B.TECH. I Semester-2	L	T	P	C
CS 201: Data Structure & Algorithm	3	0	2	4

Introduction to Data Structure, Basic Data Types	12 Hours
Basic Terminology, Internal representation of Primitive Data structure: Integers, Floating point numbers, Packed decimal, Characters, Structures, Unions, and Pointers. Arrays: Definition, Memory organization, Operations on Arrays: Traversing, Insertion, Deletion, Updating, Resizing Stacks: Basic operations, Stack, Dstack and applications Queues : Operations of queues, Circular Queue, Priority Queue, Dequeue, Application of queues Linked list : Singly linked lists and memory representation, Operations of Link list (Traversing, Searching, Insertion, Deletion, inversion, concatenation, copying and comparison, allocation and deallocation), Doubly linked list and operations, Circular Link list, Multilevel link list	
Trees	**10 Hours**
Introduction, Binary Trees and their representation, Operations on Binary trees: Creation, transformation of trees into binary trees, traversal, Searching, Insertion and Deletion. Type of trees: Complete Binary trees, Extended binary trees, General trees, AVL trees, Threaded trees, B trees Application: Arithmetic expression evaluation, infix-prefix-postfix notation conversion.	
Graph	**10 Hours**
Graph Terminologies, Types of graph, Representation of graphs: Adjacency list, Adjacency matrix, Incidence matrix, Graph Traversal (BFS, DFS), Connected Component, minimum spanning trees, Shortest path algorithms, Topological Sort, Activity Networks and Critical Paths.	
Illustrated Algorithms	**10 Hours**
Sorting (Bubble, Selection, Insertion, Heap sort), Dictionaries, hashing table and functions, collision resolution methods and techniques, Searching(Linear Search, Binary Search), Character String and different string operations	
Total Contact Time: 42 Hours	

Recommended Books

1. “An Introduction to Data Structures with Applications”, Trembley & Sorenson, 2/E, TMH, 1991.
2. “Data Structures using C and C++”, Tanenbaum & Augenstein, 2/E, PHI, 2007.
3. “Fundamentals of Data Structures”, Horowitz and Sahani, Galgotia Publications, reprint 2004.
4. “Introduction to Algorithms”, T. H. Cormen, C. E. Leiserson, R. L. Rivest, 2/E, PHI, 2001.
5. “Data Structures and Program Design in C”, Robert L.Kruse, C.L.Tondo and Brence Leung, Pearson Education, 2/E, 2001

B.TECH. I Semester-2	L	T	P	C
EC 202: Electronic Devices and Circuits	3	0	2	4

Prerequisite
Signals, Frequency Spectrum of Signals, Circuit Models for Amplifiers Intrinsic Semiconductors, Doped Semiconductors, Current Flow in Semiconductors, The pn Junction, The pn Junction with an Applied Voltage, Capacitive Effects in the pn Junction Voltage and Current Laws, Circuit Analysis Techniques, Basic RL and RC circuits, The RLC Circuit

Unit-1 Diodes	**8 Hours**
The Ideal Diode, Terminal Characteristics of Junction Diodes, Modeling the Diode Forward Characteristic, Operation in the Reverse Breakdown Region—Zener Diodes, Rectifier Circuits, Limiting and Clamping Circuits, Special Diode Types (Schottky-Barrier Diode, Varactors, Photodiodes, Light-Emitting Diodes (LEDs), etc.)	
Unit-2 Bipolar Junction Transistors	**10 Hours**
Device Structure and Physical Operation, Current—Voltage Characteristics, BJT Circuits at DC, Transistor Breakdown and Temperature Effects	
Unit-3 MOS Field-Effect Transistors	**10 Hours**
Device Structure and Physical Operation, Current–Voltage Characteristics, MOSFET Circuits at DC, The Body Effect, Temperature Effects, Breakdown & Input Protection, Velocity Saturation, The Depletion type MOSFET	
Unit-4 Operational Amplifier	**14 Hours**
OP-AMP: The Ideal Op Amp, The Inverting Configuration, The Noninverting Configuration, DC Imperfections, Effect of Finite Open-Loop Gain and Bandwidth on Circuit Performance, Large-Signal Operation of Op Amps *Linear-Applications*: Difference Amplifier, Instrumentation Amplifier, Integrator, Differentiator Current-to-Voltage Converters, Voltage-to-Current Converters, Current Amplifier *NonLinear-Applications*: Comparators: Zero-Level Detection, Nonzero-Level Detection, Effects of Input Noise on Comparator Operation, Output Bounding	
Total Contact Time: 42 Hours	

Recommended Books

1. “Engineering Circuit Analysis”, W. H. Hyat, J. E. Kimmerly, S. M. Durbin, 8thEdition, TMH.
2. A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, 7th Edition.
3. Thomas L. Floyd, "Electronic Devices", Prentice Hall, 9th Edition.
4. Boylestad Robert L. and Nashlesky Louis, “Electronics Device & Circuits and Theory”, PHI, 10th Edition, 2009.
5. Millman Jacob, Halkias Christos C. and Parikh C., “Integrated Electronics”, McGraw-Hill, 2nd Edition, 2009.
6. Schilling Donald L. and Belove E., “Electronics Circuits - Discrete and Integrated”, McGraw-Hill, 3rd Edition, 1989, Reprint 2008.
7. "Electronic Principles", Malvin Albert & David J. Bates, Tata McGraw Hill, 7th edition, 2007.

