GITAM INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)

(Deemed to be University, Estd. u/s 3 of UGC Act 1956)

VISAKHAPATNAM ⁎HYDERABAD ⁎BENGALURU

Accredited by NAAC with 'A' Grade

REGULATIONS AND SYLLABUS

of

Master of Computer Applications

(W.e.f 2018-19 admitted batch)

Website: www.gitam.edu

M.C.A (Master of Computer Applications)
REGULATIONS
(W.e.f. 2018-19 admitted batch)

1. ADMISSION

1.1 Admission into M.C.A. program of GITAM University is governed by GITAM University admission regulations.

2. ELIGIBILITY CRITERIA

2.1. A pass in any degree with a minimum aggregate of 50% marks and Mathematics/Statistics at +2 level or degree level or equivalent examination.

2.2. Admission into M.C.A (Master of Computer Applications) will be based on an All India GITAM Science Admission Test (GSAT) conducted by GITAM University and the rule of reservation, wherever applicable.

3. CHOICE BASED CREDIT SYSTEM

Choice Based Credit System (CBCS) is introduced with effect from the admitted Batch of 2015-16 based on UGC guidelines in order to promote:

- Student Centered Learning
- Cafeteria approach
- Inter-disciplinary learning

Learning goals/ objectives and outcomes are specified leading to what a student should be able to do at the end of the program.

4. STRUCTURE OF THE PROGRAM:

4.1 The Program Consists of

i) Foundation Courses (compulsory) which give general exposure to a Student in communication and subject related area.

ii) Core Courses (compulsory).

iii) Discipline centric electives which

a) are supportive to the discipline
b) give expanded scope of the subject
c) give inter disciplinary exposure
d) Nurture the student skills

iv) Open electives are of general nature either related or unrelated to the discipline.

v) Practical Proficiency Courses

Laboratory and Project work.

4.2 Each course is assigned a certain number of credits depending upon the number of contact hours (lectures/tutorials/practical) per week.

4.3 In general, credits are assigned to the courses based on the following contact hours per week per semester.

- One credit for each Lecture / Tutorial hour per week.
- Two credits for three hours of Practical per week.
- Eight credits for project.

4.4 The curriculum of the Six semesters M.C.A program is designed to have a total of 128 credits for the award of M.C.A degree.

5. MEDIUM OF INSTRUCTION

The medium of instruction (including examinations and project reports) shall be English.

6. REGISTRATION

Every student has to register himself/herself for each semester individually at the time specified by the Institute / University.

7. ATTENDANCE REQUIREMENTS

7.1 A student whose attendance is less than 75% in all the courses put together in any semester will not be permitted to attend that end - semester examination and he/she will not be allowed to register for subsequent semester of study. He/she has to repeat the semester along with his / her juniors.

7.2 However, the Vice Chancellor on the recommendation of the Principal / Director of the Institute/School may condone the shortage of attendance to the students whose attendance is between 66% and 74% on genuine grounds and on payment of prescribed fee.

8. EVALUATION

8.1 The assessment of the student's performance in a Theory course shall be based on two components: Continuous Evaluation (40 marks) and Semester-end examination (60 marks).

8.2 A student has to secure an aggregate of 40% in the course in continuous and semester end examinations the two components put together to be declared to have passed the course, subject to the condition that the candidate must have secured a minimum of 24 marks (i.e. 40%) in the theory component at the semester-end examination.

8.3 Practical / Viva voce etc. course are completely assessed under Continuous Evaluation for a maximum of 100 marks, and a student has to obtain a minimum of 40% to secure Pass Grade. Details of Assessment Procedure are furnished below in Table 1.

Table 1: Assessment Procedure

S. No.	Component of assessment	Marks allotted	Type of Assessment	Scheme of Examination
1	Theory	40	Continuous evaluation	(i) Two mid semester examinations shall be conducted for 15 marks each. (ii) 5 marks are allocated for quiz. (iii) 5marks are allocated for assignments.
		60	Semester-end examination	The semester-end examination Shall be for a maximum of 60 marks.
	Total	100		

2	Practicals	40	Continuous evaluation	Forty (40) marks for continuous evaluation is distributed among the components: regularity, preparation for the practical, performance, submission of records and oral presentations in the laboratory. Weightage for each component shall be announced at the beginning of the Semester.
		60	Continuous evaluation	Sixty (60) marks for two tests of 30 marks each (one at the mid-term and the other towards the end of the Semester) conducted by the concerned lab Teacher and another faculty member of the department who is not connected to the lab, as appointed by the HoD.
	Total	100		
3	Project work	200	Project evaluation	(i) 150 marks for evaluation of the project work dissertation submitted by the candidate. (ii) 50 marks are allocated for the project Viva-Voce. (iii) The project work evaluation and the Viva-Voce shall be conducted by one external examiner outside the University and the internal project work supervisor.

9. REAPPEARANCE

9.1 A student who has secured 'F' grade in a Theory course shall have to reappear at the subsequent semester end examinations held for that course.

9.2 A student who has secured 'F' grade in a Practical course shall have to attend Special Instruction Classes held during summer.

9.3 A student who has secured 'F' Grade in Project work / Industrial Training etc shall have to improve his/her report and reappear for Viva – voce at the time of Special Examination to be conducted in the summer vacation.

10. SPECIAL EXAMINATION

A student who has completed his / her period of study and still has "F" grade in a maximum of four Theory courses is eligible to appear for Special Examination normally held during summer vacation.

11. BETTERMENT OF GRADES

A student who has secured only a Pass or Second class and desires to improve his/her Class can appear for Betterment Examinations only in Theory courses of any Semester of his/her choice, conducted in Summer Vacation along with the Special Examinations. Betterment of Grades is permitted 'only once' immediately after completion of the program of study.

12. GRADING SYSTEM

12.1 Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given in Table 2.

