JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech. in CSE (COMPUTER NETWORKS)
III & IV YEAR COURSE STRUCTURE & TENTATIVE SYLLABUS (R18)

Applicable From 2020-21 Admitted Batch

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Internetworking with TCP/IP	3	0	0	3
2		Database Management Systems	3	0	0	3
3		Design and Analysis of Algorithms	3	0	0	3
4		Finite Automata and Compiler Design	3	0	0	3
5		Professional Elective - I	3	0	0	3
6		Professional Elective - II	3	0	0	3
7		Database Management Systems Lab	0	0	3	1.5
8		Internetworking with TCP/IP Lab	0	0	3	1.5
9		Advanced Communication Skills Lab	0	0	2	1
10		Intellectual Property Rights	3	0	0	0
		Total Credits	**21**	**0**	**8**	**22**

III YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Software Engineering	3	1	0	4
2		Network Programming	3	1	0	4
3		Web Technologies	3	1	0	4
4		Professional Elective – III	3	0	0	3
5		Open Elective - I	3	0	0	3
6		Software Engineering Lab	0	0	3	1.5
7		Network Programming Lab	0	0	3	1.5
8		Web Technologies Lab	0	0	2	1
9		Environmental Science	3	0	0	0
		Total Credits	**18**	**3**	**8**	**22**

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Cloud Computing	3	0	0	3
2		Cryptography and Network Security	2	0	0	2
3		Professional Elective – IV	3	0	0	3
4		Professional Elective – V	3	0	0	3
5		Open Elective – II	3	0	0	3
6		Cryptography and Network Security Lab	0	0	2	1
7		Industrial Oriented Mini Project/ Summer Internship	0	0	0	2*
8		Seminar	0	0	2	1
9		Project Stage – I	0	0	6	3
		Total Credits	**14**	**0**	**10**	**21**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Organizational Behaviour	3	0	0	3
2		Professional Elective –VI	3	0	0	3
3		Open Elective-III	3	0	0	3
4		Project Stage – II	0	0	14	7
		Total Credits	**9**	**0**	**14**	**16**

*Note: Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit a report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

MC – Environmental Science – Should be Registered by Lateral Entry Students Only.
MC – Satisfactory/Unsatisfactory.

Professional Elective-I

	Advanced Computer Architecture
	Distributed Systems
	Distributed Databases
	Optimization Techniques
	DevOps

Professional Elective – II

	Image Processing
	Advanced Computer Networks
	Data Analytics
	Mobile Application Security
	Game Theory

Professional Elective – III

	Mobile Application Development
	Network Administration
	Natural Language Processing
	Cyber Forensics
	Machine Learning

Professional Elective -IV

	Neural Networks & Deep Learning
	Wireless Networks
	Information Retrieval Systems
	Wireless Security
	Network Management Systems and Operations

Professional Elective - V

	Real Time Systems
	Ad-hoc & Sensor Networks
	Distributed Storage Networks
	Blockchain Technology
	Software Process & Project Management

Professional Elective – VI

	Parallel and Distributed Computing
	Internet of Things
	5G Technologies
	Cyber Laws & Ethics
	Network Protocols

INTERNETWORKING with TCP/IP

B.Tech. III Year I Sem.   **L T P C**
                                                                              3 0 0 3

Course Objectives:
1. To help students understand how the protocols and services work, while also exploring the operation and message sequences for all key data-link, network, and transport layer protocols.
2. Students learn how to use a protocol analyzer and common IP software tools to document and troubleshoot a TCP/IP network, including basic addressing and setup.

Course Outcomes:
1. Understand the OSI and TCP/IP models.
2. Apply TCP and UDP protocols in data communication.
3. Understand the formats of a frame, a packet and a segment.
4. Understand the fundamentals of network traffic and collision avoiding techniques.
5. Learn the concepts of mobile network and transport layers.

UNIT - I
Network Models: Layered Tasks, The OSI Model, Layers in OSI Model, TCP/IP Protocol suite, Addressing.
Connecting devices: Passive Hubs, Repeaters, Active Hubs, Bridges, Two Layer Switches, Routers, Three Layer Switches, Gateway, Backbone Networks.

UNIT - II
Internetworking Concepts: Principles of Internetworking, Connectionless Interconnection, Application Level Interconnection, Network Level Interconnection, Properties of the Internet, Internet Architecture, Interconnection through IP Routers.
TCP, UDP & IP: TCP Services, TCP Features, Segment, A TCP Connection, Flow Control, Error Control, Congestion Control, Process to Process Communication, User Datagram, Checksum, UDP Operation, IP Datagram, Fragmentation, Options, IP Addressing: Classful Addressing, IPV6.

UNIT - III
Congestion and Quality of Service: Data Traffic, Congestion, Congestion Control, Congestion Control in TCP, Congestion Control in Frame Relay, Source Based Congestion Avoidance, DEC Bit Scheme, Quality of Service, Techniques to Improve QOS: Scheduling, Traffic Shaping, Admission Control, Resource Reservation, Integrated Services and Differentiated Services.

UNIT - IV
Queue Management: Concepts of Buffer Management, Drop Tail, Drop Front, Random Drop, Passive Buffer Management Schemes, Drawbacks of PQM, Active Queue Management: Early Random Drop, RED Algorithm.

UNIT - V
Stream Control Transmission Protocol: SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control, Congestion Control.
Mobile Network Layer: Entities and Terminology, IP Packet Delivery, Agents, Addressing, Agent Discovery, Registration, Tunneling and Encapsulating, Inefficiency in Mobile IP.
Mobile Transport Layer: Classical TCP Improvements, Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast Recovery, Transmission, Timeout Freezing, Selective Retransmission, Transaction Oriented TCP.

TEXT BOOKS:
1. Behrouz A Forouzan, "TCP/IP Protocol Suite", TMH, 3rd Edition
2. B.A. Forouzan, "Data communication & Networking", TMH, 4th Edition.

REFERENCE BOOKS:
1. Mahbub Hasan & Raj Jain, "High performance TCP/IP Networking", PHI -2005
2. Douglas. E.Comer, "Internetworking with TCP/IP ", Volume I PHI
3. Larry L. Perterson and Bruce S.Davie , "Computer Networks- A Systems Approach", 2011, Morgan Kaufmann
4. Jochen Schiiler, "Mobile Communications", Pearson, 2nd Edition.

DATABASE MANAGEMENT SYSTEMS

B.Tech. III Year I Sem.   **L T P C**
                                                                              3 0 0 3

Prerequisites: A course on "Data Structures".

Course Objectives:
- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Course Outcomes:
- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

UNIT - I
Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.
Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model.

UNIT - II
Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III
SQL: Queries, Constraints, Triggers: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases. **Schema Refinement**: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT - IV
Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT - V
Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:
1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, *Tata Mc Graw Hill* 3rd Edition
2. Database System Concepts, Silberschatz, Korth, *Mc Graw hill*, V edition.

REFERENCE BOOKS:
1. Database Systems design, Implementation, & Management, Peter Rob & Carlos Coronel 7th Ed
2. Fundamentals of Database Systems, Elmasri Navrate, *Pearson Education.*
3. Introduction to Database Systems, C. J. Date, *Pearson Education.*
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, *SPD*.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, *PHI*.
6. Fundamentals of Database Management Systems, M. L. Gillenson, *Wiley Student* Edition.

DESIGN AND ANALYSIS OF ALGORITHMS

B.Tech. III Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites:
1. A course on "Computer Programming and Data Structures".
2. A course on "Advanced Data Structures".

Course Objectives:
- Introduces the notations for analysis of the performance of algorithms.
- Introduces the data structure disjoint sets.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-, average-, and best-case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes:
- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specified application
- Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

UNIT - I
Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.
Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT - II
Disjoint Sets: Disjoint set operations, union and find algorithms
Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph coloring

UNIT - III
Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

UNIT - IV
Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT - V
Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.
NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

TEXT BOOK:
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.

REFERENCE BOOKS:
1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

FINITE AUTOMATA AND COMPILER DESIGN

B.Tech. III Year I Sem.

	L	T	P	C
	3	0	0	3

Course Objectives: Automata and compiler Design mainly deals with the languages which are formal and regular and also deals with grammar present in the machine.

Course Outcomes:
1. Graduates should be able to understand the concept of abstract machines and their power to recognize the languages.
2. Attain the knowledge of language classes & grammar relationship among them with the help of Chomsky hierarchy.
3. Ability to understand the design of a compiler given features of the languages.
4. Ability to implement practical aspects of automata theory.
5. Gain Knowledge of powerful compiler generation tools.

