Detailed Syllabus

for

Second Year

B. Tech program in Computer Engineering/ Computer Science/ Computer Science & Engineering

With effective from

Academic year July 2018-19

Approved in the 11th meeting of Academic Council 8th June 2018
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Code</th>
<th>Course title</th>
<th>Weekly Teaching hours</th>
<th>Evaluation Scheme</th>
<th>Credit</th>
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<td>Data Structures</td>
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<td>BTCOC305</td>
<td>Digital Electronics &amp; Microprocessors</td>
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<td>Basic Human Rights</td>
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<td>HTML and Javascript</td>
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<td>Data Structures Lab</td>
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<td>A) Object Oriented Programming in C++</td>
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<td>B) Object Oriented Programming in Java</td>
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<td>A) Numerical Methods</td>
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<td>B) Physics of Engineering Materials</td>
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<td>C) Soft Skills and Personality Development</td>
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<td>BTCOL407</td>
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<td>Field Training / Internship/Industrial Training (4 to 6 weeks which can be completed partially in first semester and second Semester or in at one time.</td>
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<td>to be evaluated at in V Sem.</td>
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**Unit 1: Laplace Transform**
Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by $t^n$, scale change property, transforms of functions divided by $t$, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function. 

**Unit 2: Inverse Laplace Transform**
Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

**Unit 3: Fourier Transform**
Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval’s identity for Fourier Transforms.

**Unit 4: Partial Differential Equations and Their Applications**
Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange’s linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$, and two dimensional heat flow equation (i.e. Laplace equation : $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$).

**Unit 5: Functions of Complex Variables (Differential calculus)**
Limit and continuity of f(z); Derivative of f(z); Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection, bilinear transformation; Conformal mapping.

**Unit 6: Functions of Complex Variables (Integral calculus)**
Cauchy’s integral theorem; Cauchy’s integral formula; Residues; Cauchy’s residue theorem (All theorems without proofs).

**Text Books**
3. A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.

**Reference Books**
4. Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy . Knowledge ware, Mumbai.
Unit 1 6 hrs
Fundamental Structures and Basic Logic: Sets, Venn diagram, Cartesian product, Power sets, Cardinality and countability, Propositional logic, Logical connectives, Truth tables, Normal forms, Validity, Predicate logic, Limitations of predicate logic, Universal and existential quantification, First order logic.


Unit 2 6 hrs
Functions and Relations: Subjective, Injective, Bijective and inverse functions, Composition of function, Reflexivity, Symmetry, Transitivity and equivalence relations.

Unit 3 6 hrs
Combinatorics: Counting, Recurrence relations, generating functions.

Unit 4 6 hrs
Graph Theory: Basic terminology, Multi graphs and weighted graphs, Paths and circuits, Shortest path problems, Euler and Hamiltonian paths, Representation of graph, Isomorphic graphs, Planar graphs, Connectivity, Matching Coloring.

Unit 5 6 hrs
Trees: Rooted trees, Path length in rooted tree, Binary search trees, Spanning trees and cut set, Minimal spanning trees, Kruskal’s and Prim’s algorithms for minimal spanning tree.

Unit 6 6 hrs

Reference Books:

Text Books:
BTCOC303 Data Structures

Unit 1
Introduction: Data, Data types, Data structure, Abstract Data Type (ADT), representation of Information, characteristics of algorithm, program, analyzing programs.

Unit 2
Arrays and Hash Tables: Concept of sequential organization, linear and non-linear data structure, storage representation, array processing sparse matrices, transpose of sparse matrices. Hash Tables, Direct address tables, Hash tables, Hash functions, Open addressing, Perfect hashing.

Unit 3
Searching and Sorting: Sequential, binary searching, skip lists – dictionaries, linear list representation, skip list representation, operations – insertion, deletion and searching. Insertion sort, selection sort, radix sort, File handling.

