Department of Information Technology

Course Structure and Syllabus for 2nd Year / 3rd Semester (Autonomy) B. Tech. in Information Technology

SL. NO.	PAPER CODE	PAPER NAME	L	T	P	CONTACT HRS./WEEK	CREDIT
THEORY							
01.	HS303	ECONOMICS FOR ENGINEERS & FINANCIAL MANAGEMENT	3	0	0	3	3
02.	BS(IT)306	PROBABILITY AND STATISTICS	3	1	0	4	3
03.	IT 301	NUMERICAL METHODS	3	1	0	4	3
04.	IT302	COMPUTER ORGANIZATION	3	1	0	4	3
05.	IT303	DATA STRUCTURE & ALGORITHM	3	1	0	4	3
PRACTICAL							
06.	IT391	NUMERICAL METHODS LAB	0	0	3	3	2
07.	IT392	COMPUTER ORGANIZATION LAB	0	0	3	3	2
08.	IT393	DATA STRUCTURE LAB	0	0	3	3	2
09	IT394	SOFTWARE LAB - I	0	0	3	3	2
		TOTAL	**15**	**4**	**12**	**31**	**23**
10.	MC303	VALUE EDUCATION & HUMAN RIGHTS	3	0	0	3	3

Subject Name: Economics for Engineers & Financial Management
Code: HS-303
Contacts: 3L
Credits: 3

Module-I

Making Economic Decision: The Role of Engineering Economic Analysis, The Decision Making Process: **Engineering Cost and Cost Estimation**: Fixed, Variable ,Marginal, Average Cost, sunk- cost, opportunity cost, Recurring and Non-recurring cost, Incremental cost, Cash Cost versus Book Cost and Life cycle Cost, Cost Estimating: its various Types, Benefits and Difficulties in estimation, Cash Flow Diagram, Estimating Models: Per-Unit ,Segmenting ,Cost Indexes ,Power Sizing, Improvement and The Learning Curve

Cash Flow, Interest and Equivalence: Computing Cash Flows, Time Value of Money and Equivalence , Uniform Series compound Interest Formulas, Single Payment, Uniform Series, Arithmetic Gradient, Nominal and Effective Interest.

Module-II

Present Worth Analysis: End of Year Convention, Viewpoint of Economic Analysis Studies, Borrowed Money Concept, Effect of Inflation & Deflation, Taxes, Economic Criteria Application of Present Worth Technique

Cash Flow & Rate of Return Analysis: Calculation, Treatment of Salvage Value Annual Cash Flow Calculation , Analysis Period, Internal Rate of Return ,Incremental Analysis ,Best Alternative Choosing An Analysis Method , Future Worth Analysis ,Benefit-Cost Ratio Analysis, Sensitivity and Break-even Analysis, Payback Period Incremental Analysis, Comparison of Mutually Exclusive Alternatives, Incremental Challenger-Defender Comparison

Module-III

Depreciation and Replacement Analysis: Basic aspect of Depreciation and Capital Allowance Methods, Replacement Analysis Design Map, Minimum cost Life of A New Asset, Marginal Cost , Minimum Cost Life Problem Natural Resources , Allowances and Depletion

Inflation and Price change: Definition, Effects, Causes, Price Change With Indexes, Type of Indexes, Composite vs Commodity Indexes, Use of Price Indexes in Engineering Economic Analysis
Financial Management: Introduction, Scope of Finance, Objectives & Goal,
Financial Decision, Financial Planning and Capitalization: Definition, Objectives, Changing Roles and functions of Financial Manager.

Capital Budgeting: Nature of Investment Decision, Importance of Capital Budgeting, The Capital Budgeting Process-Investment Criterion, Payback, Rate of Return (ROR)Method, Discounting Cash Flow Method, NPV,IRR, The Benefit-Cost Ratio Method

Module-IV

Management of Working Capital: Financing and importance of Working capital Investment Analysis, Cash Flow determination cost of capital, Capital Budgeting method

Cost-Volume-Profit Analysis: Classification of costs, Allocation, Apportionment ,Absorption, Cost Centers Different Costing systems, Cost analysis for Managerial decisions, Meaning of Linear CVP analysis Objectives, Assumptions Break-Even Analysis, Determining of Break Even point profit Volume Graph Profit, Volume ratio margin of safety