UNIT - I
Formal Language and Regular Expressions: Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata to lexical analysis, lex tools.
Context Free grammars and parsing: Context free grammars, derivation, parse trees, ambiguity LL(K) grammars and LL(1) parsing.

UNIT - II
Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification.
Semantics: Syntax directed translation, S-attributed and L-attributed grammars, Intermediate code – abstract syntax tree, translation of simple statements and control flow statements.

UNIT - III
Context Sensitive features – Chomsky hierarchy of languages and recognizers. Type checking, type conversions, equivalence of type expressions, overloading of functions and operations.

UNIT - IV
Run time storage: Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation.
Code optimization: Principal sources of optimization, optimization of basic blocks, peephole optimization, flow graphs, Data flow analysis of flow graphs.

UNIT - V
Code generation: Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block.

TEXT BOOKS:
1. Introduction to Theory of computation. Sipser, 2nd Edition, Thomson.
2. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

REFERENCE BOOKS:
1. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.
2. Compiler Construction, LOUDEN, Cengage Learning.
3. Elements of Compiler Design, A.Meduna, Auerbach Publications, Taylor and Francis Group.
4. Principles of Compiler Design, V.Raghavan, TMH.
5. Engineering a Compiler, K.D.Cooper, L.Torczon, ELSEVIER.
6. Introduction to Formal Languages and Automata Theory and Computation – Kamala Krithivasan and Rama R, Pearson.
7. Modern Compiler Design, D.Grune and others,Wiley-India.
8. A Text book on Automata Theory, S.F.B.Nasir, P.K.Srimani, Cambridge Univ. Press.
9. Automata and Languages, A.Meduna, Springer.

ADVANCED COMPUTER ARCHITECTURE (Professional Elective – I)

B.Tech. III Year I Sem.
                                                                          L T P C
                                                                          3 0 0 3

Course Objectives
- To impart the concepts and principles of parallel and advanced computer architectures.
- To develop the design techniques of Scalable and multithreaded Architectures.
- To Apply the concepts and techniques of parallel and advanced computer architectures to design modern computer systems.

Course Outcomes: Gain knowledge of
- Computational models and Computer Architectures.
- Concepts of parallel computer models.
- Scalable Architectures, Pipelining, Superscalar processors, multiprocessors

UNIT - I
Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

UNIT - II
Principals of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

UNIT - III
Bus Cache and Shared memory, Backplane bus systems, Cache Memory organizations, Shared-Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

UNIT - IV
Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivetor and SIMD computers, Vector Processing Principals, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5,

UNIT - V
Scalable, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

TEXT BOOK:
   1. Advanced Computer Architecture Second Edition, Kai Hwang, Tata McGraw Hill Publishers.
REFERENCE BOOKS:
   1. Computer Architecture, Fourth edition, J. L. Hennessy and D.A. Patterson. ELSEVIER.
   2. Advanced Computer Architectures, S.G. Shiva, Special Indian edition, CRC, Taylor &Francis.
   3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & Francis Group.
   4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
   5. Computer Architecture, B. Parhami, Oxford Univ. Press.

DISTRIBUTED SYSTEMS (Professional Elective – I)

B.Tech. III Year I Sem.

L	T	P	C
3	0	0	3

Pre-requisites
- A course on "Operating Systems".
- A course on "Computer Organization & Architecture".

Course Objectives:
1. This course provides an insight into Distributed systems.
2. Topics include- Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory

Course Outcomes:
1. Ability to understand Transactions and Concurrency control.
2. Ability to understand Security issues.
3. Understanding Distributed shared memory.
4. Ability to design distributed systems for basic level applications.

UNIT - I
Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI

UNIT - II
Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture.

UNIT - III
 Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, OceanStore. Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging. Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT - IV
Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT - V
Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, Consistency models.

TEXT BOOKS:
1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S. Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:
1. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

DISTRIBUTED DATABASES (Professional Elective - I)

B.Tech. III Year I Sem.   L T P C
                                                              3 0 0 3

Prerequisites: A course on "Database Management Systems"

Course Objectives:
- The purpose of the course is to enrich the previous knowledge of database systems and exposing the need for distributed database technology to confront with the deficiencies of the centralized database systems.
- Introduce basic principles and implementation techniques of distributed database systems.
- Equip students with principles and knowledge of parallel and object-oriented databases.
- Topics include distributed DBMS architecture and design; query processing and optimization; distributed transaction management and reliability; parallel and object database management systems.

