University of Engineering & Management

Department of Computer Science

(CSE / CSE (AIML) / CSE (IOT-CYS-BCT))

Detailed Syllabus for Theory Subjects

Course Title: Mathematics - III
Course Code: BTHBSCCS301
Credit: 2

Detailed syllabus:

Module 1: Random Variables & Probability Distributions (12 Lectures)

Discrete Random Variable; Discrete Probability Distribution, Expectation and Variance of random variables; Binomial and Poisson Distributions; Mean, Variance and Moment Generating Functions of Binomial and Poisson Variates; Convergence of Binomial to Poisson Variate.
Continuous Random Variable; Continuous Probability Distributions, Expectation and Variance of random variables, Exponential, Normal and Gamma Distributions; Mean, Variance and Moment Generating Functions of the corresponding variates.
Tchebycheff's Inequality and Weak Law of Large Numbers (Statement only).

Module 2: Method of Least Squares and Curve Fitting (4 Lectures)

Principle of Least Squares, Curve fitting by the method of Least Squares - fitting of straight lines, second degree parabolas and exponential curves.

Module 3: Sampling and Sampling Distributions (8 Lectures)

Population and Sample, Sampling With and Without Replacement (SRSWR and SRSWOR); Random Samples, Population Parameters, Sample Statistics, Sampling Distributions, Standard Error and Probable Error; Sample Mean, Sampling Distribution of Means; Sample Proportion, Sampling Distribution of Proportions, Sample Variances, Sampling Distribution of Variances; Case where Population Variance is unknown; Central Limit Theorem (Statement only); Degrees of freedom, Chi-square distribution, Mean & Variance of Chi-square variate.

Module 4: Estimation of Parameters (6 Lectures)

Point and Interval estimations, Biased and Unbiased estimators, Minimum Variance Unbiased Estimator (MVUE), Consistent Estimator, Maximum Likelihood Estimation of Parameters, Applications in populations following theoretical distributions (Binomial, Poisson and Normal), Calculation of confidence limits for population mean and population proportions.

Module 5: Testing of Hypothesis **(12 Lectures)**

*Large Sample Test***:** Statistical Hypotheses, Test Statistic, Best Critical Region, Test for single mean, difference of means, single proportion, difference of proportions, and difference of standard deviations.
Small Sample Test: Test for single mean, difference of means and correlation coefficients, Test for ratio of variances, Chi-square test for goodness of fit and independence of attributes.

Text Book:

- **Saktipada Nanda and Sibashis Nanda,** "A Course on Probability & Statistics", 1st Edition (2022), Mindprobooks.

Reference Books:

1. **Sheldon M. Ross**, "Introduction to Probability and Statistics for Engineers and Scientists", 6th Edition (2020), Academic Press.
2. **Douglas C. Montgomery and George C. Runger**, "Applied Statistics and Probability for Engineers", 7th Edition, (2018), John Wiley & Sons.
3. **Richard A. Johnson, Irwin Miller and John E. Freund,** "Probability and Statistics for Engineers", 9th Edition (2018), Pearson Education India.
4. **Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan**, "Schaum's Outline of Probability & Statistics", 4th Edition (2012), McGraw Hill Education.
5. **B. K. Pal & K. Das,** "Engineering Mathematics" - Vol. IIA, 13th Edition (2021), U. N. Dhur & Sons.
6. **S. C. Gupta and V. K. Kapoor,** "Fundamentals of Mathematical Statistics", 12th Edition (2020), S. Chand & Sons.
7. **N. G. Das,** "Statistical Methods", Combined Edition Vol. 1 & 2 (2017), McGraw Hill Education.

Course Title: Analog Electronic Circuits
Course Code: BTHESCCS301
Credit: 3

Detailed Syllabus:

Module 1: 10L

1. Filters and Regulators: Capacitor filter, π-section filter, ripple factor, series and shunt voltage regulator, percentage regulation, 78xx and 79xx series, concept of SMPS. [4]
2. Transistor Biasing and Stability: Q-point, Self-Bias-CE, Compensation techniques, h-model of transistors. Expression for voltage gain, current gain, input and output impedance, trans-resistance & trans-conductance; Emitter follower circuits, High frequency model of transistors. [6]