Table 2: Grades & Grade Points

Sl.No.	Grade	Grade Points	Absolute Marks
1	O (outstanding)	10	90 and above
2	A+ (Excellent)	9	80 to 89
3	A (Very Good)	8	70 to 79
4	B+ (Good)	7	60 to 69
5	B (Above Average)	6	50 to 59
6	C (Average)	5	45 to 49
7	P (Pass)	4	40 to 44
8	F (Fail)	0	Less than 40
9	Ab. (Absent)	0	-

12.2 A student who earns a minimum of 4 grade points (P grade) in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course, subject to securing a GPA of 5 for a Pass in the semester.

13. GRADE POINT AVERAGE

13.1 A Grade Point Average (GPA) for the semester will be calculated according to the formula:

$$GPA = \frac{\Sigma [C * G]}{\Sigma C}$$

Where

C = number of credits for the course,
G = grade points obtained by the student in the course.

13.2 To arrive at Cumulative Grade Point Average (CGPA), a similar formula is used considering the student's performance in all the courses taken, in all the semesters up to the particular point of time.

13.3 CGPA required for classification of class after the successful completion of the program is shown in Table 3.

Table 3: CGPA required for award of Class

Class	CGPA Required
First Class with Distinction	≥ 8.0*
First Class	≥ 6.5
Second Class	≥ 5.5
Pass Class	≥ 5.0

* In addition to the required CGPA of 8.0 or more the student must have necessarily passed all the courses of every semester in first attempt.

14. ELIGIBILITY FOR AWARD OF THE M.C.A DEGREE

14.1 Duration of the program: A student is ordinarily expected to complete M.C.A program in Six semesters of three years. However a student may complete the program in not more than Six years including study period.

14.2 However the above regulation may be relaxed by the Vice Chancellor in individual cases for cogent and sufficient reasons.

14.3 A student shall be eligible for award of the M.C.A Degree if he / she fulfills all the following conditions.

a) Registered and successfully completed all the courses and projects.

b) Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.

c) Has no dues to the Institute, hostels, Libraries, NCC / NSS etc, and

d) No disciplinary action is pending against him / her.

14.4 The degree shall be awarded after approval by the Academic Council.

15. Discretionary Power:

Notwithstanding anything contained in the above sections, the Vice Chancellor may review all exceptional cases, and give his decision, which will be final and binding.

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Master of Computer Applications (M.C.A.) - Scheme of Instruction
I SEMESTER

Sl. No.	Course Code	Name of the Course	Credits	Scheme of Instruction		Total	Scheme of Examination		
				Hours per Week			Duration in Hrs.	Maximum Marks	
				L/T	P			Sem. End Exam	Con. Eval
1	SCA 601	Object Oriented Programming with C++	4	4	0	4	3	60	40
2	SCA 603	Computer Organization and Architectures	4	4	0	4	3	60	40
3	SCA 605	Operating Systems	4	4	0	4	3	60	40
4	SCA 607	Mathematics for Computer Science-I	4	4	0	4	3	60	40
5	SCA 609	Technical English Language Skills	3	3	0	3	3	60	40
PRACTICALS :									
	SCA 621	Programming with C++ Lab	2	0	3	3	3	--	100
8	SCA 623	Programming with Unix Lab	2	0	3	3	3	--	100
		Total	23	19	6	25	--	300	400

M.C.A. – II SEMESTER

Sl. No.	Course Code	Name of the Course	Credits	Scheme of Instruction		Total	Scheme of Examination		
				Hours per Week			Duration in Hrs.	Maximum Marks	
				L/T	P			Sem. End Exam	Con. Eval
1	SCA 602	Database Management Systems	4	4	0	4	3	60	40
2	SCA 604	Data structures with C++	4	4	0	4	3	60	40
3	SCA 606	Mathematics for Computer Science-II (Probability and Statistics)	4	4	0	4	3	60	40
4	SCA 608	Information Systems Analysis and Design	4	4	0	4	3	60	40
5		Open Elective - I	3	3	0	3	3	60	40
PRACTICALS :									
	SCA 622	Database Management Systems Lab	2	0	3	3	3	--	100
	SCA 624	Data structures using C++Lab	2	0	3	3	3	--	100
		Total	23	19	6	25	--	300	400

M.C.A. – III SEMESTER

Sl. No.	Course Code	Name of the Course	Credits	Scheme of Instruction		Total	Scheme of Examination		
				Hours per Week			Duration in Hrs.	Maximum Marks	
				L/T	P			Sem. End Exam	Con. Eval
1	SCA 701	Programming with JAVA	4	4	0	4	3	60	40
2	SCA 703	Computer Networks	4	4	0	4	3	60	40
3	SCA 705	Optimization Techniques	4	4	0	4	3	60	40
4	SCA 707	Software Engineering	4	4	0	4	3	60	40
PRACTICALS :									
	SCA 721	Programming with JAVA Lab	2	0	3	3	3	--	100
	SCA 723	Technical English Language Skills Lab	2	0	3	3	3	--	100
	SCA 791	Minor Project	2	--	3	3	3	50	50
		Total	22	16	9	25	--	290	410

M.C.A. – IV SEMESTER

Sl. No.	Course Code	Name of the Course	Credits	Scheme of Instruction		Total	Scheme of Examination		
				Hours per Week			Duration in Hrs.	Maximum Marks	
				L/T	P			Sem. End Exam	Con. Eval
1	SCA 702	Design and Analysis of Algorithm	4	4	0	4	3	60	40
2	SCA 704	Network Security	4	4	0	4	3	60	40
3	SCA 706	Data Mining	4	4	0	4	3	60	40
4	SCA 708	Technical English Skills -II	3	4	0	4	3	60	40
5		Open Elective - II	3	3	0	3	3	60	40
PRACTICALS :									
	SCA 722	UML Lab	2	0	3	3	3	--	100
	SCA 724	Data Mining Lab	2	0	3	3	3	--	100
		Total	22	19	06	25	--	300	400