Unit 4
Linked Lists: Concept of linked organization, singly and doubly linked list and dynamic storage management, circular linked list, operations such as insertion, deletion, concatenation, traversal of linked list, dynamic memory management, garbage collection.

Unit 5
Stacks and Queues: Introduction, stack and queue as ADT, representation and implementation of stack and queue using sequential and linked allocation, Circular queue and its implementation, Application of stack for expression evaluation and expression conversion, recursion, priority queue.

Unit 6

Reference Books:
5. R. G. Dromey, “How to Solve it by Computer”, 2nd Impression, Pearson Education.

Text Books:
BTCOC304 Computer Architecture and Organization

Unit 1  6 hrs
Introduction: Concept of computer organization and architecture, Fundamental unit, Computer function and interconnection, CPU structure and function.

Unit 2  6 hrs
Instruction Sets: Characteristics, Types of operands, Types of operations, Assembly language, Addressing modes, Instruction format, Types of instruction, Instruction execution, Machine state and processor status, Structure of program, Introduction to RISC and CISC architecture.

Unit 3  6 hrs
Computer Arithmetic: The arithmetic and logic Unit, Integer representation, Integer arithmetic, Floating point representation, Floating point arithmetic, Introduction of arithmetic co-processor.

Unit 4  6 hrs
Memory Organization: Internal Memory: Semiconductor main memory, Error correction, Advanced DRAM organization, Virtual memory systems and cache memory systems. External Memory: Organization and characteristics of magnetic disk, Magnetic tape, Optical memory, RAID, Memory controllers.

Unit 5  6 hrs
Control Unit: Control unit operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Micro-instruction sequencing, Micro-instruction execution, Applications of micro-programming.

Unit 6  6 hrs

Reference Books:

Text Books:
BTCOC305 Digital Electronics & Microprocessor

Unit 1
Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, **Number Systems**: binary, signed binary, octal hexadecimal number, binary arithmetic, one’s and two’s complements arithmetic, codes, error detecting and correcting codes.

Unit 2
**Combinational Digital Circuits:**
Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don’t care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, parity checker / generator.

Unit 3
**Sequential circuits and systems:**
A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J-K-T and D-type flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC’s, asynchronous sequential counters, applications of counters.

Unit 4
**Fundamentals of Microprocessors:**
Fundamentals of Microprocessor, Comparison of 8-bit, (8085) 16-bit (8086), and 32-bit microprocessors (80386). **The 8086 Architecture:** Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Unit 5

Unit 6
**8086 Instruction Set and Programming:**

**Text Books:**
Basic Human Rights

Unit 1 6 hrs

The Basic Concepts:
Individual, Group, Civil Society, State, Equality, Justice, Human Values: - Humanity, Virtues, Compassion.

Unit 2 6 hrs

Human Rights and Human Duties:

Unit 3 6 hrs

Society, Religion, Culture, and their Inter-Relationship:
Impact of Social Structure on Human behaviour, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization.

Unit 4 6 hrs

Social Structure and Social Problems:
Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged.

Unit 5 6 hrs

State, Individual Liberty, Freedom and Democracy:
The changing of state with special reference to developing countries, Concept of development under development and Social action, need for Collective action in developing societies and methods of Social action, NGOs and Human Rights in India: - Land, Water, Forest issues.

Unit 6 6 hrs

Human Rights in Indian Constitution and Law:
The constitution of India:
(i) Preamble
(ii) Fundamental Rights
(iii) Directive principles of state policy
(iv) Fundamental Duties
(v) Some other provisions

Text / Reference Books:
- Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.
One hour per week is for program demonstration and instruction which can be conducted as a classroom session or lab session.

**Module 1:**  
Informal introduction to programming, algorithms and data structures, Downloading and installing Python, run a simple program on Python interpreter.  

**Module 2:**  
Variables, operations, control flow – assignments, conditionals, loops, functions: optional arguments, default values, Passing functions as arguments.