Module 2: 10L

1. Transistor Amplifiers: RC coupled amplifier, functions of all components, equivalent circuit, derivation of voltage gain, current gain, input impedance and output impedance, frequency response characteristics, lower and upper half frequencies, bandwidth, and concept of wide band amplifier. [6]
2. Feedback Amplifiers & Oscillators: Feedback concept, negative & positive feedback, voltage/ current, series/shunt feedback, Berkhausen criterion, Colpitts, Hartley's, Phase shift, Wein bridge and crystal oscillators. [4]

Module 3: 12L

1. Operational Amplifier: Ideal OPAMP, Differential Amplifier, Constant current source (current mirror etc.), level shifter, CMRR, Open & Closed loop circuits, importance of feedback loop (positive & negative), inverting & non-inverting amplifiers, voltage follower/buffer circuit. [6]
2. Applications of Operational Amplifiers: adder, integrator & differentiator, comparator, Schmitt Trigger. Instrumentation Amplifier, Log & Anti-log amplifiers, Trans-conductance multiplier, Precision Rectifier, voltage to current and current to voltage converter, free running oscillator. [6]

Module 4: 8L

Multivibrator – Monostable, Bistable, Astable multivibrators; Monostable and astable operation using 555 timer. [8]

Text books:

1. Microelectronic Circuits, Sedra & Smith, Oxford University Press.
2. Integrated Electronics, Milman & Halkias, Mc Graw Hill Company.
3. Electronic devices & Circuits, Balbir Kumar & Shail B. Jain, PHI.
4. Op-amps and Linear IC's, R.A. Gayakwad, PHI.

Reference books:

1. Microelectronic Circuit- Analysis & Design, Rashid, Cenage Learning.
2. Electronic Circuits: Discrete & Integrated, 3rd Edition, Schilling & Belove, Mc Graw Hill Company.
3. Electronic principles, 6th Edition, Malvino, Mc Graw Hill Company.
4. Operational Amplifier & Linear IC's, Bell, Oxford University Press.
5. 2000 Solved Problems in Electronics, Jimmie J. Cathey, Mc Graw Hill Inc.
6. Electronic Devices -System & Application, Robert Diffenderfer, Cengage Learning.
7. Op- Amps & Linear Integrated Circuits, Ravi Raj Dudeja & Mohan Dudeja, Umesh Publication

Course Title: Digital Electronics
Course Code: BTHESCCS302
Credit: 3

Detailed Syllabus:

Module 1: 10L
Binary Number System & Boolean Algebra [1L]; BCD, Excess-3, Gray codes and their conversions, ASCII, EBCDIC [2L]; Signed binary number representation with 1's and 2's complement methods [1L]; Binary arithmetic, Venn diagram, Boolean algebra (recapitulation) [1L]; Representation in SOP and POS forms, [1L]; Minimization of logic expressions by KMAP [3L]; Quine-McCuskey Minimization Technique (Tabular Method) [1L].

Module 2: 10L
Combinational circuits - Adder and Subtractor circuits (half and full adder, subtractor) [2L]; Code converters, Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator [8L].

Module 3: 12L
Sequential Circuits - Latch & Basic Flip-flops [1L]; Types of Flip-flops -SR, JK, D, T and JK Master-slave Flip-flops [3L]; Basic concept of Synchronous and Asynchronous counters [2L]; Design of Mod N Counter [3L]; Ring counter, Johnson counter [1L]; Registers (SISO, SIPO, PIPO, PISO) [2L].

Module 4: 4L
A/D and D/A conversion techniques – Basic concepts D/A : R-2-R ladder Circuit. A/D: successive approximation type ADC [2L]; Logic families- TTL, ECL, MOS and CMOS - basic concepts [2L].

Text book and Reference books:

1. Morries Mano- Digital Logic Design- PHI

2. R.P.Jain—Modern Digital Electronics, 2/e ,McGraw Hill D.Ray Chaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers 4. Leach & Malvino—Digital Principles & Application, 5/e, McGraw Hill 5. Floyed & Jain- Digital Fundamentals-Pearson.

Course Title: Data Structure & Algorithms
Course Code: BTHPCCCS301
Credit: 3

Detailed Syllabus:

Module 1: 10L
Introduction: Why do we need data structure? [1L]; Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type [2L]; Applications Algorithms and programs [1L]; the basic idea of pseudo-code [2L]; Algorithm efficiency and analysis [1L]; time and space complexity analysis of algorithms – order notations [3L].

