sqoop architecture, different modes of Sqoop, etc. Understanding of Apache Spark: RDD, Spark Core, Spark Architecture. HadoopVs Apache Spark, Big Data Privacy, Privacy in big data life cycle: Data Generation, Data Storage and Data Processing.

Text/ Reference Books:

1. Hadoop: The Defiantive Guide, By Tom White O’Rielly Publications 4th edition 2015.
2. High Performance Spark, By Holden Karau, Rachel Warren O’Rielly Publications 2014.
3. Getting Started with Storm, By Jonathan Leibiusky, Gabriel Eisbruch, DarioSimonassiO’Rielly Publications 2014.

References:

1. Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and GraphBy David Loshin
2. Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data: Analytics for Enterprise Class Hadoop and Streaming Data By Paul Zikopoulos, Chris Eaton.
3. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, By Michael Minelli, Michele Chambers, Ambiga Dhira.

Course Name: Randomized Algorithm**Code: IT 617**

Introduction to randomized algorithms. Game Theoretic Techniques. Probabilistic Method, MarkovChains and Random Walks. Randomized Data Structures: Treaps, skip lists, Hash tables. Geometric algorithms and linear programming, Graph algorithms, Approximate Counting, Online Algorithms.

Text/ Reference Books:

1. Randomized Algorithm Motwani and Raghavan

Course Name: Cyber Crime & Information Warfare**Code: IT 618**

Introduction of cyber crime, challenges of cyber crime, categorizing cyber crime, cyber terrorism, virtual crimes, perception of cyber criminals: hackers, insurgents and extremist group, interception of data, surveillance and protection, criminal copy right infringement, cyber stalking, hiding crimes in cyber space and methods of concealment. Anonymity and markets, privacy and security at risk in the global information society, privacy in cyber space, war fare concept, information as an intelligence weapon, attack and retaliation attack and defense. An I-WAR risk analysis model, implication of I –WAR for information managers, perceptual intelligence and I-WAR, handling cyber terrorism and information warfare, Jurisdiction.

Text/ Reference Books:

1. Principle of cyber-crime Jonathan Clough
2. Information warfare: Corporate attack and defence in digital world William Hutchinson, Mathew Warren

Course Name: Parallel Algorithms**Code: IT 619**

Introduction to parallel algorithm, data parallel and control parallel approach, models of parallel computation, dense matrix algorithm , sorting searching, selection and graph algorithms. Introduction to distributed algorithms, synchronous algorithms network model, leader election algorithm, minimum spanning tree, shortest path, distributed consensus k agreement problem, two phase commit, three phase commit, mutual exclusion algorithms, and applications of distributed algorithm.

Text/ Reference Books:

1. Parallel algorithms Michael. J.Quinn
2. Distributed algorithm Nancy Lynch
1. Implicit Parallel Programming in Ph, Rishiyur S. Nikhil, 1947-Arvind

Course Name: Computer Vision**Code: IT 620**

Introduction to computer vision, computer imaging system, Image formation and sensing CVIP tools, Image representation. Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization. Image Enhancement in the Spatial Domain, Image Enhancement in the Frequency Domain, Homomorphic Filtering. Image Restoration, Color Image Processing, Segmentation, Thresholding, The Use of Motion in Segmentation, Image Compression, Error-Free Compression, Lossy Compression, Image Compression, Standards, Wavelets and Multiresolution Processing, Multiresolution Expansions, Wavelet Transforms. Chain code, Tracking and Motion model, Reflectance map, Photometric stereo.

Text/Reference Book:

1. Computer vision Dana H. Ballard
2. Computer Vision Young, Tzay Y.

Course Name: Cloud Computing**Code: IT 621**

Cloud Computing: Introduction, Working of cloud computing, benefits; Understanding Cloud Computing: Developing cloud computing services, Discovering cloud services; Cloud Computing for Everyone: Centralizing email communications, Cloud computing for community; Cloud Computing for the Corporation: Managing Schedules, Managing Projects; Using Cloud Services: Collaborating on Calendars, Schedules, and Task Management, Collaborating on Project Management Outside the Cloud: Other Ways to Collaborate Online: Collaborating via Web-Based Communication Tools, Collaborating via Social Networks and Groupware. Case Study: Different cloud models- Private cloud, Public cloud. Creation of private/public cloud using different hypervisors.

Text/ Reference Books:

1. Cloud Computing Michael Miller
2. Implementing and Developing Cloud Computing Applications David E., Y. Sarna,

Course Name: Neural Networks**Code: IT 622**

Introduction to neural networks, working of a biological and an artificial neuron, neural network architectures, types of neural networks: single and multi-layer, perceptron, linear separability, perceptron training algorithm, back propagation algorithm. Adalines, Madalines, adaptive multi-layer networks, prediction networks, radial basis functions. Supervised and unsupervised learning, winner takes all networks, Counter-propagation networks, Adaptive resonance theory, Neocognitron. Associative Memory, Hopfield networks, Bi-directional associative memory, Boltzmann's training. Various types of optimization methods like gradient descent, simulated annealing etc. Introduction to fuzzy logic, neuro-fuzzy systems, Applications of neural networks.

Text/Reference Book:

1. Elements of artificial neural networks by Kisha Mehrotra, Chilukuri K. Mohan and Sanjay Ranka.
2. Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India.
3. Fundamentals of artificial neural networks by Mohammad H. Hassoun, Prentice Hall of India.

Course Name: Software Testing and Quality**Code: IT 623**

Software Testing Principles, Quality, Testing flow process. Defect Classification: Origin of Defects, Classes, Repository and Design, Developer/Tester Support for Developing a Defect Repository. Test Case Design Strategies: Black Box Approach, Random Testing, Equivalence Class Partitioning, Boundary Value Analysis, COTS, White Box approach, Test Adequacy Criteria, Coverage and Control Flow Graphs, Covering Code Logic, Additional White Box Test Design Approaches, Evaluating Test Adequacy Criteria. Unit testing, Integration tests, System testing, Regression testing and Acceptance testing, Test Plan Writing. Testing Tools. Criteria for Test Completion. Types of system testing-Acceptance testing: performance testing, Regression Testing internationalization testing, ad-hoc testing, Alpha – Beta Tests, testing OO systems, usability and accessibility testing. Testing services: Test Planning, Test Plan Components, Test Plan Attachments, Locating Test Items, test management , test process ,Reporting Test Results. Software test automation: Skills needed for automation, scope of automation, design and architecture for automation, requirements for a test tool, challenges in automation, Test metrics and measurements –project, progress and productivity metrics.

Text/ Reference Books:

1. “Software Testing – Principles and Practices”, Pearson education, 2006, Srinivasan Desikan and Gopaldaswamy Ramesh.
2. “Foundations of Software Testing”, Pearson Education, 2008, Aditya P.Mathur.
- 3.

References:

1. Software Testing in the Real World – Improving the Process EdwardKit
2. Effective Software Testing Elfriede Dustin
3. The Art of Software Testing Glenford J.Mayers
4. Foundations of Software Testing Aditya P.Mathur

Course Name: Biometrics**Code: IT 624**

Introduction and definitions of biometric. Traditional authenticated methods and technologies. Biometric technologies: Fingerprint, Face, Iris, Hand Geometry, Gait Recognition, Ear, Voice, Palmprint, On-Line Signature Verification, 3D Face Recognition, Dental Identification and DNA. The Law and the use of Multibiometric systems. Statistical measurement of biometric. Biometrics in Government Sector and Commercial Sector. Case Studies of biometric system., Biometric Transaction. Biometric System Vulnerabilities.

Text/ Reference Books:

1. Biometrics for network security, Paul Reid, hand book of Pearson
1. Handbook of Fingerprint Recognition, D. Maltoni, D. Maio, A. K. Jain, and S. Prabhakar, SpringerVerlag.
2. BIOMETRICS: Personal Identification in Networked, A. K. Jain, R. Bolle, S. Pankanti (Eds.), Society, Kluwer Academic Publishers, 1999.
3. Biometric Systems: Technology, Design and Performance Evaluation, J. Wayman, A.K. Jain, D. Maltoni, and D. Maio (Eds.), Springer.

Course Name: Optimization Method**Code: IT 625**

Unconstrained Optimization, Convex Optimization, Optimization Using Calculus Graphical Optimization, Linear Programming Quadratic Programming. Optimization Problem Formulation of machine learning algorithms like SVM and its variants, ELM and its variant etc.. Study of evolutionary optimization techniques like GA, PSO, Artificial Bee Colony Algorithm, Genetic Algorithm, Ant Colony Optimization, Simulated Annealing, Neadler Mead Algorithm etc. Integer Programming Dynamic Programming 8 Error Functions and their minimization techniques.