Course Outcomes:
- Understand theoretical and practical aspects of distributed database systems.
- Study and identify various issues related to the development of distributed database system.
- Understand the design aspects of object-oriented database system and related development.

UNIT - I
Introduction; Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas.
Distributed DBMS Architecture: Architectural Models for Distributed DBMS, DDMBS Architecture.
Distributed Database Design: Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

UNIT - II
Query processing and decomposition: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data.
Distributed query Optimization: Query optimization, centralized query optimization, distributed query optimization algorithms.

UNIT - III
Transaction Management: Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.

UNIT - IV
Distributed DBMS Reliability: Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning. **Parallel Database Systems**: Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.

UNIT - V
Distributed object Database Management Systems: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing.
Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS

TEXT BOOKS:
1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

REFERENCE BOOK:
1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: The Complete Book", Second Edition, Pearson International Edition.

OPTIMIZATION TECHNIQUES (Professional Elective – I)

B.Tech. III Year I Sem.   **L T P C**
                                                                       3 0 0 3

Prerequisite: Mathematics – I, Mathematics – II.

Course Objectives:
1. To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming.
2. Constrained and unconstrained optimization techniques for solving and optimizing electrical and electronic engineering circuits design problems in real world situations.
3. To explain the concept of Dynamic programming and its applications to project implementation.

Course Outcomes: After completion of this course, the student will be able to:
1. explain the need of optimization of engineering systems
2. understand optimization of electrical and electronics engineering problems
3. apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
4. apply unconstrained optimization and constrained non-linear programming and dynamic programming
5. Formulate optimization problems.

UNIT - I
Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surface - classification of Optimization problems.
Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

UNIT - II
Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems. Degeneracy.
Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

UNIT - III
Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints: Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints: Kuhn – Tucker conditions.
Single Variable Nonlinear Unconstrained Optimization: Elimination methods: Uni Model function-its importance, Fibonacci method & Golden section method.

UNIT - IV
Multi variable nonlinear unconstrained optimization: Direct search methods – Univariant method, Pattern search methods – Powell's, Hooke - Jeeves, Rosenbrock's search methods. Gradient methods: Gradient of function & its importance, Steepest descent method, Conjugate direction methods: Fletcher-Reeves method & variable metric method.

UNIT - V
Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

TEXT BOOKS:
1. Optimization Techniques & Applications by S.S.Rao, New Age International.
2. Optimization for Engineering Design by Kalyanmoy Deb, PHI.

REFERENCE BOOKS:
1. George Bernard Dantzig, Mukund Narain Thapa, "Linear programming", Springer series in Operations Research 3rd edition, 2003.
2. H. A. Taha, "Operations Research: An Introduction", 8th Edition, Pearson/Prentice Hall, 2007.
3. Optimization Techniques by Belegundu & Chandrupatla, Pearson Asia.
4. Optimization Techniques Theory And Practice by M.C. Joshi, K. M. Moudgalya, Narosa Publications.

DEVOPS (Professional Elective – I)

B.Tech. III Year I Sem.   L   T   P   C
                                                                     3   0   0   3

Course Objectives: The main objectives of this course are to
   1. Describe the agile relationship between development and IT operations.
   2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability
   3. Implement automated system update and DevOps lifecycle

Course Outcomes: On successful completion of this course, students will be able to:
   1. Identify components of Devops environment
   2. Describe Software development models and architectures of DevOps
   3. Apply different project management, integration, testing and code deployment tool
   4. Investigate different DevOps Software development models
   5. Assess various Devops practices
   6. Collaborate and adopt Devops in real-time projects

UNIT - I
Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT - II
Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.
DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT - III
Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT - IV
Integrating the system: Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT - V
Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development
Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

TEXT BOOKS:
   1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
   2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOK:
   1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.

IMAGE PROCESSING (Professional Elective – II)

B.Tech. III Year I Sem.   **L   T   P   C**
                                                                                                            3   0   0   3

Pre-requisites:
1. Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques; knowledge of Digital Signal Processing is desirable.
2. A course on "Computational Mathematics"
3. A course on "Computer Oriented Statistical Methods"

Course Objectives:
1. Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
2. The topics include image acquisition; sampling and quantization; preprocessing; enhancement; restoration; segmentation; and compression.