M.C.A. – V SEMESTER

Sl. No.	Course Code	Name of the Course	Credits	Scheme of Instruction		Total	Scheme of Examination		
				Hours per Week			Duration in Hrs.	Maximum Marks	
				L/T	P			Sem. End Exam	Con. Eval
1	SCA 801	Cloud Computing	4	4	0	4	3	60	40
2	 SCA 841 SCA 843 SCA 845 SCA 847	Generic Elective – I J2EE Technologies .Net Technologies Image Processing and Analysis Advanced Database Management Systems	4	4	0	4	3	60	40
3	 SCA 849 SCA 851 SCA 853 SCA 855 SCA 857	**Generic Elective – II** TCP/IP Formal Language and Automata Theory Enterprise Resource Planning Principles of Information Security Machine Learning	4	4	0	4	3	60	40
4	 SCA 859 SCA 861 SCA 863 SCA 865 SCA 867	**Generic Elective – III** Introduction to Microprocessors Information Retrieval Scheduling and Supply Chain Management Distributed Operating Systems Software Testing and Methodologies	4	4	0	4	3	60	40
PRACTICALS :									
	 SCA 881 SCA 883 SCA 885 SCA 887	**Generic Elective – I Lab** J2EE Technologies Lab .Net Technologies Lab Image Analysis Using MatLab Advanced Database Management Systems Lab	2	0	3	3	3	--	100
	SCA 891	Summer Internship	2	--	--	--	--	50	--
		Total	20	16	03	19	--	290	260

M.C.A. – VI SEMESTER

Sl. No.	Course Code	Name of the Course	Credits	Scheme of Instruction		Total	Scheme of Examination		
				Hours per Week			Duration in Hrs.	Maximum Marks	
				L/T	P			Sem. End Exam	Con. Eval
		Generic Elective – IV	4	4	0	4	3	60	40
	SCA 842	Bioinformatics							
	SCA 844	Ethical Hacking							
	SCA 846	Real Time Operating Systems							
	SCA 848	Big Data Analytics							
	SCA 850	Compiler Design							
	SCA 852	Software Project Management							
		Generic Elective – V	4	4	0	4	3	60	40
	SCA 854	Mobile Computing							
	SCA 856	E Commerce							
	SCA 858	Web Services							
	SCA 860	Human Computer Interaction							
	SCA 862	Cloud Security and Privacy							
	SCA 864	Computational Intelligence							
	SCA 892	Comprehensive Viva (On any 5 subjects of study from Core and Generic Elective Subjects)	2	--	--	--	--	50	--
	SCA 894	Project Work	8	0	3	3	--	50	150
		Total	18	08	03	11	--	220	230

Total Credits: 23 + 23 + 22 + 22 + 20 + 18 = 128

OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF COMPUTER SCIENCE, GIS

S.No	Course Code	Title of the Paper	Course Offered Semester	Course Offered To	Course Not Offered To
1.		Object Oriented Programming using C++	2nd Semester	Student's of GIT, GIM, GIP, GSIB, School of Architecture, School of Law	Student's who do not study Object Oriented Programming using C++ as a core/elective subject
2.		Database Management Systems	3rd Semester	Student's of GIT, GIM, GIP, GSIB, School of Architecture, School of Law	Student's who do not study Database Management Systems as a core/elective subject

MCA – I SEMESTER

SCA 601: OBJECT ORIENTED PROGRAMMING WITH C++

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Objectives: This course presents the Object Oriented Programming concept in C++, data types, arrays, pointers, files, classes, inheritance, polymorphism, exception handling.

UNIT - I

Principles of Object Oriented Programming: Software Crisis, Software Evolution, A look at Procedure Oriented Programming, Object Oriented Programming Paradigms, Basic concepts and benefits of OOP, Application of OOP, OOP languages. Structure of C++ Program, Applications of C++, Tokens, Keywords, Identifiers and Constants, Basic data types, User Defined data types, Storage Classes, Derived Data Types, Symbolic constants, Type Compatibility, Declaration of Variables, Dynamic initialization, Reference variables, Operators, Scope resolution, Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Casting, Expressions and their types, Special Assignment Expressions, Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures. (12)

UNIT - II

Functions: Main Function, Function Prototyping, Call by Reference, Return By Reference, Inline functions, Default arguments, const Arguments, Recursion, Function overloading, Friend and virtual functions, Math Library Functions**.**

Classes and Objects: Class specification, Member function definition, Making outside function inline, Nesting Of Member Functions, Private Member Function, Arrays Within a Class, Memory Allocation For Objects, Static Data Members And Member Functions, Array of Objects, Objects As Arguments, Friend Functions, Returning Objects, const Member Function, Pointer To Members, Local Classes. (10)

UNIT - III

Constructors and Destructors: Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic initialization of Objects, Copy constructors, Dynamic Constructors, Constructing Two Dimensional Arrays, const Objects, Destructors.

Operator Overloading and Type Conversions: Defining Operator Overloading, Overloading Unary And Binary Operator, Overloading Binary Operators Using Friends, Manipulation Of String Using Operators, Rules For Overloading Operators, Type Conversion. (10)

UNIT - IV

Inheritance Extending Classes: Introduction, Defining Derived Classes, Single Inheritance, Making a Private Member Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors In Derived Classes, Member Classes, Nesting of Classes.

Pointers, Virtual Functions and Polymorphism: Pointers, Pointer to objects, this pointer, Pointer To Derived Classes, Virtual Functions, Pure Virtual Functions, Virtual Constructors and Destructors.

Templates: Introduction, Class Template, Class Template With Multiple Parameters, Function Templates, Function Templates With Multiple Parameters, Overloading of Template Functions, Member Function Templates, Non type Template Arguments. (10)

UNIT - V

Managing Console I/O Operations: Streams in C++, Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output With Manipulators.

Working With Files: Introduction, Classes For File Stream Operations, Opening And Closing A File, Detecting End-Of-File, File Modes, File Pointers And Their Manipulations, Sequential Input and Output Operations, Updating a File: Random Access, Error Handling During File Operations, Command Line Arguments.

