Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Matrices:** Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof), Similar matrices, diagonalizable of matrix. Functions of square matrix	8
2	**Probability:** Baye's Theorem, Random Variables:- discrete & continuous random variables, expectation, Variance, Probability Density Function & Cumulative Density Function. Moments, Moment Generating Function. Probability distribution: binomial distribution, Poisson & normal distribution. (For detail study)	9
3	**Sampling Theory and ANOVA** Sampling Distribution, Test of Hypothesis, Level of significance, Critical region, One Tailed and Two Tailed test, Interval Estimation of population parameters. Large and small sample Test of significant for Large Samples: Test for significance of the difference between sample mean and population means, Test for significance of the difference between the means of two samples Test of significant for small samples: Student's t-distribution and its properties. Test of significance of small samples: Test for significance of the difference between sample mean and population means, Test for significance of the difference between the means of two Samples, paired t-test Chi square test:- Test of goodness of fit and independence of attributes, Contingency table. Association of attributes and Yate's correction Analysis of Variance(F-Test): One way classification, Two-way classification(short-cut method)	13
4	**Mathematical Programming** Types of solution, Standard and Canonical form of LPP, Basic and feasible solutions, simplex method. Artificial variables, Big –M method (method of penalty). Duality, Dual simplex method. Non Linear Programming:-Problems with equality constrains and inequality constrains (No formulation, No Graphical method)	12
5	**Correlation & regression, Curve Fitting (Flipped Classroom)** Scattered diagrams, Karl Pearson's coefficient of correlation, covariance, Spearman's Rank correlation(non-repeated and repeated ranks) Regression coefficient & Lines of Regression. Fitting of curves: Least square method. Fitting of the straight line $y=a+bx$,parabolic curve $y=a+bx+cx^2$,& exponential curve $y=ab^x$	--

Books Recommended:

Text books:

1. Higher Engineering Mathematics by Dr. B. S. Grewal 42th edition, Khanna Publication
2. Advanced Engineering Mathematics –Fourth Edition , Dennis G Zill& Warren S Wright
3. Operation Research by Hira &Gupta, S Chand.
4. Probability and Statistics for Engineering, Dr. J Ravichandran, Wiley-India.

Reference Books:

1. Advanced Engineering Mathematics by Kreyszig E. 9th edition, John Wiley.
2. Advanced Engg. Mathematics by C. Ray Wylie & Louis Barrett. TMH International Edition.
3. Mathematical Methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
4. Fundamentals Of Mathematical Statistics by S. C. Gupta, V. K. Kapoor, Sultan Chand & Sons -2003
5. Probability & Statistics with reliability by Kishor s. Trivedi, Wiley India
6. Advanced Engg. Mathematics by C. Ray Wylie & Louis Barrett.TMH International Edition
7. Operations Research by S.D. Sharma KedarNath, Ram Nath& Co. Meerat.
8. Engineering optimization (Theory and Practice) by SingiresuS.Rao, New Age International publication

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Fundamentals:** Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non deterministic finite automaton, transition diagrams and Language recognizers.	**05**
2	**Finite Automata:** NFA with ε transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without ε transitions, NFA to DFA conversion, minimisation of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines. **Applications: –** • For the designing of lexical analysis phase of a compiler.	**06**
3	**Regular Languages:** Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).	**03**
4	**Grammars:** Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, and sentential forms. Right most and leftmost derivation of strings. **Context Free Grammars:** Ambiguity in context free grammars. Minimisation of Context Free Grammars. Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted), Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR(0) grammar.	**12**
5	**Push Down Automata:** Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA. **Applications:** • For designing the parsing phase of a compiler (Syntax Analysis). • For evaluating the arithmetic expressions	**08**
6	**Turing Machine:** Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines, Universal Turing Machine, Halting Problem.	**08**

List of Tutorials/Experiments:

1. Finite state machine and NFA with and without epsilon.
2. NFA to DFA, DFA minimization (Myhill-Nerode theorem), Moore and Mealy machines
3. Regular expressions, Arden's theorem
4. Derivation, Parse tree, ambiguity, Right and left linear grammar

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction to Operating System** Operating System Objectives and Functions, Evolution of operating system, OS Design Considerations for Multiprocessor architectures, Operating System structures, System Calls	04
2	**Process Management** **Process:** Concept of a Process, Process States, Process Description, Process Control Block, Operations on Processes. **Threads**: Definition and Types, Concept of Multithreading, Multi core processors and threads. **Scheduling:** Types of Scheduling: Preemptive and, Non-preemptive, Scheduling Algorithms and their performance evaluation: FCFS, SJF, SRTN, Priority based, Round Robin, Introduction to Thread Scheduling	07
3	**Process Synchronization and Deadlocks** **Concurrency**: Principles of Concurrency, Inter-Process Communication, Process/Thread Synchronization. **Mutual Exclusion**: Requirements, Hardware and Software Support, Semaphores and Mutex, Monitors, Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem. **Principles of Deadlock**: Conditions and Resource Allocation Graphs, Deadlock Prevention, Deadlock Avoidance: Banker's Algorithm for Single & Multiple Resources, Deadlock Detection and Recovery. Dining Philosophers Problem.	10
4	**Memory Management** Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Memory Allocation Strategies: Best-Fit, First Fit, Worst Fit, Next Fit, Relocation, Paging, Segmentation. **Virtual Memory**: Demand Paging, Structure of Page Tables, Page Replacement Strategies: FIFO, Optimal, LRU, LFU, Thrashing.	08
5	**File System and I/O Management** **File Management**: Overview, File Organization and Access, Secondary Storage Management: File Allocation Methods **Input /Output Management** **I/O Management and Disk Scheduling**: I/O Devices, I/O Buffering, Disk Scheduling algorithm: FCFS, SSTF, SCAN, CSCAN, LOOK, C-LOOK. RAID	08
6	**Case Studies** XV6 OS, Distributed OS, Real Time OS, Mobile OS	05

Detailed Syllabus: (Unit wise)		
Unit	**Description**	**Duration**
1	**Introduction to analysis of algorithms:** Introduction, Asymptotic notations (Big-Oh, small-oh, Big Omega, Theta notations). Analysis of Selection Sort, Insertion Sort, Recurrences: Recursion Tree Method, Substitution method, Master's theorem.	**08**
2	**Divide and Conquer :** Analysis of Quick sort, Merge sort, Min-Max algorithm, Finding Median, Efficient algorithms for Integer arithmetic (Euclid's algorithm, Karatsuba's algorithm for integer multiplication, fast exponentiation).	**08**
3	**Dynamic Programming:** General strategy, 0/1 knapsack, Multistage graph, Single Source Shortest Path, All Pair Shortest Path, Travelling salesman problem, Longest common subsequence problem.	**08**
4	**Greedy Approach** General strategy, Knapsack problem, Single Source shortest path, Minimum Spanning Tree (Prims and Kruskal Algorithm), Job Sequencing with deadline.	**05**
5	**Backtracking Strategy and Linear Programming:** **Backtracking Strategy: General** strategy, nqueen problem, graph coloring, sum of subset problem. **Linear Programming:** Introduction to linear programming, geometric interpretation, LP duality, Simplex algorithm, Linear optimization problems and their LP formulation.	**09**
6	**String Matching Algorithms:** The naïve string matching Algorithms ,The Rabin Karp algorithm, String matching with finite automata, The Knuth Morris Pratt algorithm.	**04**

List of Laboratory Experiments: (At Least 08)

Minimum 2 experiments should be implemented using any language on each algorithm design strategy (Divide and conquer, dynamic programming, Greedy method, backtracking and string matching).

