B. TECH.

COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

FIFTH SEMESTER

STUDY AND EVALUATION SCHEME

B.TECH. COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

III Year: V SEMESTER

S.No.	Subject Code	Subject name	L	T	P	Sessional Assessment			SEE	Subject Total	Credit
						MST	TA	Total			
THEORY SUBJECT											
1	TCS501	Artificial Intelligence	3	1	0	15	15	30	70	100	4
2	TCS502	Operating System	3	1	0	15	15	30	70	100	4
3	TCSD051 - 054	Departmental Elective-I	3	1	0	15	15	30	70	100	4
4	TCSD501	Foundation of Data Science	3	1	0	15	15	30	70	100	4
5	THM501	Constitution of India	2	0	0	15	15	30	70	100	0
6	TGP501	General Proficiency	-	-	-	-	-	50	0	50	0
PRACTICAL/DESIGN/DRAWING											
7	TCS551	Artificial Intelligence Lab	0	0	2	15	15	30	70	100	1
8	TCS552	Operating System Lab	0	0	2	15	15	30	70	100	1
9	TCS553	Mini Project or Internship Assessment	0	0	4	15	15	30	70	100	2
		Total	11	3	8					800	20

TCSD 051 – 054	Departmental Elective - I
TCSD-051	Object Oriented Design and Modeling
TCSD-052	Distributed System
TCSD-053	Cloud Computing
TCSD-054	Internet of Things
TCSD-055	Data Visualization

ARTIFICIAL INTELLIGENCE
(TCS501)

COURSE OUTCOMES (COs):	
CO1	Understand different types of AI agents.
CO2	apply various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms.
CO3	Understand the fundamentals of knowledge representation, reasoning, and machine learning techniques and apply them to real world problems.
CO4	Student should be aware of techniques used for classification and clustering.
CO5	Apply simple knowledge-based systems using languages like LISP, Prolog, and AI tools like JESS.
Unit	**Topic**
I	Introduction to Artificial Intelligence, Brief history, Various approaches to AI, Areas of application, Simulation of sophisticated and Intelligent Behavior in different area, Problem solving in games, natural language processing, automated reasoning, and visual perception, Knowledge and its role in AI, Heuristic algorithm versus solution guaranteed algorithms, Introduction to soft computing.
II	Representing problems in state space, informed versus uninformed search, Production System Model, Evaluation of the Production System, Depth First Search and Breadth First Search, Heuristics, Heuristic Search Techniques: Hill Climbing, Best First search, A* Algorithm, Branch and Bound, Cryptarithmetic Problem, Means End Analysis, AO* Algorithm, Game Playing: MINMAX Search, Alpha-Beta Pruning, Heuristic Estimation.
III	Knowledge Representation and Reasoning: Propositional Logic, First Order Predicate Logic, Graphs, Associative Network, Semantic Networks, Conceptual Dependencies, Frames, Scripts, Horn Clauses, Introductory Examples from PROLOG, Case Grammar Theory, Production Rules Knowledge Base, The Interface System, Forward and Backward Deduction, Inference System in Propositional and Predicate Logic, Reasoning under Uncertainty.
IV	Understanding Natural Languages, Various Approaches of NLP, Parsing techniques, Context free and transformational grammars, Transition nets, Augmented transition nets, Fillmore's grammars, Grammar free analyzers, Sentence generation, and translation, Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine Perception, Object Identification, Speech Recognition.
V	Expert Systems: Architecture of Expert System, Representing and using domain knowledge, Expert System Shell, Explanation System, Knowledge Acquisition System, Case study of Existing Expert Systems like DENDRAL, MYCIN, Development of a small Expert System using programming Languages and tools like LISP, PROLOG, JESS.

Text Book (s):

1. N. J. Nilsson, “Artificial Intelligence: A New Synthesis”, Elsevier Publications, Standard Edition,1998.
2. I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Addison-Wesley Educational Publishers, 2011.
3. M. Tim Jones, ―Artificial Intelligence: A Systems Approach (Computer Science) ‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008
4. Charnick, “Introduction to A.I.”, Addison Wesley, 1985.
5. Rich and Knight, “Artificial Intelligence”, McGraw-Hill Publication, 3rd Edition, 2017.
6. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013.

OPERATING SYSTEM
(TCS502)

COURSE OUTCOMES (COs):

CO 1:	Understand the fundamental concepts and components of operating systems.
CO 2:	Analyze and apply CPU scheduling and process management techniques.
CO 3:	Identify and manage deadlock situations using prevention, avoidance, detection, and recovery methods.
CO 4:	Understand and apply memory management techniques, including paging and segmentation.
CO 5:	Describe and manage file systems and I/O operations, including disk scheduling and RAID configurations.

Unit	Topic
I	**Introduction to Operating Systems** Computer system overview, concept of an operating system, batch system, multiprogramming, multiprocessing, multi user, time sharing, personal system, real time system, general system architecture, operating system services, system calls, system structure, Approaches to OS design and implementation: Microkernel, Layered, Kernel Approach.
II	**CPU Scheduling:** Concept of process, process states, process state transitions, process control block, threads, mutual exclusion and synchronization, Schedulers, Scheduling Concepts, Performance Criteria, Scheduling Algorithms, Inter process communication Deadlock Problem, Deadlock Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Methods for Deadlock Handling.
III	**Inter-process Communication:** Race conditions, Critical sections, Mutual exclusion, Critical-section problem, and Algorithmic approach to implementing critical sections, Hardware support for process synchronization, Semaphores, Mutexes, and Monitors. **Classic Problems of Synchronization:** Producers-consumers with bounded buffers problem, Readers-writers problem, Dining-philosophers problem.
IV	**Memory Management:** Introduction, Logical and Physical Address Space, Swapping, Contiguous Memory Allocation, Fragmentation, Paging, Structure of Page Table, Segmentation, Segmentation with Paging. Virtual Memory: Demand Paging, Performance of Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.
V	**File system:** File Concept, Access Methods, Directories, Mounting of File-System, File-System Structure, File-System Implementation, Allocation Methods. I/O Devices, and I/O Subsystems, I/O Buffering, Disk Storage and Disk Scheduling, Disk Management, RAID.