Exception Handling: Introduction, Basics Of Exception Handling, Exception Handling Mechanism, Throwing And Catching Mechanism, Rethrowing an Exception, Specifying Exceptions, Exceptions In Constructors And Destructors, Exception In Operator Overloaded Functions. (10)

Text Books:

1. Object Oriented Programming with C++ by E.Balagurusamy, Tata MC GrawHill, 6th edition, 2013.

Reference Books:

1. Mastering C++ by Venugopal K R, Rajkumar Buyya , Tata Mc Graw Hill, 2nd edition, 2013.
2. C++ Programming Language by Bjarne Stroustrup, Addison-Wesley Professional, 4th edition, 2013.
3. C++ Primer by Barbara E Moo , Stanley B. Lippman , Josee Lajoie, Pearson Education, 4th edition, 2007.

MCA – I SEMESTER

SCA 603: COMPUTER ORGANIZATION AND ARCHITECTURE

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Objectives: To give basic knowledge of a Digital Computer, its architecture, components and their organization. It also introduces the hardware and upcoming processor architecture and its evolution with change in working style.

Unit - I

Digital Logic Circuits: Digital Computers, Logic gates, Boolean algebra, Map simplification, Combinational circuits, Flip-flops, Sequential circuits.

Digital Components: Integrated circuits, Decoders, Multiplexers, Registers, Shift registers, Binary counters, Memory unit.

Data Representation: Data types, Compliments, Fixed-point representation, Floating point representation. (12)

Unit - II

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and memory transfers, Arithmetic operations, Logic micro operations, Shift micro operations, Arithmetic Logic and Shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer instructions, Timing and control, Instruction cycle, Memory-Reference instructions, Input-output and interrupt, Design of basic computer, Design of accumulator logic. (12)

Unit - III

Central Processing Unit: General Register Organization, Stack organization, Instruction formats, Addressing Modes, Data Transfer and Manipulation, Program control. (10)

Unit - IV

Input-output organization: Peripheral devices, Input-output interface, Asynchronous data transfer, Modes of transfer, Priority interrupt, DMA. (10)

Unit-V

Memory Organization: Memory hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware. (10)

Text books:

1. Computer System Architecture by M. Morris Mano, 3rd edition, Pearson Prentice hall, tenth impression 2013.

Reference books:

1. Computer System Architecture and Organization by M.Usha and T.S.Srikanth, Wiley India Private Limited, 2012.

2. The Basics of Computer System Architecture by Gursharan Singh and Maninder kaur, Modern publishers.

MCA – I SEMESTER
SCA 605: OPERATING SYSTEMS

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To acquire fundamental knowledge of the operating system architecture and components.

UNIT - I

Introduction: Introduction to Operating Systems, Computer System Architecture, Operating System Structure, Operating System Operations, Distributed Systems, Special Purpose Systems, Computing Environments, Open-Source Operating Systems.

System Structures: Operating System Services, User Operating Systems, System Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation Operating System Structure, Virtual Machines. (10)

UNIT - II

Process Concept: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication, Communication in Client Server Systems.

Multithreaded Programming: Overview, Multithreading Models, Thread Libraries, Threading Issues, Operating System Examples.

Process Scheduling: Basic Concepts, Scheduling Criteria and Algorithms, Thread Scheduling, Multiple Processor Scheduling, Operating System Examples, Algorithm Evaluation. (12)

UNIT - III

Synchronization: Background, The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. (13)

UNIT - IV

Memory Management Strategies: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

Virtual Memory Management: Background, Demand Paging, Copy on Write, Page Replacement, Allocation of Frames, Thrashing, Other Considerations. (13)

UNIT - V

File System: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection.

Implementing File Systems: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, NFS, The WAFL File System.

I/O Systems: Overview, I/0 Hardware, Application I/0 Interface, Kernel I/0 Subsystem, Transforming I/0 Requests to Hardware Operations, RAID Structure , Stable-Storage Implementation, Tertiary-Storage Structure , STREAMS, Performance. (12)

Text Books:

1. Operating System Concepts by Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Wiley Publications, 8th edition, 2012.

Reference Books:

1. Operating Systems by Achyut S. Godbole, Tata McGraw Hill, 3rd edition, 2010.
2. Operating Systems: Internals and Design Principles by William Stallings, Pearson Education, 7th edition, 2011.
3. Operating Systems: A Concept-based Approach by Dhamdhere, D.M., McGraw Hill, 2nd edition, 2006.

MCA – I SEMESTER

SCA 607: MATHEMATICS FOR COMPUTER SCIENCE - I

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Objectives: This course is introduced to impart knowledge of basic mathematical concepts and numerical methods. On completion of this course, the student shall be able to understand the concepts and results in Mathematical Logic, Set Theory, Lattices and Boolean Algebra, Graph Theory and Numerical methods.

UNIT - I

Mathematical Logic: Statements and Notation, Connectives, Normal Forms, The Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus. (10)

UNIT - II

Set Theory: Basic Concepts of Set Theory, Relations and Ordering.

Functions: Definitions and Introduction, Composite of Functions, Inverse Functions, Binary and n-ary Operations, Characteristic Function of a Set. (10)

UNIT - III

Lattices and Boolean Algebra: Lattices: Definition and Examples, Properties of Lattices, Sub lattices, Direct Product and Homomorphism, Some Special Lattices.

Boolean Algebra: Definition and Examples, Sub algebra, Direct Product and Homomorphism, Boolean Functions. (10)

UNIT - IV

Graph Theory: Graphs, Multi graphs, Directed Graphs, Complete, Regular and Bipartite Graphs, Planar Graphs, Tree Graphs, Labeled and Weighted Graphs, Basic Definitions, Sub-graphs, Isomorphic Graphs, Paths, Connectivity, The Bridges of Konigsberg, Traversable Multi-graphs. Rooted Trees, Sequential Representation of Directed Graphs, Warshall's Algorithm and Shortest Path (Minima) Algorithm only. (10)

UNIT - V

Numerical Methods: Solution of Algebraic and Transcendental Equations: The Bisection Method, The Methods of False Position, The Iteration Methods, Newton-Raphson Method.