Module 2: 10L
Linear Data Structures Array: Different representations – row-major, column-major [1L]; Sparse matrix - its implementation and usage [1L]; Array representation of polynomials [1L]; Linked List: Singly linked list, circular linked list, doubly linked list, linked list representation of polynomials and applications [2L]; Stack and Queue: Stack and its implementations (using array, using linked list), applications (Infix to Postfix conversion, Evaluation of Postfix expression etc.) [2L]; Queue, circular queue, dequeue [1L]; Implementation of queue- both linear and circular (using array, using linked list), Applications [1L]; Recursion: Principles of recursion – use of the stack, differences between recursion and iteration, tail recursion. Applications - Tower of Hanoi [1L].

Module 3: 12L
Nonlinear Data structures: Trees: Basic terminologies, tree representation (using array, using linked list) [1L]; Binary trees - binary tree traversal (pre-, in-, post- order), recursive and non-recursive traversal algorithms of binary tree, threaded binary tree (left, right, full), and expression tree [2L]; Binary search tree- operations (creation, insertion, deletion, searching) [1L]; Height balanced binary tree – AVL tree (insertion, deletion with examples only) [1L]; B-Trees – operations (insertion, deletion with examples only) [1L]; B+ Trees – operations (insertion, deletion with examples only) [1L]; Graphs: Graph definitions and concepts (directed/undirected graph, weighted/un-weighted edges, subgraph, degree, cut vertex/ articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path, and isomorphism) [1L]; Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list [1L]; Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, backedge, cross-edge, forward-edge) [2L]; applications. Minimal spanning tree – Prim's algorithm, Kruskal's algorithm (basic idea of greedy methods) [2L].

Module 4: 4L
Searching and Sorting: Sorting Algorithms: Bubble sort, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort [2L]; Time and space complexity derivations [1L]; Searching: Sequential search, binary search, interpolation search. Time and space complexity derivations. Hashing: Hashing functions, collision resolution techniques [2L].

Textbook and Reference books:
1. "Data Structures Using C" by Reema Thareja.
2. "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed.

3. “Introduction to Algorithms” by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
4. “Data Structures in C” by Aaron M. Tenenbaum

Course Title: IT Workshop (MATLAB)
Course Code: BTHPCCCS302
Credit: 1

Detailed Syllabus:
Module I: [2L]
Introduction, Why MATLAB? History, its strengths, Competitors, Starting MATLAB, Using MATLAB as a calculator, Quitting MATLAB, Basics Familiar with MATLAB windows, Basic Operations, MATLAB-Data types, Rules about variable names, Predefined variables.

Module II: [4L]
Programming-I Vector, Matrix, Array Addressing, Built-in functions, Mathematical Operations, Dealing with strings (Array of characters), Array of array (cell) concept. Programming-II Script file, Input commands, Output commands, Structure of function file, Inline functions, feval command, Comparison between script file and function file.

Module III: [4L]
Conditional statements and Loop, Relational and Logical Operators, if-else statements, switch-case statements, for loop, while loop, Special commands (break and continue), Import data from a large database, Export data to own file or database.

Module IV: [4L]
2D Plotting In-built functions for plotting, Multiple plotting with special graphics, Curve fitting, Interpolation, Basic fitting interface 3D Plotting Use of meshgrid function, Mesh plot, Surface plot, Plots with special graphics

Text book and Reference books:
1. A Guide to MATLAB: For Beginners and Experienced Users by Brian R. Hunt, Jonathan Rosenberg, and Ronald L Lipsman
2. MATLAB: Easy Way of Learning by S. Swapna Kumar and S. V. B. Lenina
3. MATLAB Programming for Engineers by Stephen J. Chapman
4. MATLAB for Beginners: A Gentle Approach by Peter Issa Kattan

Course Title: Principles of Management
Course Code: BTHHSMCS301
Credit: 3

Detailed Syllabus:

Module -I [6L]
Basic concepts of management: Definition – Essence, Functions, Roles, Level. Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.

Module -II [6L]
Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.

Module -III [12L]
Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship. Leadership: Concept, Nature, Styles. Decision making: Concept, Nature, Process, Tools & techniques.

Module -IV [12L]
Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Text book and Reference books:

1. Principles of Management by J. S. Chandan [Test Book]
2. Management – Principles, Processes and Practices by Anil Bhat and Arya Kumar [Reference Book]
3. Principles of Management by P C Tripathi and P N Reddy [Reference Book]

****