Text Book (s):

1. Operating system, Galvin & Silberschatz, 7th Edition, John Willey 2004
2. Operating Systems-A Concept Based Approach, Dhamdhare, TMH 2006
3. Dhananjay M. Dhamdhere, “Operating Systems A Concept-Based Approach”, TMH
4. Operating System Concepts, Ekta Walia, Khanna Book Publishing 2020
5. Operating Systems –A Design Oriented Approach, Crowley, TMH, 2001

DEPARTMENTAL ELECTIVE - I
(TCSD051-054)
OBJECT ORIENTED DESIGN AND MODELING
(TCSD051)

COURSE OUTCOMES (COs):	
CO 1:	Analyse information systems in real-world settings and use an object-oriented method for analysis and design.
CO 2:	Understand features of object-oriented design such as encapsulation, polymorphism, inheritance, and UML.
CO 3:	Understand and prepare different types of UML diagrams like use case diagrams, interaction diagrams, nested state diagrams, state chart diagrams, activity diagram etc.
CO 4:	Understand and appreciate the use of Design Patterns in the Software Development.
CO 5:	Understand the core and advance Java Programming features and apply them in complex problem solving.

Unit	**Topic**
I	Object Oriented Design and Modeling: Object oriented fundamentals, Objects and Classes, Object-oriented Design Process, importance of modeling, principles of modeling, OOAD Methods, Software Development Life Cycle, Introduction to Unified Process, Introduction to UML: UML Terminology, conceptual model of the UML, Use of UML in Unified Process.
II	Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams, Links and Associations, Link Attributes and Link Classes, Generalization and Inheritance, Aggregation and Composition, Qualified Association, Handling multiplicity in Object creation, Abstract Classes, Specifying constraints in Class Diagrams,
III	Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Use Case Modeling: Use Cases and Use Case Diagrams.
IV	Behavioral Modeling: Interactions and Interaction Diagrams, Use-Case Realization: Scenario, Events Trace Diagram, Collaboration Diagrams, State Chart Diagrams, Nested State Diagrams, Activity Diagrams, Advanced Behavioral Modeling Concepts, Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.
V	Elementary Design Patterns, The MVC Architecture Pattern, Features of Elegant Software Design: Elegant variable, Elegant Classes, Elegant Methods, Elegant Packages, Introduction to Object Oriented Software Quality Metrics.

Text Book (s):

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.
2. Mark Priestley: Practical Object-Oriented Design with UML, TATA Mc-GrawHill.
3. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.

DISTRIBUTED SYSTEM
(TCSD052)

COURSE OUTCOMES (COs):	
CO 1:	Understand the characteristics and challenges of distributed systems, including resource sharing, system models, and networking principles, covering types of networks and protocols such as Ethernet, WiFi, Bluetooth, and ATM.
CO 2:	Explore interprocess communication methods, including APIs, external data representation, client-server and group communication, and technologies such as Java RMI and the Sun Network File System.
CO 3:	Analyze operating system support for distributed systems, focusing on layers, protection, processes and threads, and communication and invocation mechanisms.
CO 4:	Examine time and global states in distributed systems, including clock synchronization, logical time, and coordination mechanisms such as mutual exclusion, elections, and consensus.
CO 5:	Investigate transactions and concurrency control in distributed systems, including nested transactions, locks, optimistic concurrency control, and methods for handling distributed transactions, deadlocks, and recovery.

Unit	Topic
I	**Characterization of Distributed Systems.** Examples of distributed systems, Resource sharing on the web, challenges. **System Models:** Introduction, Architectural model fundamental model. **Networking and Internetworking:** Types of Networks, Network Principles, Internet Protocols**.** Ethernet, WIFI, Bluetooth and ATM.
II	**Interprocess Communication:** API for the internet protocols, External data representation and marshalling, client-server communication, Group communication, Interprocess communication in Unix. **Distributed Objects and Remote Invocation:** Communication between distributed objects, Remote Procedure calls, Events and notifications, Java RMI, Sun network File system.
III	**Operating System Support:** Operating system Layer, Protection, Processes and threads, Communication and Invocation, Operating system Architecture. **Security:** Overview of security techniques, Cryptographic algorithms, Digital signatures, Cryptography pragmatics.
IV	**Time and Global States:** Clocks, events and process states, synchronizing physical clocks, logical time and logical clocks. **Coordination and agreement:** Distributed mutual exclusion, elections, multicast communication, consensus and related problems.
V	**Transactions and concurrency control:** Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. **Distributed Transactions:** Flat and Nested transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

Text Book (s):

1. Distributed Systems, S. Ghosh, Chapman & Hall/CRC, Taylor & Francis Group.
2. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Pearson Education
3. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
4. Rama krishna,Gehrke," Database Management Systems", McGraw Hill
5. Vijay K.Garg Elements of Distributed Computing, Wiley

CLOUD COMPUTING
(TCSD053)