Numerical Integration: Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's $3/8^{th}$ Rule . (10)

Text Books:

1. Discrete Mathematical Structures with applications to computer science by J.P. Tremblay and R. Monohar, Tata McGraw – Hill.
2. Discrete Mathematics by Seymour Lipschutz & Marc Lipson, Schaum's outlines, Tata McGraw Hill.
3. Introductory Methods of Numerical Analysis by S.S Sastry, Prentice – Hall India.

Reference Books:

1. Discrete Mathematics and its Applications by Kenneth H.Rosen, Tata McGraw – Hill.
2. Numerical Methods for Engineers – Steven C. Chopra and Raymond P.Canale, Mc Graw Hill

MCA – I SEMESTER
SCA 609: TECHNICAL ENGLISH LANGUAGE SKILLS

Hours per week: 3 End Examination: 60 Marks
Credits: 3 Sessionals: 40 Marks

Objectives: In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of MCA students. The prescribed book and the exercises are meant to serve broadly as students handbooks.

UNIT – I

Textual lesson 1 : Astronomy –Our Picture of the Universe (Adaptation from Stephen Hawking)
Synonyms, Antonyms, One Word Substitutes, Words often confused Pharasal Verbs. (12)

UNIT - II

Textual Lesson 2: Information Technology – A very short history of Computer Ethics by Terrell Ward Bynum
Foreign Phrases, Tenses, Concord. . (10)

UNIT - III

Textual lesson 4: Humour – The Gold Frame by R.K.Laxman
Error Analysis, Idioms, Paragraph Writing. (10)

UNIT – IV

Textual lesson 5: Environment – Water the Elixir of Life by C.V.Raman
Essay Writing, Dialogue Writing, Reading Comprehension. (10)

UNIT - V

Textual lesson 7: Inspiration – Reaching for the stars –Biography of Kalpana chawla
Textual lesson 8: Human Interest – A service of Love by O. Henry. (10)

Text Books:

1. Learning English: A Communicative Approach, Orient Longman, 2006.

Reference Books:

1. Current English for colleges by N. Krishna Swamy and T. Sri Raman, Macmillan, 2014.
2. Examine your English by Margaret Maison, Orient Longman, 1st edition.
3. Effective English Communication for you by V. Shyamala, Emerald Publishers, 1st edition, 2014.
4. Communicative skills for Technical Students by M. Faratullah. Orient Blackswan, 2002.

MCA – I SEMESTER
SCA 621: PROGRAMMING WITH C++ Lab

Hours per week: 3 Examination: 100 Marks
Credits: 2

1. Program to perform the input and output statements.
2. C++ program to demonstrate Functions.
3. C++ program to implement Class concepts.
4. C++ program to implement Member functions.
5. C++ program to demonstrate Array of objects.
6. C++ program to demonstrate Constructors, parameterized Constructors.
7. C++ program to demonstrate copy constructors.
8. C++ program to demonstrate Friend function.
9. C++ program to implement Inline function.
10. C++ program to demonstrate Function Overloading.
11. C++ program to implement Operator Overloading(using unary and binary operators).
12. C++ program to demonstrate Operator Overloading using Friend Concept.
13. C++ program to implement Inheritance.
14. C++ program to implement Function overriding.
15. C++ program to demonstrate constructors in derived and base class.
16. C++ program to implement Virtual base class and abstract base class.
17. C++ program to demonstrate File handling.
18. C++ program to demonstrate streams and manipulators.
19. C++ program to demonstrate Exception Handling mechanism.
20. C++ program to demonstrate Class Templates and Function Templates.

Reference Book:

1. Object Oriented Programming with C++ by E.Balagurusamy, Tata McGraw Hill Education, 4th edition, 2008.

MCA – I SEMESTER
SCA 623: PROGRAMMING WITH UNIX LAB

Hours per week: 3 Examination: 100 Marks
Credits: 2

1 **Unix Utilities** – Introduction to Unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, cp, mv ln, rm, unlink, mkdir, rmdir, du, df, mount, umount find, unmask, ulimit, ps, who, finger, arp, ftp, telnet, rlogin, text processing utilities and backup utilities, detailed commands to be covered are cat, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm., cmp, diff, tr, awk, tar, cpio.

2. Study about the General Purpose Utilities
a) Banner b) cal c) date d) calendar e) tty f) bc g) spell & fspell

3. Write a shell program to find the Sum of digits in a 3 digit number using while loop.

4. Write a shell program to print first 'n' terms of Fibonacci series.

Programs on Processes:

5. Chain of processes.
6. Fan of processes.

Programs on Process Scheduling

7. FCFS scheduling algorithm
8. Round Robin scheduling algorithm
9. Priority scheduling algorithm (Preemptive, Non Preemptive)
10. Shortest job First scheduling algorithm(Preemptive, Non Preemptive)

Reference Books:

1. Unix Concepts and Applications by Sumitabha Das, Tata McGraw Hill, 4th edition, 2006.
2. Unix networking program by Stevens W. Richard, 2005.
3. Advanced Unix programming by H.J.Rechkind, Pearson Education, 2nd edition, 2004.

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MCA II SEMESTER

SCA 602: DATABASE MANAGEMENT SYSTEMS

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Objectives: The objective of this course is to introduce the students to basic concepts of databases and database management systems with emphasize on relational databases.

UNIT - I

Introduction and Conceptual Modeling:

Databases and Database Users: Introduction, Characteristics of Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of using DBMS Approach.