Financial Control: Posting of Ledgers and preparation of Trial Balance,
Preparation of balance Sheet and Profit and loss Accounts, Controlling of other Financial Accounting

Readings

1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,David B.Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub
7. *Van Home,PE- Fundementals of Financial Management-*
8. I.M. Pandey -Financial Management: ,Vikas
9 Khan &Jain-Financial Management, ,TMH

Subject Name: PROBABILITY AND STATISTICS
Code: BS(CS)306
Contacts: 3L +IT = 4
Credits: 3

Module I - Theory of Probability: [8 L]

One dimensional random variable. Probability distributions-discrete and continuous. Expectation. Binomial, Poisson, Uniform, Exponential, Normal distributions and related problems. t, χ^2 and F-distribution (Definition only). Transformation of random variables. Central Limit Theorem, Law of large numbers (statement only) and their applications. Tchebychev inequalities (statement only) and its application.

Module II – Two Dimensional Distribution: [6 L]

Two dimensional probability distributions. Discrete and continuous distributions in two dimensions. Uniform distribution and two dimensional normal distribution. Joint, marginal and conditional distributions .

Module III - Sampling theory: [6 L]

Random sampling: Parameter, Statistic and its Sampling distribution. Standard error of statistic. Sampling distribution of sample mean and variance in random sampling from a normal distribution (statement only) and related problems. Estimation of parameters: Unbiased and consistent estimators. Point estimation. Interval estimation. Maximum likelihood estimation of parameters (Binomial, Poisson and Normal). Confidence intervals and related problems.

Module IV - Testing of Hypothesis: [8 L]

Simple and Composite hypothesis. Critical region. Level of significance. Type I and Type II errors. One sample and two sample tests for means and proportions. χ^2 - test for goodness of fit.

Neyman-Pearson theorem (Statement only) and its application to normal population. Likelihood ratio testing and its application to normal population. Comparison of Binomial Populations; Normal Populations; Testing of Equality of Means;

Module V - Linear Inference and Multivariate Analysis: [8L]

Multiple Regression analysis, linear regression, curvilinear regression and orthogonal polynomials, discriminant analysis, canonical correlations, principal component analysis.

Text Books:

1. Banerjee A., De S.K. and Sen S.: Mathematical Probability, U.N. Dhur & Sons.
2. De S.K. and Sen S.: Mathematical Statistics, U.N. Dhur & Sons.
3. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
4. Das N.G.: Statistical Methods, TMH.
5. Spiegel M R., Schiller J.J. and Srinivasan R.A. : Probability and Statistics (Schaum's Outline Series), TMH.
6. Multivariate Data Analysis: Joseph F. Hair, Rolph E. Anderson , Prentice Hall Higher Education, 2010.
7. Applied Multivariate Statistical Analysis: R. A. Johnson and D.W. Wichern, PHI.
8. Fundamentals of Statistics (Vol-1) ; A.M. Gun, M.K. Gupta and B. Dasgupta, World Press.
9. Probability and Statistics; D. Biswas, New Central Book Agency.
10. Probability, Statistics and Random Processes; T Veerarajan, Tata McGraw-Hill.

NUMERICAL METHODS

Code: CS301

Contacts: 3L +1T = 4

Credits: 3

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors. (4)

Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. Central difference interpolation formula – Stirling and Bessels interpolation. Cubic Spline interpolation. (8)

Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. Weddle's rule , Gaussian Quadrature. (3)

Numerical solution of a system of linear equations:
Gauss elimination method, Gauss Jordan method, Gauss-Seidel iterative method, LU Factorization method
(6)

Numerical solution of Algebraic equation:
Bisection method, Secant method , Regula-Falsi method, Newton-Raphson method. Order of convergence of the iterative methods.(4)

Numerical solution of ordinary differential equation:
Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method. (6)

Numerical solution of partial differential equation:
Finite difference methods, Implicit and explicit schemes. (5)

Text Books:
1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).
5. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
6. Balagurusamy: Numerical Methods, Scitech.