**Module 3:**  
Statements, Expressions, Strings: String processing. Exception handling, Basic input/output, Handling files.

**Module 4:**  
Class and Object, Data Structure: List, Tuple and Sequences, Set, Dictionaries.

**Module 5:**  
Using Database and Structured Query Languages (SQL): SQLite manager, Spidering Twitter using a Database, Programming with multiple tables, JOIN to retrieve data.

*Programming assignments are mandatory.*

**Reference Books:**

**Text Books:**
Unit 1  2 hrs


Unit 2  2 hrs

**Hyper Text Markup Language (HTML):** HTML and the Evolution of Markup languages, Create Hyperlinks, Create Tables, Create Web Forms, Image Inserting Techniques, Create Frames, GUI HTML Editors, Site Content and Metadata.

Unit 3  2 hrs


Unit 4  2 hrs

**Cascading Style Sheets:** Cascading Style Sheets for Web page design, Creating CSS rules in Dreamweaver, Format Text with CSS, Use of CSS Selectors, Embed Style Sheets, and Attach External Style Sheets.

**Using CSS with Tables:** Insert and Styling Tables, Import Table Data, Style Tables with CSS, Sort Data in Table.

Unit 4  4 hrs

**JavaScript** first steps; JavaScript first steps overview; What is JavaScript?; A first splash into JavaScript; What went wrong? Troubleshooting JavaScript; Storing the information you need — Variables; Basic in JavaScript — Numbers and operators; Handling text — Strings in JavaScript; Useful string methods; Arrays; Making decisions in your code — Conditionals; Looping code; Functions — Reusable blocks of code; Build your own function; Function return values; Introduction to events

*Programming assignments are mandatory.*

**Reference Books:**
List of Experiments:
1. Write a program to implement stack using arrays.
2. Write a program to evaluate a given postfix expression using stacks.
3. Write a program to convert a given infix expression to postfix form using stacks.
4. Write a program to implement circular queue using arrays.
5. Write a program to implement double ended queue (dequeue) using arrays.
6. Write a program to implement a stack using two queues such that the push operation runs in constant time and the pop operation runs in linear time.
7. Write a program to implement a stack using two queues such that the push operation runs in linear time and the pop operation runs in constant time.
8. Write a program to implement a queue using two stacks such that the enqueue operation runs in constant time and dequeue operation runs in linear time.
9. Write programs to implement the following data structures: (a) Single linked list (b) Double linked list.
10. Write a program to implement a stack using a linked list such that the push and pop operations of stack still take O(1) time.
11. Write a program to create a binary search tree (BST) by considering the keys in given order and perform the following operations on it. (a) Minimum key (b) Maximum key (c) Search for a given key (d) Find predecessor of a node (e) Find successor of a node (f) delete a node with given key.
12. Write a program to construct an AVL tree for the given set of keys. Also write function for deleting a key from the given AVL tree.
13. Write a program to implement hashing with (a) Separate Chaining and (b) Open addressing methods.
14. Implement the following sorting algorithms: (a) Insertion sort (b) Merge sort (c) Quick sort (d) Heap sort.
15. Write programs for implementation of graph traversals by applying: (a) BFS (b) DFS
List of Experiments:

1. Simplification, realization of Boolean expressions using logic gates/universal gates.
2. Realization of half/full adder & half/full subtractors using logic gates.
3. Realization of parallel adder/subtractors using 7483 chip, BCD to Excess-3 code conversion & vice versa.
4. Realization of binary to gray code conversion & vice versa.
5. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits & code converter.
6. Realization of one/two bit comparator and study of 7485 magnitude comparator.
7. Use of a) Decoder chip to drive LED display & b) Priority encoder.
9. Realization of 3-bit counters as a sequential circuit & MOD-N counter design (7476, 7490, 74192, 74193).
10. Writing & testing of sequence generator.
BTCOC401 Design and Analysis of Algorithms

**Unit 1**
6 hrs


**Unit 2**
6 hrs

**Divide and Conquer:** Introduction to Divide and Conquer Technique, Binary Search, Merge Sort, Quick Sort, Strassen’s Matrix Multiplication.