Database System, Concepts and Architecture: Data Models, Schemas and Instances, Three Schema Architecture and Data Independence, Database Language and Interfaces, The Database System Environment, Centralized and Client/Server Architecture of Database Management Systems, Classification of Database Management Systems. (10)

UNIT - II

Data Modeling Using The ER Model: High Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraint, Weak Entity Types, ER Diagrams, Naming Conventions and Design Issues. The Enhanced Entity Relationship modeL, UML Class Diagrams, Relationship Types of Degree Higher Than Two.

The Relational Data Model and Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraints Violations. (12)

UNIT – III

The Relational Algebra: Unary Relational Operations - SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations - JOIN and DIVISION; Additional Relational Operations, Examples of Queries in Relational Algebra.

Relational Database Design By ER And EER To Relational Mapping: Relational Database Design using ER to Relational Mapping, Mapping EER Model Constructs to Relations. (8)

UNIT – IV

SQL-Schema Definition, Constraints, Queries and Views: SQL Data Definition and Data types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE, UPDATE Statements in SQL, Additional Features of SQL, Specifying Constraints As Assertions and triggers, Views, Additional features of SQL.

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relational Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of 2nd and 3rd Normal Forms, Boyce-Codd Normal Form

Relational Database Design Algorithms and Further Dependencies : Properties of Relational Decomposition, Algorithms for Relational Database Schema Design, Multi valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form. (12)

UNIT - V

Transaction Processing Concepts- Introduction to Transaction Processing, Transaction and System Concepts, Desirable properties of transactions, Characterizing Schedules based on recoverability, Characterizing Schedules based on serializability.

Concurrency Control Techniques and Database Recovery Techniques. (10)

Text Books:

1.Fundamentals of Database Systems by Ramez Elmasri and Shamkant B. Navathe, Pearson education, 5th edition, 2009.

Reference Books:

1. Database Concepts by Abraham Silberschatz, Henry F Korth, S.Sudarshan, McGraw,Hill, 6th edition, 2014.

2. An Introduction to Database Systems by C.J. Date, Addison Wesley, 8th edition, 2008.

3. Database Management Systems by Raghu Ramakrishnan, Johannes Gehrke, TMH, 2nd edition, 2000.

MCA – II SEMESTER

SCA 604: DATA STRUCTURES WITH C++

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Objectives:

- To understand the linear and non linear data structures available in solving problems.
- To know about the sorting and searching techniques and its efficiency.
- To use the data structures and algorithms in real time applications.
- To be able to design own data structure according to the application need.

UNIT - I

Fundamental Concepts: Introduction to Data Structures, Types of Data Structures, Relationship among data, data structures and algorithms, Implementation of data structures, Analysis of Algorithms, Complexity of algorithms: Space complexity, Time complexity Definition.

Linear Data Structure Using Arrays: Sequential Organization, Linear Data Structure Using Sequential Organization: Array ADT, Memory Representation, Class Array, Multidimensional Arrays, Concept of Ordered List, Single Variable Polynomial: Representation, evaluation, Addition, Multiplication, Sparse Matrix: Representation, Addition, Transpose, String Manipulation Using Array, Pros and Cons of Arrays .

Searching: Search Techniques: Sequential search, Binary search, Fibonacci search, indexed sequential search, Hashed search.

Sorting: Types of sorting, General sort concepts, Bubble sort, Insertion sort, Selection sort, Quick sort, Radix sort, Merge sort, Heap sort. (15)

UNIT - II

Stacks: Primitive operations, Stack Abstract Data Type, Representation of Stacks Using Sequential Organization, Multiple Stacks, Applications of Stacks – Expression Evaluation and Conversion, Processing of Function Calls.

Queues: Concept of Queues, Queue as Abstract Data Type, Realization of Queues Using Arrays, Circular Queue, Multi queues, Deque, Priority Queue, Applications of Queues:Job scheduling. (10)

UNIT - III

Linked Lists: Introduction, Linked List: Comparison of sequential and Linked Organizations, Terminology, Primitive operations, Realization of Linked Lists using arrays and dynamic memory management, Dynamic memory management in C++, Linked List Abstract Data Type, Linked List Variants, Doubly Linked List: Creation, Deletion, Insertion, Traversal, Circular Linked List, Linked Stack, Linked Queue. (10)

UNIT - IV

Trees: Introduction, Basic terminology, General trees, Representation of a general tree, Types of Trees, Binary Tree, Properties, Binary Tree Abstract Data Type, Realization of a Binary Tree, Insertion of a Node in Binary Tree, Binary Tree Traversal (recursive traversals), Formation of binary tree from its traversals, Binary Search Tree: Inserting a node, Searching for a key, Deleting a node, Binary Tree and Binary Search Tree, Applications of Binary Trees: Expression tree, Decision tree, Huffman's coding.

Heaps: Basic Concepts, Implementation of Heap, Heap as Abstract Data Type. (8)

UNIT - V

More on Linked Lists: Copying a linked list, Computing the length of a linked list, Reversing singly linked list without temporary storage, Concatenating two linked lists, Erasing the linked list, Representation of Sparse Matrix Using Linked List, Application of Linked List.

Graphs: Introduction, Graph Abstract Data Type, Graph Representation, Graph Traversals, Spanning Trees: Prim's, Krushkal's Algorithm. (7)

Text Books:

1. Data Structures using C++ by Varsha H.Patil, Oxford University Press, 2012.

Reference Books:

1. Data Structures Algorithms and Applications in C++ by Sartaj Sahani, University Press, 2nd Edition, 2011.

2. Data Structures Using C and C++ by Yedidyah Langsam, Moshe J Augenstein and Aaron M Tenenbaum, PHI, 2nd Edition, 2009.