B.TECH. I Semester-2	L	T	P	C
CS 203: Computer Architecture & Organization	3	0	0	3

History, Instruction Set Architecture, Basic Processing Unit, Pipelining	14 Hours
Computer Evolution & Performance: A brief history of Computers, Designing for performance, The evolution of the Intel x86 Architecture, Embedded Systems and the ARM, Performance Assessment *Instruction Set Architecture*: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Stacks, Subroutines, Additional Instructions, Dealing with 32-Bit Immediate Values, CISC Instruction Sets, RISC and CISC Styles, Example Programs, Encoding of Machine Instructions, Concluding Remarks *Basic Processing Unit*: Some Fundamental Concepts, Instruction Execution, Hardware Components, Instruction Fetch and Execution Steps, Control Signals, Hardwired Control, CISC-Style Processors, Concluding Remarks *Pipelining*: Basic Concept - The Ideal Case, Pipeline Organization, Pipelining Issues, Data Dependencies, Memory Delays, Branch Delays, Resource Limitations, Performance Evaluation, Superscalar Operation, Pipelining in CISC Processors, Concluding Remarks	
Basic Input/Output, Interrupts	**8 Hours**
Accessing I/O Devices: I/O Device Interface, Program-Controlled I/O, An Example of a RISC-Style I/O Program, An Example of a CISC-Style I/O Program *Interrupts*: Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling I/O Device Behavior, Processor Control Register, Example of Interrupt Programs, Exceptions. Concluding Remarks	
Input/Output Organization, The Memory System	**10 Hours**
Input/Output Organization: Bus Structure. Bus Operation: Synchronous Bus, Asynchronous Bus, Electrical Considerations. Arbitration. Interface Circuits: Parallel Interface, Serial Interface *Interconnection Standards*: USB, FireWire, PCI Bus, SCSI Bus, SATA, SAS, PCI Express. Concluding Remarks *The Memory System*: Basic Concepts, Semiconductor RAM Memories, Read-only Memories, Direct Memory Access, Memory Hierarchy, Cache Memories, Performance Considerations, Virtual Memory, Memory Management Requirements, Secondary Storage, Concluding Remarks	
Arithmetic	**10 Hours**
Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Unsigned Numbers, Multiplication of Signed Numbers, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations, Decimal-to-Binary Conversion, Concluding Remarks	
Total Contact Time: 42 Hours	

Recommended Books

1. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization and Embedded Systems", 6th Edition, McGraw-Hill, 2001.
2. A. S. Tanenbaum, "Structured Computer Organization", 6th Edition, PHI, reprint 1995.
3. W. Stallings, "Computer Organization & Architecture : Designing For Performance", 6th Edition, PHI, 2002.
4. "Digital Logic and Computer Design", Mano Morris, 3rd Edition, Pearson Education, 2005.
5. M. Mano, "Computer Systems Architecture", 3rd Edition, PHI, reprint 1997.
6. John L. Hannessy, David A. Patterson, "Computer Organization and Design", 2nd Edition, Morgan Kaufmaan, reprint-2003.

B.TECH. I Semester-2	L	T	P	C
AS 204: Discrete Mathematics	3	0	0	3

Graph Theory	8 Hours
Graphs, Definition & basic concepts of finite & infinite graph, Incidence & Degree, Isomorphism, Subgraph, Walk, Path & circuits, Operations on graphs, connected graph, Disconnected graph & components, Complete graph, Regular graph, Bipartite graph, Euler's graph, Hamiltonian paths & circuits, Weighted graphs, Applications, Directed & Undirected graphs, Connectivity of graphs.	
Trees	**6 Hours**
Definition & properties of trees, Pendent vertices in a tree, Distance between two vertices Centre, Radius & diameter of a tree, Rooted & binary trees, Representation of Algebraic structure by Binary trees, Binary search trees, Spanning trees & fundamental circuits.	
Relation & Lattices	**8 Hours**
Definition & Basic properties, Graphs of relation, Matrices of relation, Equivalence relation, Equivalence classes, Partition, Partial ordered relation, Posets, Hasse diagram, Upper bounds, Lower bound, GLB & LUB of sets, Definition & properties of Lattice, Sub lattice, Distributive & modular lattices, complemented & Bounded Lattices, complete lattices & Boolean algebra	
Group Theory	**8 Hours**
Basic properties of Group, Groupoid, semigroup & monoid, Abelian group, Subgroup, Cosets, Normal subgroup, Lagrange's theorem, Cyclic group, Permutation group, Homomorphism & Isomorphism of groups, Basic properties, error correction & detection code. Ring, Field.	
Mathematical Logic & Program Verification	**12 Hours**
Propositions, logical operators & propositional algebra, Predicates& quantifiers, Interaction of quantifiers with logical operators, Logical interference & proof techniques, Formal verification of computer programs (elements of Hoare logic).	
Total Contact Time: 42 Hours	