References:
1. Atkinson, Kendall E. Elementary Numerical Analysis New York, NY: John Wiley
2. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
3. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
4. Srimanta Pal: Numerical Methods, OUP.
5. Stoer, J. and Bulirsch, R. Introduction to Numerical Analysis New York, NY: Springer-Verlag,
6. Conte, Samuel D. and de Boor, Carl. Elementary Numerical Analysis: An Algorithmic Approach, New York, NY: McGraw-Hill,

Subject Name: Computer organization

Code: IT 302
Contacts: 3L + 1T = 4
Credits: 3

Module - 1: [6L]

Binary numbers & Boolean algebra , Venn diagram, Logic gates, Truth Tables and function minimization using algebraic method, Karnaugh map, Quine- Mcclusky method
BCD, ASCII, EBDIC, Gray codes and their conversions, Signed binary number representation with 1's and 2's complement methods, Maxterm, Minterm, Representation in SOPand POS

forms ; Realization of Boolean functions using NAND/NOR gates, two-level and multi-level logic circuit synthesis

Module - 2: [10L]
Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor); Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and checker
Sequential Circuits - Basic Flip-flop & Latch, Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops, Registers (SISO,SIPO,PIPO,PISO) ,Ring counter, Johnson counter , Synchronous and Asynchronous counters ,Design of Mod N synchronous and ripple Counter , finite-state machine model, synthesis of synchronous sequential circuits, minimization and state assignment.

Module – 3: [4L]
A/D and D/A conversion techniques – Basic concepts : D/A : R-2-R,weighted register [2L]
A/D: successive approximation, Flash type [2L]

Module – 4: [3L]
Introduction
History of computing, von Neumann machine, Instruction and data, fixedpoint and floating-point numbers, errors, IEEE standards

Module – 5: [7L]
Processor design:
Instruction Set Architecture - Instruction format, opcode optimization; operand addressing; Instruction implementation - data movement, branch control, logical, Input/output and debugging instructions; arithmetic instruction implementation – addition and subtraction, multiplication-division, 2's complement multiplication; Booth's algorithm – theory and examples; bit-pair algorithm; high performance arithmetic.

Module – 6: [3L]
Introduction to Memory subsystem:
Memory technology, memory interfacing, Memory hierarchy – introduction to virtual memory system; cache memory.

Module – 7: [7L]
Control unit design:
hardwired control, micro-programmed control design – micro-instruction formats, control optimization.

Textbooks:

1. Digital Logic Design- Morries Mano- PHI
2. Digital Electronics - Kharate - Oxford
3. Digital Electronics - Logic & Systems by 1.Bigmell & R.Donovan; Cambridge Learning.
4. Digital Logic and State Machine Design (3rd Edition) - D.J.Comer, OUP
5. Mano, M.M., "Computer System Architecture", PHI.
6. BehroozParhami" Computer Architecture", Oxford University Press

Reference:

7.H.Taub & D.Shilling, Digital Integrated Electronics- Mc Graw Hill.
8.D.Ray Chaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers
9.Tocci, Widmer, Moss- Digital Systems,9/e- Pearson
10.J.Bignell & R.Donovan-Digital Electronics-Sle- Cenage Learning.
11.Leach & Malvino-Digital Principles & Application, Sle, Me Graw Hill
12. Floyed & Jain- Digital Fundamentals-Pearson.
13.P.Raja- Digital Electronics- Scitech Publications
14. R.P.Jain-Modern Digital Electronics, 2/e , Me Graw Hill
15. Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,
16. Hamacher, "Computer Organisation", McGraw Hill,
17. N. senthil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers" OUP
18. Chaudhuri P. Pal, "Computer Organisation & Design", PHI,
19. P N Basu- "Computer Organization & Architecture" ,Vikas Pub

Subject Name: DATA STRUCTURE & ALGORITHM
Code: IT 303
Contacts: 3L + 1T = 4
Credits:3

The problem solving process: algorithms and data structure; role of data structure in algorithm efficiency; example: design of an array without and with distinct subscript. [1]

Introduction to algorithms: definition, properties, types (only brute force, divide and conquer, greedy, iterative improvement and recursive); pseudo codes. Time and space complexity: asymptotic notations- Big-Oh and big Theta; properties, simple examples. [2]