**Unit 3**
6 hrs

**Greedy Algorithms:** Introduction to Greedy Technique, Greedy Method, Optimal Merge Patterns, Huffman Coding, Knapsack Problem, Activity Selection Problem, Job Sequencing with Deadline, Minimum Spanning Tree, Single-Source Shortest Path Algorithm.

**Unit 4**
6 hrs


**Unit 5**
6 hrs

**Backtracking:** Backtracking Concept, N–Queens Problem, Four–Queens Problem, Eight–Queen Problem, Hamiltonian Cycle, Sum of Subsets Problem, Graph Coloring Problem.

**Branch and Bound:** Introduction, Traveling Salesperson Problem, 15-Puzzle Problem, Comparisons between Backtracking and Branch and Bound.

**Unit 6**
6 hrs

**Tree:** Introduction, B-tree, Red-Black Tree (RBT): Insertion, Deletion.


**Reference Books:**

**Text Books:**
Unit 1  
**Probability Theory:** Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes’ theorem of inverse probability, Properties of probabilities with proofs, Examples.

Unit 2  
**Random Variable and Mathematical Expectation:** Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs.

Unit 3  
**Theoretical Probability Distributions:** Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution, Examples.

Unit 4  
**Correlation:** Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient, Probable errors.

Unit 5  
**Linear Regression Analysis:** Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient.

Unit 6  
**Applied Statistics:** Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

**Reference Books:**

**Text Books:**
BTCOC403 Operating System

Unit 1 6 hrs

**Introduction and Operating system structures:** Definition, Types of Operating system, Real-Time operating system, System Components- System Services, Systems Calls, System Programs, System structure. Virtual Machines, System Design and Implementation, System Generations.

Unit 2 6 hrs

**Processes and CPU Scheduling:** Process Concept, Process Scheduling, Operation on process, Cooperating processes, Threads, Inter-process Communication, Scheduling criteria, scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Scheduling Algorithms and performance evaluation.

Unit 3 6 hrs

**Process Synchronization** The critical-section problem, Critical regions, Synchronization Hardware, Semaphores, Classical Problems of synchronization, and Monitors Synchronizations in Solaris.

Unit 4 6 hrs

**Deadlocks:** Systems Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined approach to deadlock Handling.

Unit 5 6 hrs

**Memory Management:** Basic concept, Logical and Physical address map, Memory allocation: Continuous Memory Allocation, Fixed and variable partition, Internal and external fragmentation and compaction, Paging: Principle of operation, Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

**Virtual Memory:** Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

Unit 6 6 hrs

**I/O Hardware:** I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, sDevice independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms.

**File Management:** Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

**Reference Books:**

**Text Books:**
**BTCOE404(A) Object-Oriented Programming using C++**  
*(Elective I)*

**Unit 1**  
6 hrs

*Introduction to Object Oriented Programming and Objects and Classes:* Need of object oriented programming, The object oriented approach, Characteristics of object oriented languages. A class, Objects as data types, Constructors, Objects as function arguments, Returning objects.

**Unit 2**  
6 hrs

*Operator Overloading and Inheritance:* Overloading unary and binary operators, Data conversion. Derived and base class, Public and private inheritance, Levels of inheritance, Multiple inheritance Examples.

**Unit 3**  
6 hrs

*Polymorphism:* Virtual functions, Dynamic binding, Abstract classes and pure virtual functions, Friend functions, this pointer.

**Unit 4**  
6 hrs

*Streams and Files:* Streams, Stream output and input, Stream manipulators, Files and streams, Creating, Reading, Updating sequential and random files.

**Unit 5**  
6 hrs

*Templates and Exception Handling:* Function templates, Overloading function templates, Class templates, Exception handling overview, Need of exceptions, An exception example, Multiple exceptions, Exception specifications.

