INSTITUTE OF ENGINEERING & TECHNOLOGY
DR. RAMMANOHAR LOHIA AVADH UNIVERSITY AYODHYA

EVALUATION SCHEME & SYLLABUS

for

B. TECH. SECOND YEAR

COMPUTER SCIENCE & ENGINEERING

AS PER

AICTE MODEL CURRICULUM

[Effective from the session: 2021-22]

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				ESE		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	CSB301-308	Engineering Science Course [ESC]	3	0	0	30	20	50		100		150	3
2	APH301	Technical Communication	2	0	2	30	20	50		100		150	3
3	CSC301	Data Structure Using C	3	1	0	30	20	50		100		150	4
4	CSC302	Digital logic design	3	1	0	30	20	50		100		150	4
5	CSC303	Discrete Structures & Theory of Logic	3	1	0	30	20	50		100		150	4
6	CSC3L1	*Data Structures Using C Lab	0	0	2				25		25	50	1
7	CSC3L2	*Digital logic design Lab	0	0	2				25		25	50	1
8	CSC3L3	Discrete Structure & Logic Lab	0	0	2				25		25	50	1
9	CSP301	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	MAB 301/ MAB 302	Environmental Science/Cyber Security	2	0	0	15	10	25		50		NC+	NC+
11.		MOOCS (Essential for Hons. Degree)											
12		**Total**	**16**	**3**	**10**	**165**	**110**	**325**	**75**	**550**	**75**	**950**	**22**

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				ESE		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	APS402	Environment & Biology	3	0	0	30	20	50		100		150	3
2	CSC401	Operating Systems	3	1	0	30	20	50		100		150	4
3	CSC402	Web Technology	3	1	0	30	20	50		100		150	4
4	CSC403	Theory of Automata and Formal Languages	3	1	0	30	20	50		100		150	4
5	CSC404	Computer Organization & Architecture	3	0	0	30	20	50		100		150	3
6	CSC4L1	Operating Systems Lab	0	0	2				25		25	50	1
7	CSC4L2	Web Technology Lab	0	0	2				25		25	50	1
8	CSC4L3	Python Language Programming Lab	0	0	2				25		25	50	1
9	MAB 402/ MAB 401	Cyber Security/ Environmental Science	2	0	0	15	10	25		50		NC+	NC+
10		MOOCS (Essential for Hons. Degree)											
11		**Total**	**17**	**3**	**6**	**165**	**110**	**275**	**75**	**550**	**75**	**900**	**21**

***Practical experiment to be included as per virtual lab platform**

NC+: Non Credit Course, L-Lecture, T- Theory, P- Practical, CT- Class Test, TA- Teacher Assessment, PS-practical Sessional, TE- Theory External, PE- Practical External

DATA STRUCTURE(CSC301)	**CREDITS-4**	**L-T-P 3-1-0**

COURSE OBJECTIVE:

Improve ability to understand different storage mechanisms of data for an easy access, design and implementation of various basic and advanced data structures, various techniques for representation of the data in the real world, develop application using data structures and to improve logical ability.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture

I	Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List	11
II	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion. Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	11
III	Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.	10
IV	Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks	09
V	Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting. (7) Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees Hashing: Hash Function, Collision Resolution Strategies Storage Management: Garbage Collection and Compaction.	11

Text Book:

1. Data Structures APsedocode Approach with C, Richard F. Gilberg& Behrouz A. Forouzan, second edition, CENGAGE Learning.
2. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India
3. Data Structure Using C, Balagurusamy
4. Data Structures, Adapted by: GAV PAI, Schaum's Outlines

REFERENCE BOOKS:

1.Data Structure Through C (A Practical Approach) by: Andrew S. Tanenbaum

WEB LINKS:

1. https://www.geeksforgeeks.org/data-structures/
2. http://www.cplusplus.com/doc/tutorial/structures/
3. https://nptel.ac.in/courses/106102064/
4. http://warrior-101.tripod.com/dstut/dstut.htm.

Course Outcome (CO)	
CO 1	Select appropriate data structures as applied to specified problem definition.
CO 2	Apply operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures **.**
CO 3	Make use of appropriate sorting/searching technique for given problem.
CO 4	Design advance data structure using Non-Linear data structure.
CO 5	Determine and analyze the complexity of given algorithm

Digital logic Design (CSC302)	**CREDITS-4**	**L-T-P 3-1-0**

Course Objectives:

1. Understand the basic digital principles and working of various logic gates, and different techniques for simplification of Boolean function.

2. Design combinational logic circuits and describe their applications.

3. Analyze working of Flip Flops and sequential circuits.

4.Study the basic organization and architecture of digital computers such as CPU, memory, I/O, and software

5. Discussions of digital logic and microprogramming to understand the design and application of computer systems and can be used as foundation for more advanced computer-related studies

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**Digital System And Binary Numbers**: Number System and its arithmetic, Signed binary numbers, Binary codes, Cyclic codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc- Clusky method (Tabular method).	8
II	**Combinational Logic**: Combinational Circuits: Analysis Procedure, Design procedure, Binary adder-subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Multiplexers, Demultiplexers, Decoders, Encoders.	8
III	**Sequential Logic And Its Applications**: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter.	8
IV	**Synchronous:** Analysis of clocked sequential circuits with state machine designing, State reduction and assignments, Design procedure.	8
V	**Asynchronous Sequential Circuits**: Analysis procedure of Asynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment, Hazards. **Introduction to Verilog HDL(VHDL)**	8

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.
3. RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.

Reference Books:

1. DP Kothari and J.S. Dhillon, "Digital Circuits and Design", Pearson Education.
2. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning Pvt. Ltd.

Course Outcomes	Statements
CO1	Demonstrate the various techniques like K-map, Quine-McCluskey method for minimization of combinational functions.
CO2	Develop and Analyze different combinational and sequential circuits using Logic gates, Multiplexers Decoders, PLA, Flip flops.
CO3	Describe the structure of CPU, memory and I/O unit
CO4	Discuss the design of logic circuits for arithmetic operation in computer system
CO5	Illustrate the use of timing and control signal in the execution of machine instructions of computer system

Discrete Structures & Theory of Logic (CSC303)	**CREDITS-4**	**L-T-P 3-1-0**

COURSE OBJECTIVE

Upon successful completion of this course, students will be able to:

1. Learn and **understand** fundamentals of mathematical structures and logic principles about discrete structure and theory of logic.
2. **Solve** problems by Applying Poset, Lattice, recurrence relation and generating functions
3. **Apply** the concepts of fundamentals of graph theory to solve problem.
4. Formulate and **evaluate** possible solutions to problems, and select and defend the chosen solutions

DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	**Set Theory:** Introduction, Combination of sets, Multi sets, ordered pairs, Set Identities. **Relations:** Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations. **Functions:** Definition, Classification of functions, Operations on functions, Recursively defined functions.	08
II	**Partial order sets:** Definition, Partial order sets, Combination of partial order sets, Hasse diagram. **Lattices:** Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice, Morphisms of lattices. **Recurrence Relation:** Recursive definition of functions, Recursive algorithms, Method of solving recurrences. **Generating function:** Definition of generating function, Useful Facts About Power Series, Using Generating Functions to Solve Recurrence Relations	08
III	**Propositional Logic:** Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference, Natural Deduction. **Predicate Logic:** First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.	08
IV	**Algebraic Structures:** Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism's, Definition and elementary properties of Rings and Fields, Integers Modulo n.	08
V	**Trees:** Definition, Binary tree, Binary tree traversal, Binary search tree. **Graphs:** Definition and terminology, Representation of graphs, Multi graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring. **Combinatorics:** Introduction, Counting Techniques, Pigeonhole Principle	08

References/text books:

1. Liu and Mohapatra, "Elements of Discrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, "Discrete Mathematical Structures with Application to Computer Science", McGraw-Hill
3. YN Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010.
4. RP Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
5. B. Kolman, R.C. Busby, and SC Ross, "Discrete Mathematical Structures", PHI Learning Private Limited, Delhi India.
6. Norman L. Biggs, "Discrete Mathematics"Oxford Higher Education.
7. Biswal, "Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
8. Goodaire and Parmenter, "Discrete Mathematics with Graph Theory", PHI Learning Private Limited, Delhi India.
9. Lipschutz, "Discrete Mathematics", McGraw Hill 10. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI Learning Private Limited, Delhi India

Course Outcome (CO)	
CO 1	Identify and **apply** set theory, relations and functions to solve the Problem in various area of computing
CO 2	**Apply** Poset, Lattice, recurrence relation and generating functions to solve the Problem.
CO 3	Use proposional and predicate logic to verify and **validate** of an argument
CO 4	Use Algebraic structures to **solve** problems.

ENVIRONMENTAL SCIENCE (MAB301)	**NC**	**L-T-P 2-0-0**

COURSE OBJECTIVE

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**Multidisciplinary nature of Environmental Studies:** Definition, scope and importance, need for public awareness. Definition of environment, component of the environment and structure of the atmosphere. Natural resources and associated problems a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.	06
II	Ecosystems :Concept of an ecosystem Structure and function of an ecosystem food chain, food web, Ecological Pyramid. Study of different ecosystem (Forest ecosystem, Grassland ecosystem, Desert ecosystem, pond ecosystem).	06
III	Environmental Pollution: Air pollution; Water pollution; Soil pollution, Noise pollution, Thermal pollution and solid waste management. Climate Change- Global Warming, Acid Rain, Ozone layer depletion. Human Activities And Its Effect On Environment: Agriculture, Industry, Mining, Transportation, & Urbanization.	06
IV	**Disaster management:** Flood, Earthquake, Cyclone and Landlides.	06
V	**Environmental Protection-** Role of individuals, organisation and government in pollulation control, Environmental law. Environmental Ethics, Sustainable development.	06

Reference/text books:

1. BharuchaErach, The biodiversity of India, Mapin Publishing Pvt. Ltd. Ahmendabad-380013.
2. Cunninghum, W.P. Cooper, T.H. Gorhani, E and Hepworth, M.T. 2001 Environmental encyclopedia, jaico publ. House, Mumbai. 1196p.
3. Miller T.G. Jr Environmental Science system and solution,Web enhanced edition 639p.
4. Sharam B.K. 2009 Environmental Chemistry, Goel Pulb. House.
5. Trivedi R.K. and P. K. Goel, Introduction to air Pollution, Techno, techno-Science Publication.

Course Outcome (CO)

CO 1	The students can able to make environmental friendly decision in practical applications.
CO 2	The knowledge gained will lead to pollution free environment.
CO 3	The current Environmental issues can be handled in better way.
CO 4	The knowledge of natural resources will lead to have balanced eco system.
CO 5	Environmental education at different levels will lead to control and protect the eco system.

Data Structure using C Lab (CSC3L1)	**CREDITS-1**	**L-T-P 0-0-2**

COURSE OBJECTIVE	1. To assess how the choice of data structures and algorithm design methods impacts the performance of programs. 2. To choose the appropriate data structure and algorithm design method for a specified application. 3. To write programs using procedure-oriented design principles. 4. To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.

Course Outcome (CO)	
CO 1	Able to write well-structured procedure-oriented programs
CO 2	Analyze run-time execution of previous learned sorting methods, including selection, merge sort, heap sort and Quick sort..
CO 3	To implement the Stack ADT using both array based and linked-list based data structures
CO 4	To implement the Queue ADT using both array based circular queue and linked-list based implementations.
CO5	Able to implement binary search trees.

DETAILED SYLLABUS

Write C Programs to illustrate the concept of the following:

1. Sorting Algorithms-Non-Recursive.
2. Sorting Algorithms-Recursive.
3. Searching Algorithm.
4. Implementation of Stack using Array.
5. Implementation of Queue using Array.
6. Implementation of Circular Queue using Array.
7. Implementation of Stack using Linked List.
8. Implementation of Queue using Linked List.
9. Implementation of Circular Queue using Linked List.
10. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
11. Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.

Digital logic design Lab (CSC3L2)	**CREDITS-1**	**L-T-P 0-0-2**

COURSE OBJECTIVE

1.Implement different logic design circuits using components like logic gates, multiplexer, decoder, flip-flops.

2.Understand the various computer operations using simulation

Detailed Syllabus	
Expt No.	**Experiment List**
	PART-A
1	Given a 4-variable logic expression, simplify it using K-Map and realize using logic gates.
2	Design and implement arithmetic combinational circuit. (Adder, Subtractor, Magnitude Comparator, Code converter) using logic gates./Data processing circuits.
3	Design and implement various flip flops.(SR,JK,D,T)
4	Design and implement synchronous counter using JK flip flop .
5	Design and implement asynchronous counter.
6	Design and implement shift registers.(ring ,switched tail)
7	*Design of combinational multiplier
	PART-B
1	Design and implementation of combinational circuits.
2	Design and implementation sequential circuits.
3	Design of RAM(16 byte,32 byte)
4	Designing a logic circuit to perform various functions.
5	*Designing an ALU to perform various functions.
6	Demonstrating the assembly language instruction execution.

Course Outcomes	Statements
CO1	Implement different combinational and sequential logic circuits.
CO2	Develop the different sequential circuits
CO3	Demonstrate the various operations of computer using appropriate simulator(Logisim, Marie Sim, CPUos)
CO4	Illustrate the working of computer components by analyzing their operation using simulator
CO5	Describe the assembly language instruction execution using simulator

Discrete Structure & Logic Lab (CSC3L3)	CREDITS-1	L-T-P 0-0-2

COURSE OBJECTIVE

Upon successful completion of this course, students will be able to:

1. Learn and **understand** fundamentals of mathematical structures and logic principles about discrete structure and theory of logic.
2. **Solve** problems by Applying Poset, Lattice, recurrence relation and generating functions
3. **Apply** the concepts of fundamentals of graph theory to solve problem.
4. Formulate and **evaluate** possible solutions to problems, and select and defend the chosen solutions

DETAILED SYLLABUS

List of Experiment

Lab 1. Working of Prolog software.
Lab 2. Sequences
Lab 3. Recursion and Induction Lab
Lab 4. Practice of various Set operations
Lab 5. Using Prolog for Counting
Lab 6. Combinatorial Equivalence
Lab 7. Permutations and Combinations
Lab 8. Recursive counting
Lab 9. Probability Simulations
Lab 10. Binomial coefficient or all combinations .

COURSE OUTCOME

CO1: Identify and **apply** set theory, relations and functions to solve the Problem in various area of computing

CO2: **Apply** Poset, Lattice, recurrence relation and generating functions to solve the Problem.

CO3: Use proposional and predicate logic to verify and **validate** of an argument

CO4: Use Algebraic structures to **solve** problems.

CO5: **Construct** tree and graph to solve problems

MINI PROJECT OR INTERNSHIP ASSESSMENT (CSP354)	CREDITS-1	L-T-P 0-0-2

COURSE OBJECTIVE

1.To offer students a glimpse into real world problems and challenges that need programming based solution.
2.To create awareness among the students of the characteristics of several area where programming languages are used.
3.To improve the team building ,communication and management skills of the student.

Course Outcome (CO)	
CO 1	Discover potential research areas in the field of languages.
CO 2	Compare and contrast the several existing solutions for research challenges.
CO 3	Formulate and propose a plan for creating a solution for the research plan identified.

CYBER SECURITY (MAB302)	NC	L-T-P 2-0-0

COURSE OBJECTIVE-	The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks. ... The learner will develop an understanding of security policies (such as confidentiality, integrity, and availability), as well as various IT Act and Intellectual Property Laws.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.	06
II	Application security (Database, E-mail and Internet), Data Security ConsiderationsBackups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce Electronic Payment System, e- Cash, Credit/Debit Cards Digital Signature, public Key Cryptography.	06
III	Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design. Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.	06
IV	Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement of the Policies.	06

References/ Text Books:

1. Charles P. Pfleeger, Shari LawerancePfleeger, “Analysing Computer Security”, Pearson Education India.
2. Behrouz A. Forouzan,Dedeep Mukhopadhyay “Cryptography & Network Security”, Second Edition,Tata McGraw Hill, New Delhi, 2010.
3. V.K. Pachghare, “Cryptography and information Security”, PHI Learning Private Limited, Delhi India.
4. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumarShukla,”Introduction to Information Security and Cyber Law” Willey Dreamtech Press.
5. Schou, Shoemaker, “Information Assurance for the Enterprise”, Tata McGraw Hill.
6. CHANDER, HARISH,” Cyber Laws And It Protection ” , PHI Learning Private Limited ,Delhi ,India

Web links:

1.https://nptel.ac.in/courses/106106129/**2.**https://nptel.ac.in/courses/110105083/**3.**https://nptel.ac.in/courses/106105031/
4.https://nptel.ac.in/courses/109105112/

Course Outcome (CO)	
CO 1	Identify history of information system and importance. Influence of the changing nature of current security and information scenarios.
CO 2	Identify Threats involved in the online business transactions, physical security and its needs and various access control mechanisms are identified.
CO 3	Understand Various security policies, Intellectual Property rights and cyber laws available for the welfare of the users and e-commerce
CO 4	Developing secure information system and study security issues in hardware.

Operating system (CSC401)	CREDITS-4	L-T-P 3-1-0

Course objectives:

1. Understand the services of an operating system that provides to its users and system itself.
2. Understand the process concept and also apply the various CPU scheduling algorithms.
3. Compare methods for handling deadlocks and also recognize the classic synchronization Problems and provide solutions..
4. Describe the various memory management techniques and also the file system.
5. Understand secondary storage structure and Linux operating system.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	08
II	Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.	08
III	CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	08
IV	Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	08

V	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	08

Reference/text Books:

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. SibsankarHalder and Alex A Aravind, “Operating Systems”, Pearson Education
3. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
4. D M Dhamdhere, “Operating Systems : A Concept based Approach”, 2nd Edition,
5. TMH 5. William Stallings, “Operating Systems: Internals and Design Principles ”, 6th Edition, Pearson Education

Course Outcome (CO)	
CO 1	**Identify** the significance of operating system in computing devices.
CO 2	**exemplify** the communication between application programs and hardware devices through system calls**.**
CO 3	**compare** and **illustrate** various process scheduling algorithms.
CO 4	**apply** appropriate memory and file management schemes.
CO 5	**illustrate** various disk scheduling algorithms.
CO6	**appreciate** the need of access control and protection in an operating system.

CSC-402: WEB TECHNOLOGY		3-1-0
Course objectives: 1. To familiarized with terminologies, tools, protocols used in web 2. Identify a valid standards-conformant XHTML document involving a variety of elements Such as, Hyperlinks, images, lists, tables, and forms etc… and apply styles using CSS. 3. Analyze how JavaScript programs are used to create interactive web page including the Use of Event-handlers and the Document Object Model. 4. Create well-formed XML documents. Design database driven web applications using a server-side scripting language.		
Unit	**Topic**	**Proposed Lecture**
I	I**ntroduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols Governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers	**08**
II	**Web Page Designing:** HTML: List, Table, Images, Frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML	**08**
III	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, **Networking :** Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagram	**08**
IV	**Enterprise Java Bean:** Preparing a Class to be a JavaBeans, Creating a JavaBeans, JavaBeans Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean **Java Database Connectivity (JDBC):** Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.	**08**
V	**Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resource s, Session Tracking, Cookies, Session Tracking with Http Session **Java Server Pages (JSP):** Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries. .	**08**

TEXTBOOK/REFERENCES

1. Burdman, Jessica, “Collaborative Web Development” Addison Wesley
2. Xavier, C, “ Web Technology and Design” , New Age International
3. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
4. Tanveer Alam, Internet & Java Programming, Khanna Publishing House
5. Bhave, “Programming with Java”, Pearson Education 6. Herbert Schieldt, “The Complete Reference:Java”, TMH.
6. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
7. Margaret Levine Young, “The Complete Reference Internet”, TMH
8. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
9. Balagurusamy E, “Programming in JAVA”, TMH

Course Outcomes:

CO1: Understand terminologies, tools and protocols used in web.
CO2: Design, Understand and analyze static web pages.
CO3: Design.understand dynamic and interactive web pages.
CO4: Design and Describe the data and information.
CO5: Demonstrate the ability to retrieve data from a database and present it on a web page

Theory of Automata and Formal Languages (CSC403)	CREDITS-4	L-T-P 3-1-0

COURSE OBJECTIVE :

1.Describe the basic concepts for designing automata.
2.Understand the use of pumping lemma to explain the non-regularity of language.
3.Understant the CFG and normal forms to design turing machine.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Basic Concepts and Automata Theory: Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem, Simulation of DFA and NFA	10
II	Regular Expressions and Languages: Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language	10
III	Regular and Non-Regular Grammars: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	10
IV	Push Down Automata and Properties of Context Free Languages: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	10

V	Turing Machines and Recursive Function Theory : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondance Problem, Introduction to Recursive Function Theory.	10

Reference / text Books:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI
4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age Internationa

Course Outcome (CO)	
CO 1	Understanding the basic principles &proof's of Automata, Finite Automata, Moore & Mealy Machines.
CO 2	Application of rigorous formal mathematical methods to prove properties of languages & grammars.
CO 3	Limitations of Finite Automata & designing principles of Pushdown Automata.
CO 4	Analyze the turing machine as a model of computation &its designing rules.
CO 5	Application of theoretical study in this course to engineering application like designing the compilers.

Computer Organization and Architecture (CSC404)	CREDITS-3	L-T-P 3-0-0

COURSE OBJECTIVE

1.To conceptualize the basics of organizational and architectural issues of digital computer.
2.Understand the arithmetic operation and process of instruction execution.
3.Understand the basic concept of input output and memory.
4.To analyze performance issues in processor and memory design

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**Introduction**: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer .Processor organization, general registers organization, stack organization and addressing modes.	11
II	**Arithmetic and logic unit:** Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers.	11
III	**ControlUnit:**Instructiontypes,formats,instructioncyclesandsubcycles(fetchandexecuteetc), microoperations,executionofacompleteinstruction.ProgramControl,ReducedInstructionSet Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.	10
IV	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: conceptimplementation.	09

V	**Input / Output**: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous& asynchronous communication, standard communication interfaces.	11

Reference/Text Books.

1. Computer System Architecture - M.Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Referencebooks
4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education,Seventh edition,2006.
5. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression,2011.
6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a divisionof reed India Private Limited, Fifth edition,2012

Structured Computer Organization,Tannenbaum(PHI)

Web Links.

1. https://www.digimat.in/nptel/courses/video/106105163/L01.html
2. http://www.digimat.in/nptel/courses/video/106103180/L01.html
3. http://www.digimat.in/nptel/courses/video/106103180/106103180.html4.https://nptel.ac.in/courses/106106092/9

Course Outcome (CO)	
CO 1	Able to define basic structure of Computer and perform computer arithmetic operations.
CO 2	Able to design organization that uses various memory and their instruction operations and understand the concept of cache mapping techniques.
CO 3	Able to explain Input Output Organization and interrupts.
CO 4	Able to describe various architecture , classification of computer and conceptualize pipeline and its applications.

Operating system LAB(CSC4L1)	CREDITS-1	L-T-P 0-0-2

COURSE OBJECTIVE :

- To make students aware about various types of operating systems and and its feature..
- To make students aware about CPU Scheduling Policies
- To make students aware about the memory allocation technique and fragmentation of memory.
- To study the need for special purpose operating system with the advent of new emerging technologies.

DETAILED SYLLABUS

Write C Programs to illustrate the concept of the following:

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP, WINDOWS7/8
2. Execute various UNIX system calls for
   i.Process management
   ii.File management iii. Input/output Systems calls
3. Implement CPU Scheduling Policies:
   i. SJF ii.Priority
   iii.FCFS
   iv. Multi-level Queue
4. Implement file storage allocation technique:
   i. Contiguous(using array) ii.Linked –list(using linked-list)
   iii.Indirect allocation (indexing)

5. Implementation of contiguous allocation techniques:
    i. Worst-Fit
    ii. Best- Fit iii. First- Fit
6. Calculation of external and internal fragmentation
    i. Free space list of blocks from system ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph RAG)
9. Implementation of Banker‟s algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniquesSemaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique -Semaphore

Course Outcome (CO)	
CO 1	Student will become familiar with various types of operating systems.
CO 2	Student will become familiar with the CPU Scheduling Policies.
CO 3	Describe and analyze the memory management and its allocation policies
CO 4	Identify use and evaluate the storage management policies with respect to different storage management technologies..

WEB TECH LAB

Python Language Programming Lab (CSC4L3)	CREDITS-1	L-T-P 0-0-2

COURSE OBJECTIVE

1.Describe the basic syntax of phython programming language.

2.Explain the concept of structuring the data using list tuplet and sets.

DETAILED SYLLABUS

Write C Programs to illustrate the concept of the following:

To write a python program that takes in command line arguments as input and print the number of arguments.

To write a python program to perform Matrix Multiplication.

To write a python program to compute the GCD of two numbers.

To write a python program to find the most frequent words in a text file.

To write a python program find the square root of a number (Newton's method).

To write a python program exponentiation (power of a number).

To write a python program find the maximum of a list of numbers.

To write a python program linear search.

To write a python program Binary search.

To write a python program selection sort. 11. To write a python program Insertion sort.

12. To write a python program merge sort.
13. To write a python program first n prime numbers.
14. To write a python program simulate bouncing ball in Pygame. Implement the solutions for Readers-Writers problem using inter process communication technique -Semaphore

Course Outcome-	
CO 1	To acquire programming skills in core Python.
CO 2	To acquire Object Oriented skills in Python

CO 3	To acquire Data Structure skills in Python
CO 4	To develop the skill of designing Graphical user Interfaces