Recurrence relations: substitution method. Example- development of recurrence relations from simple pseudo codes. [1]

Abstract Data Type (ADT): concepts of data types, ADT and data structure. Typical ADT: integer, array and list; primitive data types. [1]

Linear and non-linear data structures-definition and examples. [1]

Arrays as data structure: memory representation and implicit addressing; 1D and 2D, row major and column major representations, address translation; language dependence. Applications: polynomial and matrix representation. [2]

Linked Lists: explicit addressing in a node (pointer/reference); singly linked list, circular linked list, doubly linked list. Applications: polynomial (up to three variables) and matrix representation- advantages and disadvantages w.r.t array based representation; large integer arithmetic. Multi-list sparse matrices. [3]

Stack: definition, implementation with arrays and linked lists. infix, postfix and prefix notations- conversion and evaluation; palindromes. Use of stack in nested and recursive call of functions, differences between recursion and iteration, tail recursion. Application - The Tower of Brahma problem. [3]

Queue: circular queue, dequeue. Implementation of queue - linear and circular (using array and linked list); Application: well-formed parenthesis checking. [2]

Trees: basic terminologies, recursive nature; types: free tree, ordered and rooted tree, forest. Tree representation with array and linked list. Binary trees: definition; node, path, level, height; skewed and complete binary tree; extended binary tree. Basic properties of binary trees : height of a CBT, maximum and minimum number of nodes, degree of nodes and their relationship, number of distinct binary trees with n nodes (statement only). Binary tree traversal (pre-, in-, post- level-order); threaded binary tree (left, right, full) - non-recursive traversal using threaded binary tree, advantage; expression tree. Application: Huffman's algorithm. [5]

Binary search tree: definition; operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree and rotations for balancing, insertion and deletion of nodes (with examples only). Tries. Concept of balanced tree structures; B-tree. [3]

Graph: graph as: a mathematical structure, an ADT, a data structure. Representations of graphs in an algorithm - adjacency matrix, adjacency list, incidence matrix and incidence list; comparison. Graph traversal– DFS, BFS, and applications. Minimal spanning tree – Prim's and Kruskal's algorithm.[1] [5]

Sorting: inversion and unsortedness, definition. Classification - internal and external sorts; stability of a sorting algorithm. Sorting by comparison: calculation of lower bound; algorithms- Bubble sort, Insertion sort, Selection Sort, Quick sort, Merge Sort. Linear time sorting: Counting sort, Radix sort. Comparisons of different sorting algorithms.[2] [6]

Heap data structure: Binary heap (max and min). Use: priority queue. Heap sort.[1] [2]

Searching: sequential search using arrays and linked list.[2] Binary search (recursive and non-recursive) and comparison tree[3]; Interpolation search. Comparison of the three algorithms[1] [3]

Hashing: concept of key-to-address transformation, direct addressing, advantages and disadvantages: comparison with other search techniques. Hash functions- division remainder, multiplication, extraction, compression; brief comparison. Collision resolution techniques- open addressing (linear and quadratic probing), chaining; load factor and comparison[1]; applications. [3]

(***Note*****:** *examples should be given using pseudo codes; actual codes have to be developed in the practical classes. Preliminary knowledge of coding and executing some simple programs is required*)

Notes:

[1] Statement of time complexities only.

[2] Derivation of worst case and average case time complexities.

[3] Derivation of worst case time complexity, and mention of average case time complexity.

Text books:

1. **D.E. Knuth:** *The Art of Computer Programming* (Vol. 1& 3), Pearson, 1997.
2. **Horowitz, Sahni, Anderson-Freed**: *Fundamentals of Data Structures in C* (Second Edition), Universities Press, 2008.
3. **T.H. Cormen, C.E. Leiserson, R. Rivest and C. Stein**: *Introduction to Algorithms*, (Second/Third Edition), PHI, 2009.
4. **R. Sedgewick**: *Algorithms in C*, Pearson, 2004.

Reference book:

1. **Ronald L. Graham, Donald E. Knuth, and Oren Patashnik:** *Concrete Mathematics: A Foundation for Computer Science.* Addison-Wesley, 1988.