3. Data Structures and Algorithm Analysis in C++ by Mark Allen Weiss, Pearson Education, 3rd edition, 2007.

4. Data Structures and Algorithms in C++ by Adam Drozdek, Cengage Learning, 4th Edition, 2013 .

MCA – II SEMESTER
SCA 606: MATHEMATICS FOR COMPUTER SCIENCE – II
(PROBABILITY AND STATISTICS)

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: Exploring to the students in applying certain statistical concepts in practical applications of computer science areas. On completion of this course the student will be familiar with basic concepts of probability and random variables, distribution of random variables, correlation and regression analysis and to know the concepts of sampling, tests based on hypothesis.

UNIT - I

Probability: Sample Space, Events, Axiomatic Approach to Probability, Conditional Probability Independent Events, Baye's Formula with Applications.

Random Variables: Continuous and Discrete Random Variables, Distribution Function of a Random variable, Expectation, Variance, Coefficient of Variation, Moment Generation Function. (10)

UNIT - II

Probability Distribution: Discrete Distributions, Binomial, Poison and Geometric Distributions, Continuous Distributions, Uniform, Normal, Exponential. (10)

UNIT - III

Correlation and Regression: Correlation Coefficient, Rank Correlation Coefficient of Determination, Linear Regression, Methods of Least Squares, Fitting of the Curve of the Form ax + b, ax^2 + bx +c, ab^x , ax^b and ae^{bx} . (10)

UNIT - IV

Sampling Theory: Concepts of Sampling, Methods of Sampling, Simple Random Sampling, Systematic Sampling and Stratified Random Sampling (Descriptions Only), Concepts of Sampling Distributions and Standard Error, Point Estimation (Concepts only), Interval Estimation of Mean and Proportion. (10)

UNIT - V

Test of Hypotheses: Critical Region, Two Types of Errors, Level of Significance, Large Sample Tests for Mean and Proportion, Exact Tests Based on t, F and Chi – Square Distributions. (10)

Text Books:

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand & Sons, 2002.

Reference Books:

1. Probability and Statistics for Engineers by Irwin Millor and John E.Freund, PHI.
2. Probability and Statistics, Spiegel, TMH.

MCA – II SEMESTER

SCA 608: INFORMATION SYSTEMS ANALYSIS AND DESIGN

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Objective: To introduce the concepts and skills of systems analysis and design that includes expanded coverage of dataflow diagrams and process specifications. The objective is to introduce the software's used by analysts, designers to manage projects, analyze and document systems, design new systems and implement their plans. It introduces detailed case studies.

UNIT - I

The Systems Development Environment: Introduction, A Modern Approach to Systems Analysis and Design, Types of Information Systems and Systems Development, Developing Information systems and the Systems Development Life Cycle (SDLC), The heart of the Systems Development process, Approach to Systems Development.

The Origins of Software: Systems Acquisition, Sources of Software, Information Technology Services Firms, Open Source Software, Choosing Off -the- Shelf Software, Validating Purchased Software Information, Reuse. (10)

UNIT - II

Managing the Information Systems Project: Pine Valley Furniture Company Background, Managing the Information Systems Project, Representing and Scheduling Project Plans, Using Project Management Software. Case Study - BEC CASE: COMPANY BACKGROUND.

Identifying and Selecting Systems Development Projects: Identifying and Selecting Systems Development Projects, Corporate and Information Systems Planning, Electronic Commerce Applications- Identifying and Selecting Systems Development Projects. (10)

UNIT - III

Initiating and Planning Systems Development Projects: Initiating and Planning Systems Development Projects, The Process of Initiating and Planning IS Development Projects, Assessing Project feasibility, Building and Reviewing the Baseline Project Plan.

Determining System Requirements: Performing Requirements Determination, Traditional Methods for Determining Requirements, Contemporary methods for Determining System Requirements, Radical Methods for Determining System Requirements, Requirements Determination Using Agile Methodologies. (10)

UNIT - IV

Structuring System Process Requirements: Process Modeling, Data Flow Diagramming Mechanics, Four different types of DFDs, Using Data Flow Diagramming in Analysis Process. **Electronic Commerce Application:** Process Modeling Using Data Flow Diagrams.

Structuring System Logic Requirements: Logic Modeling, Modeling Logic with Structured English, Modeling Logic with Decision Tables, Deciding Among Structured English and Decision Tables.

Electronic Commerce Application: Logic Modeling. (10)

UNIT - V

System Implementation: System Implementation, Software application testing, Installation, Documenting the System, Training and Supporting Users, Training Information Systems Users, Organizational Issues in Systems Implementations.

Maintaining Information Systems: Maintaining Information systems, Conducting Systems Maintenance, Web Site Maintenance. (10)

Text Books:

1. Modern Systems Analysis and Design by Jeffrey A. Hoffer, J Oey F. George, J Osetch S. Valacich, Pearson Education, 6th edition, 2012.

Reference Books:

1. System Analysis and Design by Kenneth E. Kendall, Julie E. Kendall, Prentice Hall, 8th edition, 2010.
2. Analysis and design of information systems by James A. Sen, PHI, 2nd edition, 2009.

MCA – II SEMESTER

OPEN ELECTIVE - I

Hours per week: 3 End Examination: 60 Marks
Credits: 3 Sessionals: 40 Marks

MCA II SEMESTER

SCA 622: DATABASE MANAGEMENT SYSTEMS LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

1. Creation, altering and dropping of tables using SQL.
2. Implementing integrity Constraints on tables
3. Implementing DML Operations using SQL- INSERT, DELETE, UPDATE
4. Simple queries to access data from tables using SELECT statement and WHERE condition-using DISTINCT, AND, OR, NOT and ORDER BY operators.
5. i) Queries using Built in Functions :
   Arithmetic Functions: SIGN, ABS, CEIL, FLOOR, EXP, POWER, LOG, SQRT,

   String functions: CONCAT, LPAD, RPAD, LTRIM, RTRIM, LOWER, UPPER, INITCAP, LENGTH, SUBSTR and INSTR

   Date functions: SYSDATE, NEXT_DAY, ADD_MONTHS, LAST_DAY, MONTHS_BETWEEN, LEAST, GREATEST, TRUNC, ROUND

   Aggregate functions: COUNT, SUM, AVG, MAX and MIN, GROUP BY, HAVING,

   ii) Queries using Conversion functions: TO_CHAR, TO_NUMBER AND TO_DATE

   iii) Queries using Set Operators: UNION, INTERSECT, MINUS

6. i) Queries using JOINS, NATURAL JOIN, INNERJOIN, OUTER JOIN .
   ii) Queries along with sub queries and correlated queries using ANY, ALL, IN, EXISTS, NOTEXISTS,

7. i) Creating other Schema Objects**:** Defining Views, Creating Views, Using Views to Change Data, Dropping Views, creating Indexes and sequences.
   ii) Using DCL commands: COMMIT and ROLLBACK.