**Unit 6**  
6 hrs

*Standard Template Library (STL):* Introduction to STL-Containers, Iterators, Algorithms, Sequence containers, Associative containers, Container adapters.

**Reference Books:**

**Text Books:**
Unit 1 6 hrs


Unit 2 6 hrs

Introduction to Classes, Objects, Methods and Strings: Introduction, Declaring a Class with a Method and Instantiating an Object of a Class, Declaring a Method with a Parameter, Instance Variables, set Methods and get Methods, Primitive Types vs. Reference Types, Initializing Objects with Constructors Floating-Point Numbers and Type double.

Unit 3 6 hrs


Unit 4 6 hrs


Unit 5 6 hrs

Classes and Objects: Introduction, Controlling Access to Members, Referring to the Current Object's Members with the this Reference, Time Class Case Study: Overloaded Constructors, Time, Default and No-Argument Constructors, Notes on Set and Get Methods, Composition, Enumerations, Garbage Collection and Method finalize, static Class Members, static Import, final Instance Variables, Time Class Case Study: Creating Packages, Package Access.

Unit 6 6 hrs


Reference Book:

Unit 1 [5 Hrs.]

Unit 2 [5 Hrs.]

Unit 3 [5 Hrs.]
Finite Differences: Forward difference operator, Backward difference operator, Central difference operator, Newton’s interpolation formulae, Newton’s forward–backward-central interpolation formulae.

Unit 4 [5 Hrs.]
Differentiation and Integration: Newton-Cotes formula, Trapezoidal rule, Simpson one–third rule, Simpson three- eighth rule.

Unit 5 Numerical Solution of ODE: Picard’s methods, Taylor series method, Euler’s method, Modified Euler’s method, Runge - Kutta method.

Text Books:
2. S. S. Shastri, Introduction to Numerical Methods, PHI publication.
3. V. Rajaraman, Computer Oriented Methods, 3 rd edition, PHI publication.

Reference Books:
1. Conte and De boor, Elementary Numerical Analysis, BPB publication.

Unit II Conducting and Superconducting Materials: Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors, BCS theory, Josephson effect, High temperature superconductors, Application of superconductors (Cryotron, magnetic levitation)

Unit III Semiconducting Materials: Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic Cell

Unit IV Dielectric Materials: Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials

Unit V Nano Materials: Nanomaterials: Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials.

Text Books:
1. C. Kittle, “Introduction to Solid state Physics”.

Reference Books:
1. V. Raghavan, “Material Science and Engineering”.
UNIT I

Self Management:
Self Management, Self Evaluation, Self discipline, Self criticism, Recognition of one’s own limits and deficiencies, dependency, etc.
Self Awareness, Self Management, Identifying one’s strengths and weaknesses, Planning & Goal setting, Managing self-emotions, ego, pride,- Leadership & Team Dynamics

UNIT II

Time Management Techniques
Practice by game playing and other learning strategies to achieve the set targets Time Management Concept, Attendance, Discipline & Punctuality, Acting in time, Quality /Productive time.

UNIT III

Motivation/ Inspiration
Ability to shape and direct working methods according to self-defined criteria, Ability to think for oneself, Apply oneself to a task independently with self-motivation,
Motivation techniques :Motivation techniques based on needs and field situations

Unit IV

Interpersonal Skills Development
Positive Relationship, Positive Attitudes, Empathies: comprehending others’ opinions, points of views, and face them with understanding, Mutuality, Trust, Emotional Bonding, Handling Situations (Interview), Importance of interpersonal skills

Unit IV

Effective Computing Skills
Designing an effective Presentation: Contents, appearance, themes in a presentation, Tone and Language in a presentation, Role and Importance of different tools for effective presentation

Reference books:
3. Covey, Stephen R., “Seven Habits of Highly Effective People: Powerful Lessons in Personal Change”
BTCOC405 Product Design Engineering

Unit 1  6 hrs
Creating Simple Products and Modules.