Text/ Reference Books:

1. Operations Research : An Introduction by Hamdy A Taha, Pearson

URLs:

1. <https://nptel.ac.in/courses/105/108/105108127/>
2. <https://nptel.ac.in/courses/112/105/112105235/>
3. <https://nptel.ac.in/courses/111/105/111105100/>

Course Name: Principle of Management**Code: IT 705**

Nature and Functions of Management: Importance and Process of Management - Development of Management Thoughts - Managerial Roles.

International Business and its Environment: globalization &WTO-. Dynamics of development Global business environment-. Internal and External analysis. Nature and Importance of Planning Management by Objectives Decision Making.

MIS Forecasting: Techniques of Forecasting. Need for Organization - Principles and Process of Organizing – Span of Management Organization Structure Departmentalization Authority, Delegation and Decentralization.

Staffing and Directing: Requirement of Effective Direction Supervisor and his Qualities Co-Ordination Control

Text/ Reference Books:

1. P.C.Tripathi, P.N. Reddy, Principles of Management, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Prasad LM, Principles and Practice of Management, Sultan Chand & Sons, New Delhi.
3. Samuel C. Certo, S. TrevisCerto, Modern management 10 Ed, PHI Learning, New Delhi, 2008.
4. James A. Stoner, Edward Freeman, Daniel Gilbert, Management, PHI Learning, New Delhi, 2007
5. Williams/ Kulshrestha, Principles of Management, Cengage Learning, New Delhi, 2011.

6. Koontz, Weihrich, Aryasri. Principles of Management, TATA McGraw Hill, New Delhi, 2004.

Course Name: Engineering Economics

Code: IT 706

Introduction to economics: Introduction to Engineering Economy, Time value of money, Cash flow diagrams, Interest and Interest rate.

Discrete compounding and payment: Interest formulae for discrete compounding and discrete payments- Gradient series factors.

Nominal & Effective interest: Economic equivalence, Methods of comparison of alternatives. Replacement analysis, Economic life of the asset.

Depreciation and Depletion: Elements of cost, Break even analysis, Economic order quantity. Cost estimation,

Decision under risk and uncertainty: Effect of taxation on economic studies, Income tax analysis.

Text/ Reference Books:

1. Engineering Economy, DeGarmo, Sullivan & Canada Collier Macmillan.
2. Engineering Economic Analysis, Newnan, Eschenbach & Lavelle, Oxford University Press.
3. Engineering Economy, Blank & Tarquin, McGraw-Hill.

Course Name: Organizational Behavior

Code: IT 707

Concept, nature and importance of management: management skills, levels of management, and human relations, social system approach, decision theory approach. Planning: Organizing: span of control, delegation of authority, authority & responsibility. Staffing, Leading: Leadership Styles,

Development of Leadership Skills: Direction and Supervision Controlling: Integrated Control System, Total Quality Control. Communication

Organization Behavior: Concept, Nature, Models of Organizational Behavior, Individual Behavior: Organizational Power & Politics Organizational Culture: Conflict: Organizational design- Work stress and its management organizational development and change management.

Text/ Reference Books:

1. Robbins Stephen P. - Organizational Behavior (Pearson Education).
2. Newstrom John W. Organizational Behavior: Human Behavior at Work (Tata McGraw Hill).

Course Name: Project Management

Code: IT 708

Concept and cases of project management: Project Life Cycle, Project Selection and Criteria of Choice, Selection Models, Analysis under Uncertainty, Project Portfolio Process.

Project Proposals: The Project and Organization, Pure Project Organization, the Matrix and Mixed Organizational Systems, Initial Project Coordination and the Scheme and Syllabus.

Project Plan: Systems Integration, The Action Plan, The Work breakdown Structure and Linear Responsibility Chart.

Network Techniques: PERT (ADM) and CPM (PDM), Risk Analysis the Varieties of Project Termination, final Report writing.

Text/ Reference Books:

1. Project management - David I Cleland - Mcgraw Hill International Edition.
2. Project Management – Gopalakrishnan – Mcmillan India Ltd.