Course Outcomes:
1. Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
2. Demonstrate the knowledge of filtering techniques.
3. Demonstrate the knowledge of 2D transformation techniques.
4. Demonstrate the knowledge of image enhancement, segmentation, restoration and compression techniques.

UNIT - I
Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

UNIT - II
Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

UNIT - III
Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT - IV
Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

UNIT - V
Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

TEXT BOOK:
1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Ed, 2004.

REFERENCE BOOKS:
1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wilely, 3rd Edition, 2004.

ADVANCED COMPUTER NETWORKS (Professional Elective – II)

B.Tech. III Year I Sem.

L	T	P	C
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Prerequisites: Data Communication, Basic Networking Principles

Course Objective: This course aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computer networks.

Course Outcomes:
1. Understanding of holistic approach to computer networking
2. Ability to understand the computer networks and their application
3. Ability to design simulation concepts related to packet forwarding in networks.

UNIT - I
Review of Computer Networks, Devices and the Internet: Internet, Network edge, Network core, Access Networks and Physical media, ISPs and Internet Backbones, Delay and Loss in Packet-Switched Networks, Networking and Internet - Foundation of Networking Protocols: 5-layer TCP/IP Model, 7-Layer OSI Model, Internet Protocols and Addressing.

UNIT - II
Multiplexers, Modems and Internet Access Devices, Switching and Routing Devices, Router Structure. The Link Layer and Local Area Networks-Link Layer, Introduction and Services, Error- Detection and Error-Correction techniques, Multiple Access Protocols, Link Layer Addressing, Ethernet, Interconnections: Hubs and Switches, PPP: The Point-to-Point Protocol, Link Virtualization

UNIT- III
Data-link protocols: Ethernet, Token Ring and Wireless (802.11). Wireless Networks and Mobile IP: Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE 802.11 Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks (WMNs), Multiple access schemes Routing and Internetworking: Network–Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Intra-domain Routing Protocols, Inter-domain Routing Protocols, Congestion Control at Network Layer.

UNIT - IV
Transport and Application Layer Protocols: Client-Server and Peer-To-Peer Application Communication, Protocols on the transport layer, reliable communication. Routing packets through a LAN and WAN. Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control. Principles of Network Applications,

UNIT - V
The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, building a Simple Web Server Creating simulated networks and passing packets through them using different routing techniques. Installing and using network monitoring tools.

TEXT BOOKS:
1. Computer Networking: A Top-Down Approach, James F. Kuros and Keith W. Ross, Pearson, 6th Edition, 2012.
2. Computer Networks and Internets, Duglas E. Comer, 6th Edition, Pearson.

REFERENCE BOOKS:
1. A Practical Guide to Advanced Networking, Jeffrey S. Beasley and Piyasat Nilkaew, Pearson, 3rd Edition, 2012
2. Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Prentice Hall.

DATA ANALYTICS (Professional Electives – II)

B.Tech. III Year I Sem.	**L**	**T**	**P**	**C**
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Prerequisites
1. A course on "Database Management Systems".
2. Knowledge of probability and statistics.

Course Objectives:
- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

Course Outcomes: After completion of this course students will be able to
- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

UNIT - I
Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT - II
Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT - III
Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.
Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT - IV
Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc.
Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

UNIT - V
Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:
1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCE BOOKS:
1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

MOBILE APPLICATION SECURITY (Professional Elective – II)

B.Tech. III Year I Sem.   **L T P C**
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Course Objectives: This course provides a thorough understanding of mobile platforms, including attack surfaces, risk landscape & more.

Course Outcomes:
1. Understand common mobile application security vulnerabilities.
2. Define the security controls of multiple mobile operating systems.
3. Understand and analyze Bluetooth technology.
4. understand and analyze overview of SMS security and Enterprise security.

UNIT - I
Top Mobile Issues and Development Strategies: Top Issues Facing Mobile Devices, Physical Security , Secure Data Storage (on Disk), Strong Authentication with Poor Keyboards , Multiple-User Support with Security, Safe Browsing Environment , Secure Operating Systems, Application Isolation, Information Disclosure, Virus, Worms, Trojans, Spyware, and Malware , Difficult Patching/Update Process, Strict Use and Enforcement of SSL, Phishing , Cross-Site Request Forgery (CSRF), Location Privacy/Security, Insecure Device Drivers, Multi Factor Authentication, Tips for Secure Mobile Application Development.