Unit 2  6 hrs
Document Creation and Knowledge Sharing.

Unit 3  6 hrs
Self and Work Management.

Unit 4  6 hrs
Team Work and Communication.

Unit 5  6 hrs
Managing Health and Safety.

Unit 6  6 hrs
Data and Information Management.

Text / Reference Books:
1. Model Curriculum for “Product Design Engineer – Mechanical”, NASSCOM (Ref. ID: SSC/Q4201, Version 1.0, NSQF Level: 7)
List of Experiments:

1. Divide and conquer method (quick sort, merge sort, Strassen’s matrix multiplication).
2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).
3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling sales person problem).
4. Obtain the Topological ordering of vertices in a given digraph.
7. Find optimal ordering of matrix multiplication. (Use Dynamic programming method).
8. Use dynamic programming algorithm to solve optimal binary search tree problem.
9. Compute the transitive closure of a given directed graph using Warshall’s algorithm.
10. Write programs to find out a minimum spanning tree of a simple connected undirected graph by applying: (a) Prim’s algorithm (b) Kruskal’s algorithm.
11. Write a program to implement Dijkstra’s algorithm for solving single source shortest path problem using priority queue.
12. Write a program to implement Floyd-Warshall algorithm for solving all pairs shortest path problem.
BTCOL408 Introduction to data science with R

Module 1: Introduction to Basics  4 hrs
Take your first steps with R. Discover the basic data types in R and assign your first variable.

Module 2: Vectors  4 hrs
Analyze gambling behaviour using vectors. Create, name and select elements from vectors.

Module 3: Matrices  4 hrs
Learn how to work with matrices in R. Do basic computations with them and demonstrate your knowledge by analyzing the Star Wars box office figures.

Module 4: Factors  4 hrs
R stores categorical data in factors. Learn how to create, subset and compare categorical data.

Module 5: Data Frames  4 hrs
When working R, you’ll probably deal with Data Frames all the time. Therefore, you need to know how to create one, select the most interesting parts of it, and order them.

Module 6: Lists  4 hrs
Lists allow you to store components of different types. Section 6 will show you how to deal with lists.

Module 7: Basic Graphics  4 hrs
Discover R’s packages to do graphics and create your own data visualizations.

*Programming assignments are mandatory.*

Reference Books:

Text Books:
List of Experiments:

1. Programs on Operators, Arithmetic Promotion, Method Calling.
2. Programs on dealing with Arrays.
4. Programs on Inheritance and Polymorphism.
5. Programs on Garbage collection, packaging, access Modifiers, as well as static and abstract modifiers.
6. Programs on Interfaces, block initializers, final Modifier, as well as static and dynamic binding.
7. Programs on file handling and stream manipulation.
8. Programs on Dynamic Polymorphism.
9. Programs on Dynamic Memory Management.
10. Programs on Exception Handling.
11. Programs on generic programming using templates.
12. Programs on STL-containers and iterators.
BTCOL409 Operating Systems Laboratory

1. Hands on Unix Commands
2. Shell programming for file handling.
3. Shell Script programming using the commands grep, awk, and sed.
4. Implementation of various CPU scheduling algorithms (FCFS, SJF, Priority).
5. Implementation of various page replacement algorithms (FIFO, Optimal, LRU).
6. Concurrent programming; use of threads and processes, system calls (fork and v-fork).
7. Study pthreads and implement the following: Write a program which shows the performance improvement in using threads as compared with process.(Examples like Matrix Multiplication,
11. Implementation of various memory allocation algorithms, (First fit, Best fit and Worst fit),
    Disk
12. Scheduling algorithms (FCFS, SCAN, SSTF, C-SCAN).
13. Kernel reconfiguration, device drivers and systems administration of different operating systems.
14. Writing utilities and OS performance tuning.