Recommended Books

1. "Discrete Mathematics and Its Applications", Rosen K.H., McGraw Hill, 6th Ed., 2006.
2. "Discrete Mathematical Structure", Kolman B., Busby R.C. & Ross S., Prentice Hall of India Pvt. Ltd, 5thEd, 2003.
3. "Discrete Mathematical Structure with Applications to Computer Science", Tremblay J. P. & Manohar R., McGraw Hill, 1999.
4. "Graph theory with applications to Engineering & Computer Science", DeoNarsingh., Prentice Hall of India Pvt. Ltd., 2000.
5. "Elements of Discrete Mathematics", Liu C.L., McGraw Hill, 2000.

B.TECH. I Semester-2	L	T	P	C
CS 205: ICT Workshop - II	0	0	4	2

Programming Languages, Introduction to Website Development	28 Hours
Introduction of HTML: Elements, attributes, Heading, Paragraphs, Style, Formatting, Anchor, Image, Audio, Video, Table, list, Forms, Form Input, Form Attributes. Introduction of CSS: Need for CSS, basic syntax and Structure, Selector, Types of CSS, Properties-Background, Border, Display, Cursor, Buttons, Font, Color, Hover, Margin, Padding, Opacity Introduction of Java Script: Variables, Data types, Comment, Operators, If statements, Switch statement, Loop, Functions, Array, Strings, Date, Math, Events, Document Object Model(DOM), Validation. Introduction to PHP.	
Introduction to MATLAB/Scilab	**14 Hours**
Commands, Vectors and Matrices, Indexing into and Modifying Arrays, Array calculations, Calling Functions, Obtaining Help, plotting data, Importing data, Logical Arrays, Programming, Toolboxes.	
Introduction to Android APP Development	**14 Hours**
Layouts, Types of Layouts, Widgets: Edit Text, Button, Toggle Button, Checkbox, Radio Button, Spinner, List View, AutoComplete Text View, Rating Bar, Date Picker, Time Picker, Progress Bar, Toast, Alert Dialog, Scroll View, Activity and Intents, Fragments, Menu: Option Menu, Context Menu, Popup Menu.	
Total Contact Time: 56 Hours	

Recommended Books

1. I. Bayross, “Web enabled commercial application development using HTML, DHTML, JavaScript, PERLCGI”, BPB Publications, 2009.
2. D. W. Mercer, A. Kent, S. D. Nowicki, D. Mercer, D. Squier and W. Choi, “Beginning PHP5”, 1st Edition, Wrox, 2004.
3. S. Holzner, “Complete Reference PHP”, McGraw Hill Education, 2017.
4. M. Glass, Y. Scouarnec, E. Naramore, G. Mailer, J. Stolz and J. G. Gerner, “Beginning PHP, Apache, MySql Web Development”, Wrox, 2004.

B.TECH. I Semester-2	L	T	P	C
HM 206: Yoga Practice	2	0	0	2

Yoga Practice	28 Hours
Introduction Streams of Yoga: Bhakti Yoga, Raja Yoga (Antaranga Yoga, Bahiranga Yoga), Karma Yoga (Concept, Secrets of Action), Jnana Yoga, Unity of Diversity Yoga and Exercise Physiology; Yoga & Health: Concept of Health and Pancha Kosha Vivek, Yogic Concept of Health and Disease; Introduction to Patanjali Yoga Sutras; Introduction to Hatha Yoga & PYS; Yogic Principles of Healthy living; Effect of Diet and Yogic Concept of Diet in Therapeutic Situations Sukshma Vyayama: Grivasanchalana, Janusanchalana, Katisanchalana Breathing Exercise: Hands In and Out, Dog Breathing Exercise, Sasankasana Breathing Exercise, Ankle Stretch Breathing, Tiger Breathing Exercise Loosening Practices: Jogging, Twisting, Side Bending Suryanamaskar Kriyas: Jala Neti, Kapalabhati, Trataka Prayanama: Sectional Breathing, Bastrika, Ujjayi, Sitali - Sitkari - Sadata, Brahmari Mudras: Namaskar, Cin, Nasika, Chinmaya, Brahma Dhyana: OM Meditation, Mindfulness Meditation Asanas: Ardahakatichakrasana, Trikonasana, Uttkattasana, Sukhasana, Paschimotanasana, Siddhasana, Ardhasirsasana, Ardhamatsyendrasana, Bhujangasana, Mastyasana, Padahastasana, Parsvakonasana, Bakasana Kakasana, Suptavajrasana, Vajrasana, Vakrasana, Mayurasana, Dhanurasana, Sarvangasana, Chakrasana Vedic Chanting: Sarve Bhavantu Sukhinah, Aham vrukshasya reriva, Om Vangme manasi, Om Yo Vai Brahmanam, Om yashandasam vrushabo, Om Bhadram karnebhih, hari om shan no mitrah, Om Apyayantu mamangani Deep Relaxation Technique	
Total Contact Time: 28 Hours	

Books and References: