CURRICULUM

(Scheme and Syllabi of Studies and Examinations for 03rd-04th semester)

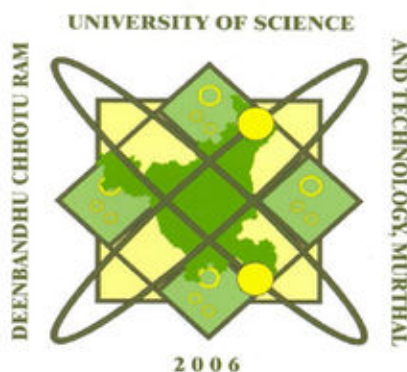# for

UNDERGRADUATE DEGREE

B. Tech. COURSE

IN

COMPUTER SCIENCE
&
ENGINEERING

[2019-20]

DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE AND TECHONOLOGY

Approved in 14th meeting of Academic Council held on 11.06.2019. Effective from Academic Session 2019-20 and applicable to all students admitted in 2018 and onwards.

B. Tech. COMPUTER SCIENCE & ENGINEERING 2nd YEAR (SEMESTER – III)
Choice Based Credit System Scheme of Studies & Examinations w.e.f. 2019-20: applicable to students admitted in 2018

Sl. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credits	Duration of Exam
			L	T	P		Theory	Practical			
1	CSE201C	Data Structures & Algorithms	3	0	0	25	75	0	100	3	3
2	CSE203C	Computer Organization & Architecture	3	0	0	25	75	0	100	3	3
3	ECE-203-C	Digital System Design	3	0	0	25	75	0	100	3	3
4	MATH307C	Mathematics-III (PDE&T)	3	0	0	25	75	0	100	3	3
5	MGT201C	Engineering Economics	3	0	0	25	75	0	100	3	3
6	CSE205C	IT Workshop	1	0	4	25	0	75	100	3	3
7	CSE281C	Data Structures & Algorithms Lab	0	0	4	25	0	75	100	2	3
8	ECE283C	D S D lab	0	0	2	25	0	75	100	1	3
9	MC 203C OR MC 201C	Constitution of India (Gr-A) / Environmental Science (Gr-B)	3	0	0	25	75	-	100	0	3
		Total	19	0	10	225	450	225	900	21	27

L = Lecture, T = Tutorial, P = Practical, AUD = Audit Course, & C = Credits

NOTE:
1. Students will be allowed to use non-programmable scientific calculator. However, sharing of calculators will not be permitted in the examinations

B.TECH. . COMPUTER SCIENCE & ENGINEERING 2nd YEAR (SEMESTER – IV)
Choice Based Credit System Scheme of Studies & Examinations w.e.f. 2019-20: applicable to students admitted in 2018

Sl. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credits	Duration of Exam
			L	T	P		Theory	Practical			
1.	CSE202C	Web & Internet Technologies	3	0	0	25	75	0	100	3	3
2.	CSE204C	Operating Systems	3	0	0	25	75	0	100	3	3
3	CSE206C	Design & Analysis of Algorithms	3	0	0	25	75	0	100	3	3
4	CSE208C	Discrete Mathematics	3	0	0	25	75	0	100	3	3
5	MGT202C	Organizational Behaviour	3	0	0	25	75	0	100	3	3
6	CSE282C	Web & Internet Technologies Lab	0	0	4	25	0	75	100	2	3
7	CSE284C	Operating Systems Lab	0	0	4	25	0	75	100	2	3
8	CSE286C	Design & Analysis of Algorithms Lab	0	0	4	25	0	75	100	2	3
9	MC 203C OR MC 201C	Constitution of India (Gr -B) Environmental Science (Gr-A)	3	0	0	25	75	0	100	0	3
Total			21	00	12	225	450	225	900	21	27

Note: Students will be allowed to use non-programmable scientific calculator. However, sharing of calculators will not be permitted in the examinations

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CSE 201 -C DATA STRUCTURES & ALGORITHMS
B. Tech. Semester – III (Computer Science and Engg.)
w.e.f 2019-2020

L	T	P	Credits				
3	0	–	3	Class Work	:	25	Marks
				Examination	:	75	Marks
				Total	:	100	Marks
				Duration of Exam	:	3 Hours	

UNIT-I

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure operations: insertion, deletion, traversal etc. Analysis of an Algorithm, Asymptotic Notations , Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

UNIT-II

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding
algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

UNIT-III

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.
Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

UNIT-IV
Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.
Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

TEXT BOOKS :

1. Fundamentals of Data Structures , Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

Approved in 14th meeting of Academic Council held on 11.06.2019. Effective from Academic Session 2019-20 and applicable to all students admitted in 2018 and onwards.

2. Data Structures , Revised 1st Edition by Seymour Lipschutz , Scaum's Outline Series McGraw Hill

REFERENCE BOOKS :
1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company

2. How to Solve it by Computer , 2nd Impression by R. G. Dromey, Pearson Education.

Note:

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For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

Course Outcomes: Upon successful completion of the course , students will demonstrate the ability to:

1. Analyze the algorithm for a problem solution determine the time and computation complexity and justify the correctness.
2. Implement the algorithm for Search problem (Linear Search and Binary Search) .
3. Solve the given problem of Stack , Queue ,Linked list, Graph search and traversal implement it and analyze the same to determine the time and computation complexity.
4. Write an algorithm for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap sort and compare their performance in term of Space and time complexity.

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CSE 203-C COMPUTER ORGANIZATION AND ARCHITECTURE
B. Tech. Semester – III (Common with ECE 3rd Sem)
w.e.f. 2019-2020

L	T	P	Credits		Class Work	:	25 Marks
3	0	–	3		Examination	:	75 Marks
					Total	:	100 marks
					Duration of Examination	:	3 Hours

UNIT-I

Functional blocks of a computer : CPU, Memory, input/output subsystems, control unit , Multilevel viewpoint of a machine: digital logic, micro architecture, ISA, operating systems, high level language , RTL Computer Buses (basic design using multiplexers), Bus width, Bus clocking(synchronous , asynchronous), bus arbitration, Bus examples(ISA bus, PCI bus, Universal serial bus) .

Data   representation : signed number representation,   fixed   and   floating point

representations,character representation.   Computer arithmetic – integer addition and subtraction,   multiplication – shift-and add, Booth multiplier,

UNIT-II

CPU Organization: Instruction set architecture of a CPU , interpretation of instructions, Instruction set based classification of processors (RISC, CISC, and their comparison), CPU Architecture types (accumulator, register, stack, memory/ register) Instruction cycle (Fetch-Decode-Execute)

Addressing modes(register, immediate, direct, indirect, indexed); Operations in the instruction set; Arithmetic and Logical, Data Transfer, Control Flow; Instruction set formats (fixed, variable, hybrid) Pipelining (basic concepts, throughput and speedup, hazards)

UNIT-III

Input /Output & Control Unit: Input Output Interface , Asynchronous data transfer (Strobe control, handshaking , serial transfer); Serial Vs parallel data transmission;Modes of data transfer, (Programmed I/O, Interrupt driven, Direct Memory access (DMA).

Control Unit design:- Control unit design methods (hardwired & microprogrammed) Control Memory, Address Sequencing, Micro instructions.

UNIT-IV

Memory Organization: Memory device characteristics(access/ cycle time, cost per bit, volatility , storage density) ;Memory hierarchy ;Main memory Design   (Semiconductor RAM & ROM organization, memory expansion, Static & dynamic memory types , their comparison); Associative memory Design ,Match logic ,Locality of reference principle(Temporal & Spatial)
 Cache mapping(Direct , associative , set associative); Cache writing policies (Copy-Back , Write-through); Virtual Memory(Address space , memory space , Address mapping using pages , Page replacement)

TEXT BOOKS:

1. Computer System Architecture by M. Mano, Prentice-Hall.

2. Structured Computer Organisation by A.S. Tanenbaum, 6th edition, Prentice-Hall of India, Eastern Economic Edition

REFERENCE BOOKS:

1. Computer Organization, 5th Edi, by Carl Hamacher, Zvonko Vranesic,2002, SafwatZaky.
2. Computer Organization and Design, 2nd Ed., by David A. Patterson and John L. Hennessy, Morgan 1997, Kauffmann.
3. Computer Architecture and Organization, 3rd Edi, by John P. Hayes, 1998, TMH
4. Computer Organisation& Architecture: Designing for performance by W. Stallings, 4th edition, 1996, Prentice-Hall International edition.

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Course Outcomes :
After successful completion of the course students will learn the following:-

1. How Computer Systems work & the basic principles
2. Instruction Level Architecture and Instruction Execution pipelining, parallelism and microprogramming
3. How I/O devices are accessed and its principles.
4. The current state of art in memory system design

CSE205C INFORMATION TECHNOLOGY WORKSHOP
B. Tech. Semester – III(Computer Science and Engg.)

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L	T	P	Credits		Class Work	:	25 Marks
1	0	4	3		Examination	:	75 Marks
					Total	:	100 marks
					Duration of Examination	:	3 Hours

UNIT-I

Introduction: Data types and variables: Introduction to MATLAB, Data Types, Inter-conversion of Data types, MATLAB Variables, Keywords and Constant, Session Command. MATLAB Operators and Operations: Operators(Arithmetic, Relational, Logical, Bitwise), Set Operations, Operator Precedence, Mathematical Functions.

UNIT-II

MATLAB Programming : Script and Function, Decision Making, Loops, branches, Functions, Working on Script File (Creating, Saving and Executing), MATLAB I/O, Formatted I/O Method,.

UNIT-III

Arrays: Introduction to Matrices, Operations on Arrays/Matrices, Manipulations of Arrays/Matrices, Expansion of Matrix Size, Reduction of Matrices/Arrays order,
Graphics: Introduction to plot, Basic 2-D Plots(Style options, Labels, Axis control, etc.), specialized 2-D
Plots, drawing multiple plots. Using MATLAB for fractals and chaos and Conway game of life

UNIT-IV

File Handling: File Handling: Introduction to file handling, working on files, accessing of Text File, Saving/ Loading MATLAB Variables, reading data without opening file, reading and writing Excel.
Debugging: Introduction to debugging, Break points, debugger, stepping, watching variable values, debugging commands.

TEXT BOOKS:
1. Delores M. Etter, David C. Kuncicky, Holly Moore, "Introduction to MATLAB 7.0", Pearson, 2013.
2. RudraPratap, "Getting Started with MATLAB", OXFORD University Press, 2010.
3. Agam Kumar Tyagi, "MATLAB and Simulink for Engineers", University Press, 2012.

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Course Outcomes : Upon successful completion of the course, students will be able to

1. Use MATLAB for programming purposes
2. Learn and explore MATLAB tools.
3. Use this learning experience to learn other programming languages.
4. To write and debug the code written in MATLAB .

L	T	P	Credits
3	0	–	3

Class Work   : 25 Marks
Examination   : 75 Marks
Total   : 100Marks
Duration of Exam. : 3 Hours

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UNIT-I

First order partial differential equations, solutions of first order linear and non linear PDEs. Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method.

UNIT-II

Flows, vibrations and diffusions, second-order linear equations and their-classification, Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables. Boundary-value problems: Solution of boundary-value problems for various linear PDEs in Various geometries.

UNIT-III

Polynomials, Orthogonal Polynomials-Lagrange's, Chebysev Polynomials; Trigonometric Polynomials, LaplaceTransform, Properties of Laplace Transform, Laplace transform of periodic function. Finding inverse Laplace transform by different. methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs 'and PDEs by Laplace Transform method.

UNIT-IV

Fourier transforms, Z-transform and Wavelet transforms:properties, methods, inverses and their applications.

TEXT BOOKS :

1. Erwin Kreyszig -Advanced Engineering Mathematics, 9th Edition, John' Wiley & Sons, 2006.
2. S.S. Sastry, Engineering Mathematics, PHI, Vol. I & II.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
4. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

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Course Outcomes:

1. The students will understand solutions of first and second order linear and non linear PDFs and their classifications.

2. The students will understand to solve various naming equations using separation of variables method.

3. The students will come across various Polynomials such as-Lagrange's, Chebysev Polynomials, Trigonometric Polynomials.

4. The students will be able to solve various engineering mathematical problems using various transforms such as Laplace Transform Fourier Transforms, Z-transform and Wavelet transforms.

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ECE-203 -C DIGITAL SYSYTEM DESIGN
B. Tech. Semester – III (Common with ECE and CSE)
w.e.f 2019-2020

L	T	P	Credits					
3	0	–	3	Class Work	:	25 Marks		
				Examination	:	75Marks		
				Total Marks	:	100		
				Duration of Exam.	:	3 Hours		

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UNIT- I

Logic Simplification: Review of Boolean Algebra and DeMorgan's Theorem, SOP & POS forms, Canonical forms, Realization Using Gates. Karnaugh maps up to 6 variables, VEM technique, Binary codes, Code Conversion. Numericals.

UNIT- II

Combinational & Sequential Logic Design: Comparators, Multiplexers, Encoder, Decoder, Half and Full Adders, Subtractors, Parallel Adders, Adder with Look Ahead Carry, BCD Adder. Sequential Logic Design: Building blocks like S-R, J K and Master-Slave J K FF, Edge triggered FF, Ripple and Synchronous counters, Sequence Generator, Shift registers.

UNIT III

Finite state machines: Introduction, Design of synchronous FSM Driver & Multiplexed Display: Serial Binary Adder, Sequence detector, Parity Bit Generator, pulse train generator. Algorithmic State Machines charts: Introduction, Component of ASM chart, Introductory examples of ASM chart.

UNIT IV

Logic Families and PLDs: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing. Concept of Programmable logic devices like PAL, PLA, ROM, CPLD and FPGA. Logic implementation using Programmable Devices.

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TEXT /REFERENCE BOOKS:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009
2. A.Anand Kumar, "Switching Theory & Logic Design", PHI.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition, 2006.
4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989.
5. Morris Mano, "Digital Design: With an Introduction to the Verilog HDL", 5th Edition, Pearson Education, 2013.
6. Morris Mano, "Logic & Computer Fundamentals",4th Edition, Pearson Education.

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Course Outcomes: Upon successful completion of the course , students will demonstrate the ability to:

1. Understand binary codes, binary arithmetic, minimization techniques and their relevance to digital logic design.
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder and sequential logic circuits.
3. Understand finite state machines and develop a digital logic to find out sustainable solution of a real life problem.
4. Understand and implement various digital integrated circuits using different logic families and simple systems composed of PLDs.

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MGT-201-C ENGINEERING ECONOMICS
B. Tech. Semester – III (Common for all Branches Except BT& BME)

L	T	P	Credits		
3	0	–	3	Class Work	: 25 Marks
				Examination	: 75Marks
				Total Marks	: 100
				Duration of Exam	: 3 Hours

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UNIT-I

Concept of Economics- various definitions, nature of Economic problem, Micro and macro economics- their features and scope, production possibility curve, Relationship between Science, Engineering Technology and Economics. Utility: Concept and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its importance and practical applications.

UNIT-II

Demand: Concept, Individual and Market demand schedule, Law of demand, shape of demand curve. Elasticity of demand: Concept, measurement of elasticity of demand, factors affecting elasticity of demand, practical application of elasticity of demand. Various concepts of cost: Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost.

UNIT III

Production : Meaning of production and factors of production; Law of variable proportions, Law of Return to Scale, Internet and External economics and diseconomies of scale. Meaning of Market, Type of Marker– perfect Competition, Monopoly, Oligopoly, Monopolistic competition (Main features of these markers).

UNIT-IV

Supply : Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on price. Nature and characteristics of Indian economy, privatization – meaning, merits and demerits. Globalisation – meaning, merits and demerits.

TEXT BOOKS:
1. Ahuja H.L"Micro Ecomomic Theory" S. Chand Publication, New Delhi
2. Dewett K.K "Modern Ecomomic Theory" S. Chand Publication, New Delhi
3. Jain T.R, Grover M.L, Ohri V.K Khanna O.P,"Economics for engineers" V.K .Publication ,New Delhi
4. Dr. R.K. Agarwal & Rashmi Agarwal, " Principles and Applications of Economic", Pragati Prakashan.

SUGGESTED BOOKS:
1. Jhingan 1. Jhingan M.L"Micro Ecomomic Theory" S.Chand Publication ,New Delhi
2. Chopra P.N "Principle of Economics" Kalyani Publishers, Delhi
3. Mishra S.K "Modern Micro Economics" Pragati Publication Mumbai. 44
4. Dwivedi D.N "Micro Economics " Pearson Education, New Delhi.

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COURSE OUTCOMES: Upon Successful Completion of this Course the students will :-

1. Acquire the skills to apply the basics of economics and cost analysis to engineering and take economically sound decision.
2. Acquaint the with the basic economic concepts and their operational significance.
3. Be able to think systematically and objectively about cotemporary economic problems.
4. Learn the ability to optimally utilize the limited resources of the organization..

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CSE 281C   DATA STRUCTURES & ALGORITHMS LAB
B. Tech. Semester – III(Computer Science and Engg)

L	T	P	Credits			
		4	2	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100Marks
				Durationof Examination	:	3 Hours

List of Programs:
1. Write a program to perform binary search in an array.

2. Write a program to perform binary search using recursion.

3. Write a program to perform linear search in 2D array.

4. Write a program to perform various operations on matrices.

5. Write a program to swap two nos. using calls by value and reference.

6. Write a program to implement bubble sort.

7. Write a program to implement insertion sort.

8. Write a program to implement selection sort.

9. Write a program of link list implementation of a stack.

10. Write a program of link list implementation of a queue.

11. Write a program of array implementation of a stack.

12. Write a program of array implementation of a queue.

13. Write a program to search an element in a link list.

14. Write a program to maintain a link list.

15. Write a program to implement BST

The teacher concerned may give 10 more exercises based upon syllabus CSE201C

Course Outcomes: Upon successful completion of the course , students will be able to :

1. Implement the algorithm for a problem solution , determine the time and computation complexity and justify the correctness.
2. Implement the algorithm for Search problem (Linear Search and Binary Search) .
3. Solve the given problem of Stack , Queue ,Linked list, Graph search and traversal implement it and analyze the same to determine the time and computation complexity.
4. Write an algorithm for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap sort and compare their performance in term of Space and time complexity.

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ECE283C Digital System Design Lab

L	T	P	Credits			
-	-	2	1	Class Work	:	25 Marks
				Exam	:	25Marks
				Total	:	50 Marks
				Duration of Exam.	:	3 Hrs.

LIST OF EXPERIMENTS:

1. To study & design basic gates.

2. To realize and minimize five & six variables using K-Map method.

3. To verify the operation of Multiplexer & De-multiplexer.

4. To perform Half adder and Full adder

5. To perform Half substractor and Full substractor.

6. To verify the truth table of S-R,J-K,T & D Type flip flop .

7. To study FLIP- FLOP conversion.

8. To design & verify the operation of 3 bit synchronous counter.

9. To design & verify the operation of synchronous UP/DOWN decade counter using JK flip

10. To design & verify operation of Asynchronous counter.

11. To design and implement a circuit to detect a Count Sequence.

12. Conversion of state diagram to the state table and implement it using logical circuit.

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009
2. A.Anand Kumar, "Switching Theory & Logic Design", PHI.

3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition, 2006.

Note:-
1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/ disallowed.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Implement the basic digital theory concepts practically and will be able to verify various results derived in theory.
2. Design, analyze and troubleshoot broad range of combinational and sequential circuits for various practical problems using basic gates and flip flops I.C's.
3. Develop technical writing skills to communication effectively and present one's own work.
4. Acquire teamwork skills for finding sustainable solution of a complex problem and working effectively in groups.

CSE-202-C   WEB & INTERNET TECHNOLOGIES

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L	T	P	Credits		Class Work	:	25 Marks
3	0	–	3		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Exam.	:	3 Hours

UNIT-I

Introduction to the Internet, The world wide web: The idea of hypertext and hyper media; How the web works-HTTP, HTML and URLs; How the browser works-MIME types, plugins and helper applications; The standards-HTML, XML, XHTML and the W3C.

Hypertext markup language: The anatomy of an HTML document; Marking up for structure and style: basic page markup, absolute and relative links, ordered and unordered lists, embedding images and controlling appearance, table creation and use, frames, nesting and targeting.

Descriptive markup: Meta tags for common tasks, semantic tags for aiding search, the doubling code and RDF.

UNIT-II

Separating style from structure with style sheets: Internal style specifications within HTML, External linked style specification using CSS, page and site design considerations.

Client side programming: Introduction to the JavaScript syntax, the JavaScript object model, Event handling, Output in JavaScript, Forms handling, miscellaneous topics such as cookies, hidden fields, and images; Applications.

UNIT-III

Server side programming: Introduction to Server Side Technologies CGI/ASP/JSP., Programming languages for server Side Scripting, Configuring the server to support CGI, applications; Input/ output operations on the WWW, Forms processing, (using PERL/VBSCRIPT/JavaSCIPT)

UNIT-IV

Other dynamic content Technologies: introduction to ASP & JSP, Delivering multimedia over web pages, The VRML idea, The Java phenomenon-applets and servelets, issues and web development.

Introduction to Microsoft .NET Technology and its comparison with the competing Technologies.

TEXT BOOKS:-
1. Beginning XHTML by Frank Boumpery, Cassandra Greer, Dave Raggett, Jenny Raggett, Sebastian Schnitzenbaumer& ted Wugofski, 2000, WROX press (Indian Shroff Publ. SPD) 1st edition
2. Web Technologies By Achyut S Godbole ,AtulKahate, 2003, T.M.H
3. Internet & World Wide Web How to program by P.J Deitel & H.M Deitel,Pearson

REFERENCE BOOKS:-
1. HTML &XHTML:The Definitive Guide by Chuck Musciano, Bill Kennedy, 2000, 4th Edi.

2. XHTML Black Book by Steven Holzner, 2000
3. CGI Programming on the World Wide Web. O'Reilly Associates.
4. Internet and Web Technologies – Raj Kamal, 2002, T.M.H

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

Course Outcomes: Upon completion of the course the students will be able to

1. Understand, analyze and apply the role of languages like HTML, CSS, XML, JavaScript and protocols in the workings of web and web applications.

2. Create a good, effective and dynamic website

3. Understand about network programming using Java.

4. Develop interactive web applications using ASP.NET Framework alongwith XML .
.

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L	T	P	Credits			
3	0	–	3	Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100Marks
				Durationof Examination	:	3 Hours

UNIT-I

Introduction: Introduction to Operating System Concepts (including Multitasking, multiprogramming, multi user, Multithreading etc)., Generations of operating systems Types of Operating Systems: Batch operating system, Time-sharing systems, Distributed OS, Network OS, Real Time OS; Various Operating system services, architecture, System programs and calls. Monolithic , microkernel operating systems, concept of virtual machine Unix System And Windows NT Overview: Unix system call for processes and file system management, Shell interpreter, Windows NT architecture overview, Windows NT file system.

UNIT-II

Process Management: Process definition, different states of a process , process state transitions, process control box(PCB), context switching
Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,
Process scheduling, Foundation and Scheduling objectives, Types of Schedulers,
Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time;
Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJ F, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

UNIT-III

Memory Management: Logical & Physical Address Space, swapping, contiguous memory allocation, non-contiguous memory allocation, fixed and variable partitions – internal and external fragmentation and compaction; Paging : principle of operation- page allocation – page allocation- hardware support for paging, Protection and sharing disadvantages of paging , Segmentation techniques, segmentation with paging;
Virtual Memory: basic concepts of VM, management - Demand Paging & Page-Replacement Algorithms; Demand Segmentation.

UNIT-IV

Process-Synchronization & Deadlocks: Critical Section Problems, semaphores; methods for handling deadlocks-deadlock prevention, avoidance & detection; deadlock recovery.
I/O Systems: I/O Hardware, Application I/O Interface, Kernel, Transforming I/O requests, Performance Issues.
File System: Different types of files and their access methods, directory structures, various allocation methods, disk scheduling and management and its associated algorithms, Introduction to distributed file system.

Approved in 14th meeting of Academic Council held on 11.06.2019. Effective from Academic Session 2019-20 and applicable to all students admitted in 2018 and onwards.

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TEXT BOOKS:
1. Operating System Concepts by Silberchatz et al, 5th edition, 1998, Addison-Wesley.
2. Modern Operating Systems by A. Tanenbaum, 1992, Prentice-Hall.
3. Operating Systems Internals and Design Principles by William Stallings,4thedition, 2001, Prentice-Hall

REFERENCE BOOKS :

1. Operating System by Peterson, 1985, AW.
2. Operating System by Milankovic, 1990, TMH.
3. Operating System Incorporating With Unix& Windows By Colin Ritche, 1974, TMH.
4. Operating Systems by Mandrik& Donovan, TMH
5. Operating Systems – Advanced Concepts By MukeshSinghal , N.G. Shivaratri, 2003, T.M.H

Note:
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For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

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Course Outcomes:

After successful completion of the course students will learn the following:-

1. The mechanisms of OS to handle processes and threads and their communication
2. The mechanisms involved in memory management in contemporary OS
3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
4. To know the components and management aspects of concurrency management

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CSE 206-C DESIGN AND ANALYSIS OF ALGORITHMS
B. Tech. Semester – IV (Computer Science and Engg.)
w.e.f. 2019-2020

L	T	P	Credits		Class Work	:	25 Marks
3	0	–	3		Examination	:	75 Marks
					Total	:	100Marks
					Durationof Examination	:	3 Hours

UNIT-I

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

UNIT-II

Fundamental Algorithmic Strategies: Brute-Force, Greedy,Dynamic Programming, Branch-and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics-characteristics and their application domains.

UNIT-III

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT-IV

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard.Cook's theorem, Standard NP-complete problems and Reduction techniques.
Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE

TEXT BOOKS:
1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.

REFERENCE BOOKS:
1. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
3. Algorithms – A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

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For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

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Course Outcomes:

After successful completion of the course students will learn to :-

1. Analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms .
2. Describe greedy, divide-and-conquer and dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the algorithms and analyze it to determine its computational complexity.
3. Model a given engineering problem using graph and write the corresponding algorithm to solve the problems.
4. Explain the ways to analyze randomized algorithms (expected running time, probability of error) and Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).

CSE 208-C DISCRETE MATHEMATICS

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L	T	P	Credits				
3	0	–	3	Class Work	:	25	Marks
				Examination	:	75	Marks
				Total	:	100	Marks
				Duration of Examination	:	3 Hours	

UNIT-I

Sets, Relation and Function: Operations and Laws of Sets, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets Cartesian Products, Disjunctive and Conjunctive Normal Form Binary Relation : representation of relations, Partial Ordering Relation, Equivalence Relation, Image of a Set, Function: Sum and Product of Functions, Bijective functions, Inverse and Composite

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

UNIT-II

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination. Introduction to recurrence relations and generating functions.

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof, Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

UNIT-III

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function,

UNIT-IV

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

TEXT BOOKS:

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1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications,4th edition, Wadsworth Publishing Co. Inc.

3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.

REFERENCE BOOKS:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to
   Computer Science", TMG Edition, TataMcgraw-Hill

2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson,

3. Discrete Mathematics, Tata McGraw - Hill

Note:

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For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

Course Outcomes:

After successful completion of the course students will learn the following:-

1. For a given logic sentence , express it in terms of predicates, quantifiers, and logical connectives
2. For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference
3. For a given a mathematical problem, classify its algebraic structure and evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
4. Develop the given problem as graph networks and solve with techniques of graph theory.

MC201C (Environmental Studies)
(Common for all branches of B.Tech and B.Arch)

L	T	P/D	Credits	Field Work	:	25 Marks
3	–	–	0	Examination (Theory/Practical)	:	75 Marks

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UNIT-I

The Multidisciplinary Nature of Environmental Studies, .Introduction to Environment: Definition, Scope, and importance of environmental studies; need for public awareness.

Environmental Pollution: Definition, Cause and effects of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Role of an individual in prevention of pollution, Pollution case studies

UNIT- II

Natural Resources: Water resources: over-utilization, floods, drought, dams-benefits and problems; Mineral resources: Use and exploitation, environmental effects; Food resources : changes caused by modern agriculture, fertilizer-pesticide problems, water logging, Energy resources : Growing energy needs, renewable and non renewable energy sources; Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

UNIT – III

Ecosystems and Biodiversity: Concept of an ecosystem, Structure and function, Energy flow, Ecological succession, ecological pyramids. Concept of Biodiversity, definition and types, Hot-spots of biodiversity; Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT – IV

Social Issues and Environment: Water conservation, rain water harvesting, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, Public awareness. Population growth, variation among nations, Family Welfare Programme. Human Population and the Environment - Population growth, Population explosion, Women and Child Welfare.

Field Work - Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc   (Field work equal to 5 lecture hours)

REFERNCE BOOKS:

1.   A Textbook of Environmental Studies by Asthana D.K. and Asthana Meera

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Approved in 14th meeting of Academic Council held on 11.06.2019. Effective from Academic Session 2019-20 and applicable to all students admitted in 2018 and onwards.

2. Fundamental Concepts in Environmental Studies by Mishra D.D.

3. Environmental Studies by S.C Sharma M.P Poonia

4. Textbook of Environmental Studies for Undergraduate by Erach Bharucha

5. Environmental Studies: Third Edition by R. Rajagopalan

COURSE OUTCOMES: On completion of the course, the students will be able to:
1. Develop concepts of basic environmental factors.
2. Understand the basic issues of ecosystem and its structural and functional aspects and vast biodiversity
3. Outline aspects of environmental issues.
4. Understand the knowledge of energy resources and their environmental implications

B.Tech (Semester III/IV)
MC203C Constitution of India
(Common for all branches of B. Tech.)

L	T	P	Credits		
3	0	0	0	Class-work Marks	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

Approved in 14th meeting of Academic Council held on 11.06.2019. Effective from Academic Session 2019-20 and applicable to all students admitted in 2018 and onwards.

Course Objectives:

To make students conscious citizens of India and well equip them to explain and understand the importance of constitution of the country

Course Contents:

Unit I

Philosophy of Indian Constitution

Ideological Basis and Salient Features of Indian Constitution
Fundamental Rights & Duties of the Citizens
Directive Principles of State Policy

Unit II

Nature and Dynamics of Indian Federalism

Federalism: Theory and Practice in India
Federal Features of the Indian Constitution
Legislative, Administrative and Financial Relations between the Union and the States

Unit III

Union and State Legislature

Parliament: Composition, Functions and Working of the Parliamentary system
State Legislature: Composition and Functions of Vidhan Sabha/ Vidhan Parishad

Unit IV

Centre and State: Executive and Judiciary

President, Prime Minister and Council of Ministers
Governor, Chief Minister and Council of Ministers
Judiciary: Supreme Court; High Court

Course Outcomes:

At the end of the course students will be able to

1. To understand basic features of the constitution and rights and duties of Indian citizens
2. To understand the basic structure of Centre and State Government
3. To get acquainted with the nature of parliamentary form of Government

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4. To have knowledge of the executive and judiciary powers in Indian democratic set-up

Scheme of End Semester Examinations (Major Test):

1. The duration of examinations will be three hours.
2. Nine questions of 15 marks each will be set out of which the students will have to attempt five questions in all.
3. First question of 15 marks will be compulsory. It will cover all the four units of the syllabus. The nature of the questions in each unit will depend upon the nature of content therein. The questions may have sub-parts with marks assigned against each.
4. Question No 02 to 09 of 15 marks each will be set from the four units of the syllabus --- two from each unit.
5. In addition to first compulsory question the students will have to attempt four more questions, selecting one from each unit.

Recommended Readings:

1. Austin G., *The Indian Constitution: Corner Stone of a Nation*, New Delhi: Oxford University Press, 1966
2. Basu D.D., *An Introduction to the Constitution of India*, New Delhi: Prentice Hall, 1994
3. Kothari R., *Politics in India*, New Delhi: Orient Language, 1970
4. Siwach J.R., *Dynamics of Indian Government and Politics*, New Delhi: Sterling Publishers, 1985
5. Bhambhri C.P., *The Indian State–Fifty Years*, New Delhi: Shipra, 1997
6. Ghai U.R*., IndianPoliticalSystem*, Jalandhar: New Academic Publishing Company, 2010

Note:
1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

   For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

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MGT202C ORGANIZATIONAL BEHAVIOUR

B. Tech. Semester – IV(Computer Science and Engg.)
w.e.f. 2019-2020

L	T	P	Credits			
3	0	–	3			

Class Work : 25 Marks
Examination : 75 Marks
Total : 100Marks
Duration of Examination : 3 Hours

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UNIT-I

Introduction: Definition and concept of Organizational Behaviour, nature and scope of OB, elements of OB, contributing disciplines to OB, challenges for OB, evolution of OB.

UNIT-II

Individual processes: Attitudes, Values; Perception – concept, process and applications; Personality - concept, determinants, theories and applications; Learning – concept and theories of learning.

UNIT-III

Team processes: Motivation – concept and theories of motivation; Group behaviour – concept, types of group, group development, group dynamics; Teams - types, creating effective teams.

UNIT-IV

Organizational processes and Stress management: organizational structure – elements of organizational structure; organizational change – concept, resistance to change, managing resistance to change, Lewin's three- step model of change; Stress – sources, consequences and management.

TEXT BOOKS:

1. Robbins Judge and Vohra, Organizational Behaviour, Pearson, New Delhi.
2. Khanka S S, Organizational Behavior, S.Chand& Company Pvt. Ltd., New Delhi.

REFERENCE BOOKS :

1. Greenberg Jerald, Behavior in Organizations, PHI, New Delhi.
2. Parikh and Gupta, OrganisationalBehaviour, Mc Graw Hill, New Delhi.
3. PareekUdai, Understanding Organizational Behaviour, Oxford University Press, New Delhi.
4. Aswathappa K., OrganisationalBehaviour, Himalaya Publishing House, New Delhi.
5. Luthans, F. Organizational Behavior, McGraw Hill Education.

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Note:

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Year (C-Scheme) in 2019 and all trailing students.

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Course Outcomes: On completion of this course, the students will be able to

1. Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization.

2. Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.

3. Analyze the complexities associated with management of the group behavior in the organization.

4. Demonstrate how the organizational behavior can integrate in understanding the motivation behind behavior of people in the organization.

Approved in 14th meeting of Academic Council held on 11.06.2019. Effective from Academic Session 2019-20 and applicable to all students admitted in 2018 and onwards.

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CSE282C **WEB & ITERNET TECHNOLOGIES LAB**
B. Tech. Semester – III (Computer Science and Engg.)

L	T	P	Credits				
	4	2		Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100Marks
				Duration of Examination	:	3 Hours

List of practicals

1 A Simple HTML home page provide links to move to other pages like hobbies, educational info, personal info etc.

2 A HTML program to illustrate the use of frame and frameset tags of HTML.

3 A HTML Program which use a HTML controls to create a student information form to collect student's information like name, address, phone, email, sex, birth date, hobbies etc. Download

4 A HTML Program which demonstrates loops like for loop, do while, while in java script.

5 A HTML Program which demonstrates the use of functions in java script.

6 A HTML Program which demonstrates various events like onclick, ondbclick, onfocus, onblur, onchange, onmouseover, onmouseover, window event, onload, onunload event.

7 A HTML Program to create various functions and sub routines to validate the data entered by user in form.   Download

8 Create a program to illustrate the concept of associative array in PHP.

9 Create PHP program to implement the concept of Session management.

10 Create a PHP program to display student information in webpage. Student's data is stored in My SQL database.

11.Create a PHP program to insert student information from HTML form. Student's data is stored in My SQL database.
Note: More exercises based on CSE202C may be given by the teacher
Course Outcomes: After successful completion of the course , the students will be able to :
1. Develop web pages using mark up languages like HTML, DHTML and style sheets for
making it more presentable to the user.
2. Develop dynamic web pages using client side programming and server side programming.
3. Develop interactive web applications using ASP.NET Framework.
4 . Develop PHP programs for interactive web pages.

Approved in 14th meeting of Academic Council held on 11.06.2019. Effective from Academic Session 2019-20 and applicable to all students admitted in 2018 and onwards.

CSE 284-C OPERATING SYSTEMS LAB
B. Tech. Semester – IV (Computer Science and Engg)

L	T	P	Credits			
	4	1		Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100Marks
				Duration of Examination	:	3 Hours

List of Practicals :-

1) Study of WINDOWS 2000 Operating System.

2) Administration of WINDOWS 2000 (including DNS,LDAP, Directory Services).

3) Study of LINUX Operating System (Linux kernel, shell, basic commands pipe & filter commands).

4) Administration of LINUX Operating System.

5) Writing of Shell Scripts (Shell programming).

6) AWK programming.

Course Outcomes:
On successful completion of the course, the students will:

1. Demonstrate the concepts of operating system, advantage and disadvantage of OS

2. Demonstrate the concepts of Process networking in Windows. .

3. Demonstrate the concepts of networking in LINUX.

4. Be able to work in different shell environments.

CSE 286-C DESIGN AND ANALYSIS OF ALGORITHMS LAB
B. Tech. Semester – IV (Computer Science and Engg.)
w.e.f. 2019-2020

L	T	P	Credits			
_	_	4	2	Class Work	:	25 Marks
				Examination	:	75 Marks
				Total	:	100Marks
				Duration of Examination	:	3 Hours

List of Programs:

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the lIst to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

2. Implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

3. a. Obtain the Topological ordering of vertices in a given digraph.

   b. Compute the transitive closure of a given directed graph using Warshall's algorithm.

4. Implement 0/1 Knapsack problem using Dynamic Programming.

5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra"s algorithm.

6. Find Minimum Cost Spanning Tree of a given undirected graph using Kristal"s algorithm.

7. a. Print all the nodes reachable from a given starting node in a digraph using BFS method.

   b. Check whether a given graph is connected or not using DFS method.

8. Find a subset of a given set S = {sl,s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions{1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation

algorithm and determine the error in the approximation.

10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim"s algorithm.

11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using Open and determine the speed-up achieved.

12. Implement N Queen's problem using Back Tracking.

Note:
   More exercises based on CSE 206-C may be given by the teacher

Course Outcomes: Upon successful completion of the course students will learn:
   -

1. To develop and code program for the algorithms and analyze it to determine its computational complexity.
2. To identify and analyze worst-case running times of algorithms.
3. To model given engineering problem using graph and write the corresponding algorithm to solve the problems.
4. To Design, develop and implement the specified algorithms for the following problems using C or C++ Language.