COURSE OUTCOMES (COs):	
CO 1:	Analyze the evolution, and underlying principles of cloud computing and its characteristics.
CO 2:	Evaluate client systems, networks, server systems, and security from a service perspective within cloud computing.
CO 3:	Understand the conceptual models and functionalities of Infrastructure.
CO 4:	Assess resource management techniques and security challenges associated with inter-cloud resource provisioning.
CO 5:	Use and Examine cloud computing platforms along with current trends and research.
Unit	**Topic**
I	**Introduction To Cloud Computing:** Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristic, cloud environment.
II	Cloud Computing Technology - Client systems, Networks, server systems and security from services perspectives; Accessing the cloud with platforms and applications; cloud storage.
III	**Working with Cloud-** Infrastructure as a Service – conceptual model and working Platform as a Service – conceptual model and functionalities Software as a Service – conceptual model and working Technologies and Trends in Service provisioning with clouds.
IV	**Resource Management and Security In Cloud:** Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges
V	Case studies-Microsoft Azure, Google App Engine and Open-source clouds- Open-Nebula and Eucalyptus, Current trends and research.

Text Book (s):

1. Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications, Cambridge.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach.
3. Dimitris N. Chorafas, Cloud Computing Strategies.

INTERNET OF THINGS
(TCSD054)

Course Outcomes (COs):	
CO1	Understand the fundamental concepts of IoT, including its functionality and ecosystem.
CO2	Understand various IoT hardware components, including computing platforms, sensors, and actuators.
CO3	Understand Compare and contrast wireless communication protocols used in IoT, including Bluetooth, Wi-Fi, ZigBee, and cellular IoT.
CO4	Analyze IoT solution architecture models and their application in real-world scenarios.
CO5	Explore IoT applications and case studies across different industries fields.
Unit	**Topic**
I	**Introduction to IoT:** What is IoT, how does it work? Difference between Embedded device and IoT device, Properties of IoT device, IoT Ecosystem, IoT Decision Framework, IoT Solution Architecture Models, Major IoT Boards in Market.
II	**Elements of IoT Hardware Components-** Computing (Arduino, Raspberry Pi), Sensing, Actuation, I/O interfaces.
III	**Communication Protocols used in IoT:** Types of wireless communication, Major wireless Shortrange communication devices, properties, comparison of these devices (Bluetooth, WIFI, ZigBee, 6LoWPAN), Major wireless Long-range communication devices, properties, comparison of these devices (Cellular IoT, LPWAN.
IV	**IoT Applications:** Industrial Internet 4.0, Applications such as: Smart home, wearables, smart city, smart grid, connected car, connected health (digital health, telehealth, telemedicine), Smart Retail.
V	**IoT Case Studies:** IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

Text Book (s):

1. Vijay Madisetti, Arshdeep Bahga, Ïnternet of Things, “A Hands-on Approach”, University Press
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, “Introduction to Internet of Things: A practical Approach”, ETI Labs
3. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press
4. Jeeva Jose, “Internet of Things”, Khanna Publishing House, Delhi
5. Adrian McEwen, “Designing the Internet of Things”, Wiley
6. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill
7.CunoPfister, Getting Started with the Internet of Things, O Reilly Media, 2011
8.. Kyung, C.-M., Yasuura, H., Liu, Y., Lin, Y.-L., Smart Sensors and Systems, Springer International Publishing, 2015

DATA VISUALISATION
(TCSD055)

CO 1:	Understand and apply the principles and techniques of data visualization to effectively communicate data insights.
CO 2:	Utilize various tools and software to create diverse types of visualizations for different data sets.
CO 3:	Design and evaluate effective data visualizations, considering design principles and user perception.
CO 4:	Develop interactive visualizations and dashboards, integrating them with databases and big data platforms.
CO 5:	Analyze and critique real-world data visualizations, understanding ethical considerations and emerging trends in the field.
UNIT	**TOPICS**
I	**Introduction to Data Visualization** Overview of Data Visualization, Importance and purpose of data visualization, History of data visualization, Key principles of effective visualization, Data types and their implications for visualization, Introduction to visualization tools like Tableau, Matplotlib, and D3.js.
II	**Visual Encoding and Design** Understanding visual encoding techniques, Color theory and its application in visualization, Design principles for effective visualizations, Perception and cognition in visual data interpretation, Use of charts, graphs, and maps for different data types, best practices for designing dashboards and reports.
III	**Data Visualization Techniques** Exploring different types of visualizations: Bar charts, line charts, scatter plots, pie charts, histograms, and heatmaps, Advanced visualization techniques: Tree maps, bubble charts, network diagrams, and geospatial visualizations, Interactive visualizations: Techniques and tools for creating dynamic and user-interactive visuals, Visualization of time-series data, Visual storytelling and narrative techniques.
IV	**Tools and Technologies** Introduction to popular data visualization tools: Tableau, Power BI, and QlikView, Overview of open-source visualization libraries: Matplotlib, Seaborn, Plotly, and D3.js, Data preparation for visualization using Python and R, Integration of visualization tools with databases and big data platforms, Creating and publishing interactive dashboards and reports.
V	**Evaluation and Applications** Evaluating the effectiveness of data visualizations, Case studies of successful data visualizations in various industries, Ethical considerations in data visualization, Addressing bias and misleading visuals, Trends and future directions in data visualization, Visualization in AI and machine learning contexts.

Text Book (s):

1. Tamara Munzner, "Visualization Analysis and Design," CRC Press.
2. Stephen Few, "Show Me the Numbers: Designing Tables and Graphs to Enlighten," Analytics Press.
3. Edward R. Tufte, "The Visual Display of Quantitative Information," Graphics Press.
4. Nathan Yau, "Data Points: Visualization That Means Something," Wiley.
5. Alberto Cairo, "The Functional Art: An Introduction to Information Graphics and Visualization," New Riders.
6. Ben Fry, "Visualizing Data: Exploring and Explaining Data with the Processing Environment," O'Reilly Media.

FOUNDATION OF DATA SCIENCE
(TCSD501)

COURSE OUTCOMES (COs):	
CO 1:	Understand key concepts and processes in Data Science, and identify various data types and sources.
CO 2:	Apply data preprocessing techniques to prepare data for analysis.
CO 3:	Utilize probability and statistical methods for data-driven analysis.
CO 4:	Implement and evaluate basic machine learning algorithms.
CO 5:	Analyze real-world data science applications, with consideration for ethical implications and emerging trends.
Unit	**Topic**
I	**Introduction to Data Science** Overview of Data Science, Data Science process, data types and sources, introduction to data mining, tools and technologies like Python, R, and relevant libraries.
II	**Data Preprocessing** Data cleaning, data transformation, feature engineering, data integration, exploratory data analysis (EDA) with visualization techniques.
III	**Probability and Statistics for Data Science** Basic probability, statistical inference, descriptive statistics, correlation and regression, understanding key probability distributions.
IV	**Machine Learning Basics** Introduction to machine learning, supervised vs. unsupervised learning, key algorithms, model evaluation metrics, overfitting and underfitting.
V	**Data Science Applications and Ethics** Real-world applications in various domains, big data technologies like Hadoop and Spark, data ethics and privacy, emerging trends in AI and deep learning.

Text Book (s):

1. Joel Grus, "Data Science from Scratch: First Principles with Python," O'Reilly Media.
2. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, "Introduction to Data Mining," Pearson.
3. Wes McKinney, "Python for Data Analysis," O'Reilly Media.
4. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective," MIT Press.
5. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, "The Elements of Statistical Learning," Springer.
6. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data," O'Reilly Media.

CONSTITUTION OF INDIA
(THM501)

COURSE OUTCOMES (COs):	
CO 1:	Identify and explore the basic features and modalities about Indian constitution.
CO 2:	Differentiate and relate the functioning of Indian parliamentary system at the centre and state level.
CO 3:	Differentiate different aspects of Indian Legal System and its related bodies.
CO 4:	Knowledge about Human Rights.
CO 5:	Knowledge about Professional Ethics.
UNIT	**TOPICS**
I	**Constitution of India** Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution, Preamble to the Indian Constitution Fundamental Rights & its limitations.
II	**Fundamental Duties and Union Executives** Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties. Union Executives — President, Prime Minister, Parliament, Supreme Court of India.
III	**State Legislature and Electoral Process** State Executives — Governor Chief Minister, State Legislature High Court of State, Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th &9Ist Amendments.
IV	**Human Rights** Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. Human Rights —Meaning and Definitions, Legislation Specific Themes in Human Rights- Working of National Human Rights Commission in India, Powers and functions of Municipalities, Panchayats and Co - Operative Societies.
V	**Professional Ethics** Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

Text Book(s):

1. J. N. Pandey, "Constitutional Law of India," Central Law Agency.
2. M. P. Jain, "Indian Constitutional Law," LexisNexis.
3. Granville Austin, "The Indian Constitution: Cornerstone of a Nation," Oxford University Press.
4. D. D. Basu, "Introduction to the Constitution of India," LexisNexis.
5. V. N. Shukla, "Constitution of India," Eastern Book Company.
6. H. M. Seervai, "Constitutional Law of India: A Critical Commentary," Universal Law Publishing.

ARTIFICIAL INTELLIGENCE LAB
(TCS551)

LIST OF THE EXPERIMENTS:

1. Write a python program to implement Breadth First Search Traversal

2. Write a python program to implement Water Jug Problem

3. Write a python program to remove punctuations from the given string

4. Write a python program to sort the sentence in alphabetical order

5. Write a program to implement Hangman game using python.

6. Write a program to implement Tic-Tac-Toe game using python.

7. Write a python program to remove stop words for a given passage from a text file using NLTK

8. Write a python program to implement stemming for a given sentence using NLTK

9. Write a python program to POS (Parts of Speech) tagging for the give sentence using NLTK

10. Write a python program to implement Lemmatization using NLTK

11. Write a python program to for Text Classification for the give sentence using NLTK

12. Design and Development of Expert System using JESS

Note: The instructor may add/ modify the list as per his/her wisdom for better hands on the students.

OPERATING SYSTEM LAB
(TCS552)

LIST OF THE EXPERIMENTS:

1. Implement CPU Scheduling Policies:
    i. SJF
    ii. Priority
    iii. FCFS
    iv. Multi-level Queue

2. Implement any file allocation technique:
    - Linked
    - Indexed
    - Contiguous

3. Implementation of contiguous allocation techniques:
    i. Worst-Fit
    ii. Best- Fit
    iii. First- Fit

4. Calculation of external and internal fragmentation
    i. Free space list of blocks from system
    ii. List process file from the system

Note: The instructor may add/ modify the list as per his/her wisdom for better hands on the students.

B. TECH.

COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

SIXTH SEMESTE

STUDY AND EVALUATION SCHEME

B.TECH. COMPUTER SCIENCE AND ENGINEER (ARTIFICIAL INTELLIGENCE AND DATA SCIEN

III Year: VI SEMESTER

S. No.	Subject Code	Subject name	L	T	P	Sessional Assessment			SEE	Subject Total	Credit
						MST	TA	Total			
THEORY SUBJECT											
1	TCS601	Computer Networks	3	1	0	15	15	30	70	100	4
2	TCS602	Software Engineering	3	1	0	15	15	30	70	100	4
3	TCSD601	Machine Learning	3	1	0	15	15	30	70	100	4
4	TCSD061 - 064	Departmental Elective-II	3	0	0	15	15	30	70	100	3
5	TOE061 - 064	Open Elective –I	3	0	0	15	15	30	70	100	3
6	THM601	Indian Tradition, Culture and Society	2	0	0	15	15	30	70	100	0
7	TGP601	General Proficiency	-	-	-	-	-	50	0	50	0
PRACTICAL/DESIGN/DRAWING											
8	TCS651	Computer Networks Lab	0	0	2	15	15	30	70	100	1
9	TCS652	Software Engineering Lab	0	0	2	15	15	30	70	100	1
		Total	**17**	**3**	**4**					**800**	**20**

The internship (5 - 6 weeks) conducted during summer break after VI semester and will be assessed during VII

CSM061 - 064	**Departmental Elective - II**
TCSD-061	Robotics
TCSD-062	Data Compression
TCSD-063	Recommender Systems
TCSD-064	Virtual Reality
TCSD-065	Time Series Analysis and Forecasting

TOE061 - 064	**Open Elective - I**
TOE-061	Remote Sensing
TOE-062	Bioterrorism and National Security
TOE-063	Quality Management
TOE-064	Soft Computing

COMPUTER NETWORKS
(TCS601)

COURSE OUTCOMES (COs):	
CO 1:	Understand fundamental concepts of computer network technology.
CO 2:	Comprehend various network topologies and protocols.
CO 3:	Examine the roles and functions of different network devices.
CO 4:	Analyze the architecture and principles underlying contemporary computer networks.
CO 5:	Understand future Internet requirements and their implications for computer network architecture.

Unit	Topic
I	**Computer Networks and The Internet:** Networks, Internet, Network Components, Network Categories, network edge, **Network Core,** Delay, Loss and throughput in Packet-Switched Networks, Protocol Layers and their Service Models.
II	**Data Link Layer:** Introduction to the link layer; Error Detection and Correction Techniques; Multiple Access links and Protocols; Switched local area networks.
III	**Network Layer:** Introduction; Virtual circuit and datagram networks; Router, Internet Protocol (IP): Forwarding and Addressing in the Internet, Routing Algorithms; Routing in the Internet, Broadcast and Multicast Routing.
IV	**Transport Layer:** Introduction and Transport-Layer Services; Multiplexing and Demultiplexing; Connectionless Transport: UDP; Principles of Reliable of Data Transfer; Connection-Oriented Transport: TCP; Principles of Congestion Control, TCP Congestion Control.
V	**Application Layer:** Principles of Network Applications, WWW and HTTP, Non-Persistent and Persistent Connections, Cookies, Web Caching, File Transfer, Remote Logging, Electronic Mail in the Internet, Domain Name System, Security: Introduction, Cryptography and Cryptanalysis, Public Key Cryptography Algorithms, RSA Algorithm, DES, Authentication and Authorization

Text Book (s):

1. A.S. Tanenbaum, DJ Wetherall, Computer Networks, Prentice-Hall, 2010. .
2. LL Peterson, BS Davie, Computer Networks: A Systems Approach, Morgan-Kauffman,2011.
3. G. Keiser, “Local Area Networks”, 2nd Edition, TMH 2002
4. D. Bertesekas and R. Gallager, “Data Networks”, 2nd Edition, PHI 2000
5. William Stallings, “Data & Computer Communication”, PHI, 10th Edition 2013
6. B.A. Forouzan, “Data communications and networking”, TMH, 5th Edition2012
7. B.A. Forouzan, “Local Area Networks”, TMH. 2002
8. B.A. Forouzan, “TCP/IP Protocol Suite”, TMH.2004

SOFTWARE ENGINEERING
(TCS602)

COURSE OUTCOMES (COs):	
CO 1:	Understand and apply fundamental software engineering principles and practices in the design, development, and maintenance of software systems.
CO 2:	Develop and analyze software requirements specifications, ensuring they are complete, consistent, and feasible.
CO 3:	Design software architecture and components using appropriate modelling techniques, such as UML, to create effective and efficient software solutions.
CO 4:	Implement software systems using modern programming languages and development environments while adhering to best coding practices.
CO 5:	Conduct software testing and debugging to ensure software reliability, performance, and correctness.

Unit	Topic
I	Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.
II	Software Requirement Specifications (SRS). Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Attributes, Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.
III	Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.
IV	Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.
V	Software Maintenance and Software Project Management, Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Text Book (s):

1. Software Engineering: A Practitioner's Approach, Pressman Roger, TMH.
2. An Integrated Approach to Software Engineering, Pankaj Jalote. Narosa Pub.
3. Software Engineering Concepts: Richard Fairly, Tata McGraw Hill.
4. Schaum's Series, "Software Engineering", TMH
5.Ghezzi, Carlo and Others, "Fundamentals of Software Engineering", PHI
6.Alexis, Leon and Mathews Leon, "Fundamental of Software Engineering", Vikas
7.Sommerville, Ian, "Software Engineering", AWL

MACHINE LEARNING
(TCSD601)

COURSE OUTCOMES (COs):	
CO1:	Understand and explain the fundamental concepts of machine learning, including supervised, unsupervised, and reinforcement learning, and their applications in solving real-world problems.
CO2:	Apply various machine learning algorithms to build predictive models using appropriate datasets.
CO3:	Analyze and evaluate the performance of machine learning models using various metrics and improve model accuracy through various techniques.
CO4:	Implement and utilize machine learning libraries and frameworks to develop and deploy machine learning solutions in practical scenarios.
CO5:	To optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

Unit	Topic
I	Basic Concepts, Introduction to Machine Learning, Applications of ML, Design Perspective and Issues in ML, Supervised, Unsupervised, Semi-supervised learning with applications and issues, A Formal Learning Model, The Runtime of Learning.
II	Model (or hypothesis) representation, decision boundary, cost function, gradient descent, regularization, Diagnostic: debugging a learning algorithm, evaluating a hypothesis (Model selection), training/validating/testing procedures, diagnosing bias versus variance and vice versa, regularization and bias/variance, learning curves, Accuracy and Error measures: classifier accuracy measures, predictor error measure, evaluating the accuracy of a classifier or predictor, Confusion metric, precision, recall, tradeoff between both, accuracy.
III	Decision Tree: representation, hypothesis, issues in Decision Tree Learning, Pruning, Rule extraction from Tree, Learning rules from Data, Probabilistic classifier: Bayes rule, Maximum Likelihood Estimation, case study, Support Vector Machine, Nearest Neighbor.
IV	Clustering: Unsupervised learning technique, Similarity and Distance Measures, k-means and k-medoids algorithm, optimization objective, random initialization, choosing value of k, EM algorithm Bayesian networks, bag of words classifiers, N-gram models; Markov and Hidden Markov models, Graphical Models, Combining Multiple Learners.
V	Reinforcement Learning: Elements of Reinforcement Learning, Model-Based Learning, Temporal Difference Learning, Generalization, Design and Analysis of Machine Learning Experiments.

Text Book (s):

1. Ethem Alpaydin, Introduction to Machine Learning, PHI, 2015.
2. H. Witten and E. Frank, Data Mining: Practical Machine Learning Tools and TechniquesMorgan Kaufmann2005.
3. Tom Mitchell, Machine Learning, McGraw-Hill, 1997.

DEPARTMENTAL ELECTIVE - II
(TCSD061-064)
ROBOTICS
(TCSD061)

COURSE OUTCOMES (COs):	
CO 1:	Understand the types, components, and classification of robots, including kinematic systems and control systems, while addressing social issues and safety in robotics.
CO 2:	Analyze robot kinematics and dynamics, focusing on translation and rotation representation, coordinate transformation, and dynamic modeling using Euler-Lagrange formulation.
CO 3:	Explore various sensors and vision systems used in robotics, including contact, proximity, position, and vision applications, with a focus on camera calibration and image formation geometry.
CO 4:	Apply control theories to robotics, including P, PD, PID, and advanced control laws, and understand the selection and function of various robot actuation systems.
CO 5:	Develop skills in control hardware and interfacing, focusing on embedded systems architecture, integration with sensors and actuators, and programming for robot applications.

Unit	**Topic**
I	Introduction to Robotics: Types and components of a robot, Classification of robots, closed-loop and openloop control systems, Kinematics systems; Definition of mechanisms and manipulators, social issues and safety.
II	Robot Kinematics and Dynamics: Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics, Dynamic Modelling: Equations of motion: Euler-Lagrange formulation
III	Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc, Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity/Affine/Projective transformations, Vision applications in robotics.
IV	Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID, Non-linear and advanced controls, Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.
V	Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications

Text Book (s):

1. Saha, S.K., “Introduction to Robotics, McGraw-Hill Higher Education, New Delhi.
2. Ghosal, A., “Robotics”, Oxford, New Delhi.
3. Niku Saeed B., “Introduction to Robotics: Analysis, Systems, Applications”, PHI.
4. Mittal R.K. and Nagrath I.J., “Robotics and Control”, Tata McGraw Hill.
5. Mukherjee S., “Robotics and Automation”, Khanna Publishing House, Delhi.
6. Craig, J.J., “Introduction to Robotics: Mechanics and Control”, Pearson, New Delhi.

DATA COMPRESSION
(TCSD062)

COURSE OUTCOMES (COs):	
CO 1:	Understand the mathematical foundations of data compression, focusing on information theory, entropy, and various source models.
CO 2:	Apply lossless compression techniques, including Huffman coding, arithmetic coding, and dictionary methods, and analyze standards like JPEG-LS and JBIG.
CO 3:	Explore lossy compression methods, considering distortion criteria, the human visual system, and concepts like conditional and differential entropy.
CO 4:	Analyze advanced compression algorithms, including Prediction with Partial Match (PPM), Burrows-Wheeler Transform, and Dynamic Markov Compression.
CO 5:	Evaluate scalar and vector quantization, differential encoding, and video compression techniques, focusing on performance metrics for compression algorithms.

Unit	Topic
I	Mathematical Preliminaries – Information theory, average information content, Entropy. Source models-Physical, probabilistic, Markov, Composite models. Uniquely decodable codes.
II	Huffman coding, arithmetic coding, Dictionary techniques, predictive coding. JPEG-LS, CCITT group 3, 4 recommendations, comparison of MH, MR, MMR, JBIG.
III	Lossy coding – distortion criteria, Human visual system, conditional entropy, average mutual information, differential entropy.
IV	Prediction with Partial Match (ppm): The Basic Algorithm, The ESCAPE SYMBOL, Length of Context, The Exclusion Principle, The Burrows - Wheeler Transform: Move to- Front Coding, CALlC, JPEG-LS, Dynamic Markov Compression.
V	Scalar and vector quantization, differential encoding, transforms, sub-band and wavelets, video compression techniques and standards. Performance metrics for compression algorithms.

Text Book (s):

1. Introduction to Data Compression, Khalid Sayeed, Morgan Kaufmann pub.
2. Elements of Data Compression, Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition, Khalid Sayeed, The Morgan Kaufmann Series 4. Data Compression: The Complete Reference 4th Edition by David Salomon, Springer
5. Text Compression1st Edition by Timothy C. Bell Prentice Hall.

RECOMMENDER SYSTEMS
(TCSD063)

COURSE OUTCOMES (COs):	
CO 1:	To understand basic techniques and problems in the field of recommender systems
CO 2:	To understand filtering algorithms and apply on recommendations.
CO 3:	To introduce different approaches of recommender systems
CO 4:	To apply algorithms and techniques to develop Recommender Systems that are widely used in the Internet industry.
CO 5:	To explore various types of recommender systems and develop state-of-the-art recommender systems.

Unit	Topic
I	Basic concepts for recommender systems: detailed taxonomy of recommender systems, Evaluation of recommender systems, Applications of recommendation systems, Issues with recommender system.
II	Collaborative filtering algorithms: User-based nearest neighbor recommendation, Itembased nearest-neighbour recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems.
III	Content-based recommendation: High level architecture of content-based systems, Advantages and drawbacks of content-based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags, Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.
IV	Knowledge based recommendation: Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders
V	Hybrid approaches: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies. Evaluating Recommender System: General properties of evaluation research, Evaluation designs, Evaluation on historical datasets.

Text Book (s):

1. Charu Aggarwal "Recommender Systems: The Textbook," First Edition, Springer.
2. Francesco Ricci, Lior Rokach, and Bracha Shapira "Recommender Systems Handbook," Springer.
3. Rounak Banik "Hands-On Recommendation Systems with Python," First Edition, Packet Publishing.
4. Kim Falk "Practical Recommender Systems," First Edition, Manning Publications.
5. Deepak Agarwal and Bee-Chung Chen "Statistical Methods for Recommender Systems," First Edition, Cambridge University Press.

VIRTUAL REALITY
(TCSD064)

COURSE OUTCOMES (COs):	
CO 1:	Understand the fundamentals and importance of data visualization.
CO 2:	Use various tools and software to create effective visualizations.
CO 3:	Design and evaluate visualizations based on best practices
CO 4:	Develop interactive visualizations and integrate them with data sources.
CO 5:	Analyze real-world visualizations and address ethical considerations.

Unit	Topic
I	**Introduction to Virtual Reality:** Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark **3D Computer Graphics:** Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Color theory, Simple 3D modeling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.
II	**Geometric Modeling:** Geometric Modeling: Introduction, from 2D to 3D, 3D space curves, 3D boundary representation Geometrical Transformations: Introduction, Frames of reference, Modeling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.
III	**Virtual Environment:** Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in battening, free from deformation, particle system. **Physical Simulation:** Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.
IV	**VR Hardware and Software:** Human factors: Introduction, the eye, the ear, the somatic senses. VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modeling virtual world, Physical simulation, VR toolkits, Introduction to VRML
V	**VR Applications:** Introduction, Engineering, Entertainment, Science, Training. The Future: Virtual environment, modes of interaction

Text Book (s):

1. John Vince, “Virtual Reality Systems “, Pearson Education Asia.
2. Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.
3. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill.
4. Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology”, Wiley Inter Science
5. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application and Design”, Morgan Kaufmann.
6. J.D. Majumdar and I. Manna, “Laser-Assisted Fabrication of Materials”, Springer Series in Material Science.

TIME SERIES ANALYSIS AND FORECASTING
(TCSD065)

COURSE OUTCOMES (COs):	
CO 1:	Analyze any time series data using various statistical approaches.
CO 2:	Know basic concepts of univariate time series analysis; build appropriate econometric time series models.
CO 3:	Know basic concepts of multivariate time series analysis; build appropriate econometric time series models.
CO 4:	Understand limitation and relevance of the models.
CO 5:	Generate reasonable forecast values, and to make concise decisions based on forecasts obtained
Unit	**Topic**
I	INTRODUCTION OF TIMESERIES ANALYSIS: Introduction to Time Series and Forecasting, Different types of data, Internal structures of time series. Models for time series analysis, Autocorrelation and Partial autocorrelation. Examples of Time series Nature and uses of forecasting, Forecasting Process, Data for forecasting, Resources for forecasting.
II	STATISTICS BACKGROUND FOR FORECASTING: Graphical Displays, Time Series Plots, Plotting Smoothed Data, Numerical Description of Time Series Data, Use of Data Transformations and Adjustments, General Approach to Time Series Modeling and Forecasting, Evaluating and Monitoring Forecasting Model Performance.
III	TIME SERIES REGRESSION MODEL: Introduction Least Squares Estimation in Linear Regression Models, Statistical Inference in Linear Regression, Prediction of New Observations, Model Adequacy Checking, Variable Selection Methods in Regression, Generalized and Weighted Least Squares, Regression Models for General Time Series Data, Exponential Smoothing, First order and Second order.
IV	AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) MODELS: Autoregressive Moving Average (ARMA) Models – Stationary and Inevitability of ARMA Models - Checking for Stationary using Variogram- Detecting Non-stationary - Autoregressive Integrated Moving Average (ARIMA) Models - Forecasting using ARIMA - Seasonal Data -Seasonal ARIMA Models Forecasting using Seasonal ARIMA Models Introduction - Finding the "BEST" Model -Example: Internet Users Data Model Selection Criteria - Impulse Response Function to Study the Differences in Models Comparing Impulse Response Functions for Competing Models .
V	MULTIVARIATE TIME SERIES MODELS AND FORECASTING: Multivariate Time Series Models and Forecasting, Multivariate Stationary Process, Vector ARIMA Models, Vector AR (VAR) Models, Neural Networks and Forecasting Spectral Analysis, Bayesian Methods in Forecasting.

Text Book (s):

1. Introduction To Time Series Analysis and Forecasting, 2nd Edition, Wiley Series In Probability And Statistics, By Douglas C. Montgomery, Cheryl L. Jen
2. Kendall M.G.: Time Series, Charles Griffin.
3. Chatfield C. (1980): The Analysis of Time Series –An Introduction, Chapman & Hall.

INDIAN TRADITIONS, CULTURE AND SOCIETY
(THS601)

Course Outcome (CO):	
CO 1:	Understand contemporary issues by exploring historical roots and finding solutions.
CO 2:	Recognize the importance of the environment and contribute to sustainable development
CO 3:	Develop sensitivity towards Indian culture, tradition, and its diverse character.
CO 4:	Learn about holistic lifestyles from Yogic science and Sanskrit literature relevant to modern society.
CO 5:	Gain knowledge of the Indian Knowledge System, modern scientific perspectives, and principles of Yoga and holistic health.
Unit	**Topic**
I	**Society State and Polity in India** Ancient Indian state theories, stages of state formation, kingship, administration, political ideals, societal conditions, Purusārtha, Varnāshrama system, stages of life, marriage, gender representation, and challenges faced by women.
II	**Indian Literature, Culture, Tradition, and Practices** Evolution of scripts, Vedas, Upanishads, Ramayana, Mahabharata, Puranas, Buddhist and Jain literature, Kautilya's Arthashastra, regional literatures in Sanskrit, Telugu, Kannada, Malayalam, and Hindi, Persian and Urdu influences.
III	**Indian Religion, Philosophy, and Practices** Pre-Vedic and Vedic religions, Buddhism, Jainism, Indian philosophy systems, Shankaracharya, philosophical doctrines, Bhakti and Sufi movements, 19th-century socio-religious reforms, modern practices.
IV	**Science, Management and Indian Knowledge System** Ancient Indian contributions to astronomy, chemistry, mathematics, physics, agriculture, medicine, metallurgy, geography, biology, Harappan technologies, water management, textile technology, and trade.
V	**Cultural Heritage and Performing Arts** Ancient Indian architecture, sculptures, seals, coins, pottery, puppetry, dance, music, theatre, painting, martial arts, fairs and festivals, current arts developments, and Indian cinema.

Text Book (s)

1. A. L. Basham, "The Wonder That Was India," Sidgwick & Jackson.
2. C. N. Srinath, "Indian Culture and Civilization," National Book Trust.
3. Sisir Kumar Das, "A History of Indian Literature," Sahitya Akademi.
4. C. Sivaramamurti, "The Art and Architecture of India," National Book Trust.
5. John Keay, "India: A History," HarperCollins.
6. S. Radhakrishnan, "Indian Philosophy: A Historical Analysis," Oxford University Press.
7. R. C. Majumdar, "Cultural Heritage of India," Bharatiya Vidya Bhavan.
8. A. K. Bag, "The History of Indian Science, Technology, and Culture," Abhinav Publications.
9. Amrit Rai (ed.), "The Encyclopaedia of Indian Literature," Sahitya Akademi.
10. James Fergusson, "Indian Architecture: Hindu and Buddhist," Dover Publications.

COMPUTER NETWORKS LAB
(TCS651)

LIST OF THE EXPERIMENTS:

1. To learn basics of the packet tracer simulator tool.
2. Write a program in C to implement bit stuffing and character stuffing.
3. To connect the computers in Local Area Network and to detect collision of packets.
4. To configure DHCP and DNS server for a given network in packet tracer simulator tool.
5. Write a C program to get the MAC or Physical address of the system using ARP (Address Resolution Protocol) and to subnet a given network according to the requirements in packet tracer simulator tool. .
6. To configure router using command line. Also observe the datagram formats in packet tracer simulator tool.
7. To configure NAT for a given network in packet tracer simulator tool.
8. Write a program to implement TCP & UDP Sockets.
9. Write a C program to transmit a character, a string and a file from one computer to another using RS-232 cable and to configure static routing in packet tracer simulator tool.
10. To configure dynamic routing protocols in packet tracer simulator tool.

Note: The instructor may add/ modify the list as per his/her wisdom for better hands on the students.

SOFTWARE ENGINEERING LAB
(TCS652)

LIST OF THE EXPERIMENTS:

1. Introduction to Software Engineering Processes.
2. Basic steps required to create project and prepare it for data entry (project tasks, sequence the tasks and estimate task duration).
3. Setting up a project and establish the basic constraints that project will use for its calculation. Analyze the project from different views [Gantt Chart, Network Diagram, Flow Charts]
4. Identifying relationship among the different task and subtasks of the Project.
5. Explain how to enter resources and specific information in the Project and resources to specific tasks.
6. Case Study of the Project.

Note: The instructor may add/ modify the list as per his/her wisdom for better hands on the students.