Suggested Laboratory Experiments:

Sr. No.	Module Name	Suggested Experiment List
1	Introduction to analysis of algorithm Divide and Conquer Approach	Selection sort, insertion sort. Merge sort, Quick sort, and Binary search.
2	Dynamic Programming Approach	Multistage graphs, single source shortest path, all pair shortest path, 0/1 knapsack, Travelling salesman problem, Longest common subsequence.
3	Greedy Approach	Single source shortest path, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees-Kruskal and prim's algorithm, Optimal storage on tapes.
4	Backtracking and String Matching Algorithms	8 queen problem (N-queen problem), Sum of subsets, Graph coloring, Any String matching algorithm

Books Recommended:

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction to Networking:** Introduction to computer network, network application, network software and hardware components, Network topology, design issues for the layers. **Reference models:** Layer details of OSI, TCP/IP models.	**04**
2	**Physical Layer:** Introduction to Digital Communication System: Guided Transmission Media: Twisted pair, Coaxial, Fiber optics. Unguided media (Wireless Transmission): Radio Waves, Microwave, Bluetooth.	**06**
3	**Data Link Layer:** Design Issues: Framing, Error Control: Error Detection and Correction (Hamming Code, CRC, Checksum), Flow Control: Stop and Wait, Sliding Window (Go Back N, Selective Repeat), Elementary Data Link protocols, HDLC,PPP. **Medium Access Control Sublayer:** Channel Allocation problem, Multiple Access Protocol (Aloha, Carrier Sense Multiple Access (CSMA/CA, CSMA/CD), Wired LANS: Ethernet, Ethernet Standards, Virtual LANs.	**10**
4	**Network Layer:** Network Layer design issues, Communication Primitives: Unicast, Multicast, Broadcast. IPv4 Addressing (Classfull and Classless), Subnetting, Supernetting design problems ,IPv4 Protocol, Network Address Translation (NAT) Routing algorithms : Shortest Path (Dijkastra's), Link state routing, Distance Vector Routing Protocols - ARP,RARP, ICMP, IGMP Congestion control algorithms: Open loop congestion control, Closed loop congestion control, QoS parameters, Token & Leaky bucket algorithms.	**10**
5	**Transport Layer** The Transport Service: Port Addressing, Transport service primitives, Berkeley Sockets, Connection management (Handshake, Teardown), UDP, TCP, TCP state transition, TCP timers TCP Flow control (sliding Window), TCP Congestion Control: Slow Start .	**06**
6	**Application Layer** DNS: Name Space, Resource Record and Types of Name Server. HTTP, HTTPS, SMTP, Telnet, FTP, DHCP.	**06**

List of Laboratory Experiments: (At Least Ten)

1. A Study of LAN topology.
   B. Study of various Network devices.
2. Installation & Configuration of Network Simulator (NS2) in Linux environment. -Study of different topologies and create duplex link in NS2.
3. Building of wired & wireless topology using NS2.
4. Write a program to implement
   A) Error Detection and Correction
   B) Framing
5. Implement Stop and Wait protocol in NS2.
6. Write a program to implement Sliding Window Protocols- Selective Repeat, Go Back N.
7. Build Class A & Class B Network using router and Implement subnetting concept.
8. Write a program to implement any one Routing Protocol.
9. Write a program to find out class of a given IP address, subnet mask & first & last IP address of that block.
10. Write a program to implement Congestion Control algorithms.

Unit	Description	Duration in Hrs
1	**Introduction**: **Need, Basic Guidelines, Content and Process for Value Education** Purpose and motivation for the course. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.	**05**
2	**Understanding Harmony in the Human Being - Harmony in Myself!** Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I am being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health.	**06**
3	**Understanding Harmony in the Family and Society: Harmony in Human-Human Relationship**. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.	**06**
4	**Understanding Harmony in the Nature and Existence: Whole existence as Coexistence** Understanding the harmony in the Nature 19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.	**05**
5	**Implications of the above Holistic Understanding of Harmony on Professional Ethics**: Natural acceptance of human values 23. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order, b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists, and managers, b. At the level of society: as mutually enriching institutions and organizations.	**06**