UNIT - II
WAP and Mobile HTML Security WAP and Mobile HTML Basics, Authentication on WAP/Mobile HTML Sites, Encryption, Application Attacks on Mobile HTML Sites, Cross-Site Scripting, SQL Injection, Cross-Site Request Forgery, HTTP Redirects, Phishing, Session Fixation, Non-SSL Login, WAP and Mobile Browser Weaknesses, Lack of HTTPOnly Flag Support, Lack of SECURE Flag Support, Handling Browser Cache, WAP Limitations.

UNIT - III
Bluetooth Security Overview of the Technology , History and Standards , Common Uses , Alternatives, Future, Bluetooth Technical Architecture , Radio Operation and Frequency, Bluetooth Network Topology , Device Identification , Modes of Operation , Bluetooth Stack ,Bluetooth Profiles, Bluetooth Security Features , Pairing , Traditional Security Services in Bluetooth, Security "Non-Features", Threats to Bluetooth Devices and Networks, Bluetooth Vulnerabilities, Bluetooth Versions Prior to v1.2, Bluetooth Versions Prior to v2.1.

UNIT - IV
SMS Security Overview of Short Message Service, Overview of Multimedia Messaging Service, Wireless Application Protocol (WAP), Protocol Attacks, Abusing Legitimate Functionality, Attacking Protocol Implementations, Application Attacks, iPhone Safari, Windows Mobile MMS, Motorola RAZR JPG Overflow, Walkthroughs, Sending PDUs, Converting XML to WBXML.

UNIT - V
Enterprise Security on the Mobile OS Device Security Options, PIN, Remote, 346 Secure Local Storage, Apple iPhone and Keychain, Security Policy Enforcement, Encryption, Full Disk Encryption, E-mail Encryption, File Encryption, Application Sandboxing, Signing, and Permissions, Application Sandboxing, Application Signing, Permissions, Buffer Overflow Protection, Windows Mobile, iPhone, Android, BlackBerry, Security Feature Summary.

TEXT BOOK:
1. Mobile Application Security, Himanshu Dwivedi, Chris Clark, David Thiel, TATA McGraw Hill.

REFERENCE BOOKS:
1. Mobile and Wireless Network Security and Privacy, Kami S. Makki, et al, Springer.
2. Android Security Attacks Defenses, Abhishek Dubey, CRC Press.

GAME THEORY (Professional Elective – II)

B.Tech. III Year I Sem.　　　　　　　　　　　　　　　　　　　　　L　T　P　C
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Course Objectives: The course will explain in depth the standard equilibrium concepts (such as Nash equilibrium, Subgame-Perfect Nash Equilibrium, and others) in Game Theory.

Course Outcomes:
1. Understand the basic concepts of game theory and solutions
2. Understand different types of equilibrium interpretations
3. Understand and analyze knowledge and solution concepts
4. Analyze extensive games with perfect information

UNIT - I
Introduction- Game Theory, Games and Solutions Game Theory and the Theory of Competitive Equilibrium, Rational Behavior, The Steady State and Deductive Interpretations, Bounded Rationality Terminology and Notation. Nash Equilibrium- Strategic Games, Nash Equilibrium Examples Existence of a Nash Equilibrium, Strictly Competitive Games, Bayesian Games: Strategic Games with Imperfect Information.

UNIT - II
Mixed, Correlated, and Evolutionary Equilibrium - Mixed Strategy Nash Equilibrium, Interpretations of Mixed Strategy Nash Equilibrium, Correlated Equilibrium, Evolutionary Equilibrium, Rationalizability and Iterated Elimination of Dominated Actions -Rationalizability Iterated Elimination of Strictly Dominated Actions, Iterated Elimination of Weakly Dominated Actions.

UNIT - III
Knowledge and Equilibrium -A Model of Knowledge Common Knowledge, Can People Agree to Disagree? Knowledge and Solution Concepts, The Electronic Mail Game

UNIT - IV
Extensive Games with Perfect Information -Extensive Games with Perfect Information Subgame Perfect Equilibrium Two Extensions of the Definition of a Game The Interpretation of a Strategy, Two Notable Finite Horizon Games , Iterated Elimination of Weakly Dominated, Strategies Bargaining Games - Bargaining and Game Theory , A Bargaining Game of Alternating Offers Subgame Perfect Equilibrium Variations and Extensions.