Subject Name: NUMERICAL METHODS LAB
Code :IT 391
Contacts : 3P
Credits :2

1. Assignments on Newton forward /backward, Lagrange's interpolation.

2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.

3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.

4. Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.

5. Assignments on ordinary differential equation: Euler's and Runga-Kutta methods.

6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

Subject Name: COMPUTER ORGANIZATION LAB.
CODE: IT 392
CONTACTS: 3P
CREDITS: 2

1. Design of all gates using NAND/ NOR gate

2. Design a Full Adder using basic gates and verify its output / Design a Full Subtractor circuit using basic gates and verify its output.

3. Construction of simple Decoder & Multiplexer circuits using logic gates.

4. Design odd /even parity generator / checker

5. BCD to Excess -3 code conversion

6. GRAY to BCD code conversion and viceversa.

7. Realization of RS / JK / D flip flops using logic gates.

8. Design of Shift Register using J-K, D Flip Flop.

9. Realization of Synchronous Up/Down counter.

10. Design of asynchronous MOD- N Counter.

11. Design an Adder/Subtractor composite unit & BCD adder.
12. Design of a 'Carry-Look-Ahead' Adder circuit.
13. Use a multiplexer unit to design a composite ALU .
14. Implement read write operation using RAM IC.
15. Keypad interfacing with 7 segment displayi

Subject Name: Data Structure & Algorithm Lab
Code: IT393
Contacts: 3P
Credits: 2

1. Implementation of array operations:
2. Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem:
3. Evaluation of expressions operations on Multiple stacks & queues:
4. Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists:
5. Polynomial addition, Polynomial multiplication
6. Sparse Matrices: Multiplication, addition.
7. Recursive and Non-recursive traversal of Trees
8. Threaded binary tree traversal. AVL tree implementation
9. Application of Trees. Application of sorting and searching algorithms
10. Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

Subject Name: Software Lab -I

Code: IT394

Contacts: 3P
Credits: 2

Introduction to Microsoft Visual Basic.

Basics of Project, Application, Forms, Tools, Toolbox,

Controls & Properties,
Labels, Buttons, Text Boxes.
Data Types, Type conversionss & their use in VB,
Branching & Looping
Sub-functions & Procedure details, Input box () & Msgbox ().
List boxes & Data lists, List Box control, Combo Boxes, data Arrays.
Frames, buttons, check boxes, timer control,
Programming with data, ODBC data base connectivity. Data Form Wizard, query.
Menus in VB Applications,
GraphicsPrograming.

Case studies using any of the following mini projects with the help of visual programming aids.

Library management system.
Inventory management system.
University examination & grading system.
Tourist information system.
Flight reservation system.
Bookshop automation software.

Value Education & Human Rights

Code: MC303
Contacts: 3L
Credits: 3

Module 1: Values and Self Development-Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.
Module 2: Personality and Behavior Development- Soul and scientific attitude, God and scientific attitude, Positive thinking, Integrity and discipline, Punctuality, Love and kindness, Avoiding fault finding, Free from anger, Dignity of labor, Universal brotherhood and
77 religious tolerance, True friendship, Happiness vs. suffering love for truth, Aware of self destructive habits, Association and cooperation, Doing best, Saving nature.
Module 3:Character and Competence- Science vs. God, Holy books vs. blind faith, Self management and good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of women, All religions and same message, Mind your mind, Self control, Honesty, Studying effectively.
Module 4:Human Rights- Jurisprudence of human rights nature and definition, Universal protection of human rights, Regional protection of human rights, National level protection of human rights, Human rights and vulnerable groups.

Text Books:
1. Chakraborty, S.K., Values and Ethics for Organizations Theory and Practice, Oxford University Press, New Delhi, 2001.
2. Kapoor, S.K., Human rights under International Law and Indian Law, Prentice Hall of India, New Delhi, 2002.

3. Basu, D.D., Indian Constitution, Oxford University Press, New Delhi, 2002.

Reference Books:

1. Frankena, W.K., Ethics, Prentice Hall of India, New Delhi, 1990.
2. Meron Theodor, Human Rights and International Law Legal Policy Issues, Vol. 1 and 2, Oxford University Press, New Delhi, 2000.