UNIT - V
Repeated Games - The Basic Idea Infinitely Repeated Games vs.\ Finitely Repeated Games, Infinitely Repeated Games: Definitions Strategies as Machines Trigger Strategies: Nash Folk, Theorems Punishing for a Limited Length of Time: A Perfect Folk Theorem for the Limit of Means Criterion Punishing the Punisher: A Perfect Folk Theorem for the Overtaking Criterion, Rewarding Players Who Punish: A Perfect Folk Theorem for the Discounting Criterion The Structure of Subgame Perfect Equilibria Under the Discounting Criterion Finitely Repeated Game.

TEXT BOOKS:
1. A course in Game Theory, M. J. Osborne and A. Rubinstein, MIT Press
2. Game Theory, Roger Myerson, Harvard University Press
3. Game Theory, D. Fudenberg and J. Tirole, MIT Press

REFERENCE BOOKS:
1. Theory of Games and Economic Behavior, J. von Neumann and O. Morgenstern, New York: John Wiley and Sons.
2. Games and Decisions, R.D. Luce and H. Raiffa, New York: John Wiley and Sons.
3. Game Theory, G. Owen, 2nd Edition, New York: Academic Press.

DATABASE MANAGEMENT SYSTEMS LAB

B.Tech. III Year I Sem.

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Co-requisites:
- Co-requisite of course "Database Management Systems"

Course Objectives:
- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

Course Outcomes:
- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

List of Experiments:
1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.)
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

TEXT BOOKS:
1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

REFERENCES BOOKS:
1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, *Pearson Education*
3. Introduction to Database Systems, C.J. Date, *Pearson Education*
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, *SPD.*
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, *PHI.*
6. Fundamentals of Database Management Systems, M. L. Gillenson, *Wiley Student Edition.*

INTERNETWORKING WITH TCP/IP LAB

B.Tech. III Year I Sem.   **L T P C**
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Course Objectives:
1. To help students understand how the protocols and services work, while also exploring the operation and message sequences for all key data-link, network, and transport layer protocols.
2. Students learn how to use a protocol analyzer and common IP software tools to document and troubleshoot a TCP/IP network, including basic addressing and setup.

Course Outcomes:
1. Understand the IP concepts.
2. Understand the formats of a frame, a packet and a segment.
3. Monitor the network in terms of Packet types, throughput etc.
4. Apply techniques to measure performance of TCP networks

List of Lab Experiments:
1. Demonstrate IP Configuration Procedure
2. An experiment to assign the IP address using CIDR.
3. An experiment to configure the APACHE server.
4. An experiment to capture and decode the Ethernet frame.
5. An experiment to decode header fields of IP datagram
6. An experiment to decode header fields of TCP header
7. Demonstrate the procedure to configure a DNS Server
8. Identify, Download & Install open source tools related to TCP/IP such as Wireshark, Nmap etc.
9. Write a program to implement TCP/IP socket communication in Java.
10. Compile & Test the Test TCP (TTCP), a utility for measuring network throughput.

TEXT BOOKS:
1. Behrouz A Forouzan, "TCP/IP Protocol Suite", TMH, 3rd Edition
2. B.A. Forouzan, "Data communication & Networking", TMH, 4th Edition.

REFERENCE BOOKS:
1. Mahbub Hasan & Raj Jain," High performance TCP/IP Networking", PHI -2005
2. Douglas. E.Comer, "Internetworking with TCP/IP ", Volume I PHI
3. Larry L. Perterson and Bruce S.Davie , "Computer Networks- A Systems Approach", 2011, Morgan Kaufmann
4. Jochen Schiller, "Mobile Communications", Pearson, 2nd Edition.

ADVANCED COMMUNICATION SKILLS LAB

B.Tech. III Year I Sem.   **L   T   P   C**
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1. INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.

3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.

4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/   e-mails/assignments etc.

5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

INTELLECTUAL PROPERTY RIGHTS

B.Tech. III Year I Sem.   **L T P C**
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UNIT – I
Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III
Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV
Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.
Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V
New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.
International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT & REFERENCE BOOKS:
1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.