8. PL/SQL
   Creation of simple PL/SQL program which includes declaration section, executable section, SELECT …. INTO clause

9. Develop programs that include the features of NESTED IF and CASE.
10. Program development using WHILE LOOP, FOR LOOPS, Nested Loops

Reference Books:

1. SQL, PL/SQL The programming language of ORACLE by Ivan bayross, BPB publications, 4th edition, 2009.

2. Programming Oracle triggers and Stored Procedures by Kevin Owens, PHI, 3rd Edition, 2003.

MCA – II SEMESTER

SCA 624: DATA STRUCTURES USING C++ LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

1. Implementation of Linear Search, Binary Search.
2. Implementing the following sorting methods.
    a. Bubble sort
    b. Insertion sort
    c. Selection Sort
    d. Quick Sort
    e. Merge Sort
3. Implementation of Polynomial Addition using Arrays.
4. Implementation of Sparse Matrix addition and Multiplication using Arrays.
5. Array implementation of stack.
6. Array implementation of Queue.
7. Implementation to convert infix expressions to post fix notation, prefix notation.
8. Simple expression evaluator that can handle +,-, /, *.
9. Singly Linked List operations – insertion, deletion, display, reverse.
10. Implementation of Linked Stack Operations.
11. Implementation of Linked Queue Operations.
12. Implementation of circular queue ADT using an array.
13. Implementation of Doubly Linked List.
14. Implementation of Circular Linked List.
15. Implementation of Binary Tree, Binary Search Tree creation, traversals.
16. Implementation of Binary Search Tree operations, insertion all cases and deletion all cases.
17. Implementation of Graph Traversals.

Reference Books:

1. Data Structures through C++ by Varsha H Patil, Oxford University Press, New Edition, 2011.
2. Data Structures through C in depth by S.K. Srivastva and Deepali Srivastva, BPB publications, 2004.
3. Data Structures and Algorithms in C++ by Adam Drozdek, Cengage Learning, 4th edition, 2013.

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MCA – III SEMESTER
SCA 701: PROGRAMMING WITH JAVA

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: The aim of the course is to make the students learn the basic concepts of Java programming.
This course covers preliminaries and makes the students learn how to program in java using Basic Concepts, Inheritance, Interfaces, Packages, Threads, I/Os, Applets, Swings, Event Handling, Collections and allow the students to implement effectively.

UNIT - I

Introduction to Java: Java Buzzwords, Java Programming Environment, Simple Java Program, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Arrays.
Objects and Classes: Introduction to Object Oriented Programming, Object and Object Variables, Gregorian Calendar Class, Mutator and Accessor Methods, Defining your own Classes, Static Fields and Methods, Method Parameters, Object Construction, Packages, Class Path, Documentation Comments. (10)

UNIT - II

Inheritance: Classes, Super Classes and Sub Classes, Inheritance Hierarchies, Polymorphism, Dynamic Binding, Final Classes and Methods, Abstract Classes, Protected Access, Object class, Object Wrappers and Auto-boxing.
Interfaces and Inner Classes: Interface properties, Interfaces and Callbacks, Inner Classes –use, Syntax, Local Inner Classes, Accessing, Anonymous, Static. (8)

UNIT - III

Exceptions, Logging, Assertions and Debugging: Dealing with Errors, Catching Exceptions, Using Assertions, Logging.
Multithreading: Threads - Introduction, States, Properties, Synchronization, Blocking Queues, Threads and Swing.
Managing Input-Output Files in Java: Introduction, Concept of Streams, Stream Classes, Bytes Stream Classes, Character Stream Classes, Using Streams, Other Useful I/O Classes, Using the File Class, Input-Output Exceptions, Creation of Files, Reading/Writing Characters, Reading/Writing Bytes, Handling Primitive Data Types, Concatenating and Buffering Files, Random Access Files, Interactive Input and Output, Other Stream Classes. (10)

UNIT - IV

Graphics Programming: Introducing Swing, Frame-Creating, Positioning and Displaying Information in a Component, Working with 2D shapes, Using Colors, Special Fonts for Texts, Displaying Images.
Event Handling: Basics of Event Handling, Actions, Mouse Events, AWT Event Hierarchy. **Applets:** Simple Applets, Parameter Passing, Accessing Image & Audio Files, Applet Context. (9)

UNIT - V

User Interface Components with SWING: Swing and the Model View Controller Design Pattern, Introduction to Layout Management, Text Input, Choice Components, Menus, Sophisticated Layout Management, Dialog Boxes.
Collections: Collection Interfaces, Concrete Collections, Collections Framework. (10)

Text Books:

1. Core Java Volume I Fundamentals by Cay S. Horstmann, Gary Cornell , PHI, 9th edition, 2013.
2. Programming with Java - A primer by E.Balagurusamy, Tata Mc Graw Hill, 5th edition, 2014.
(Only UNIT III for I/O Concepts).

Reference Books:

1. Java 6 and J2EE 1.5 Black Book, Kogent Learning Solutions INC, Dream Tech, 2010.
2. Java Fundamentals- A Comprehensive Introduction by Herbert Schildt, Dale Skrien, Tata McGraw Hill, Special Indian Edition, 2013.

MCA III SEMESTER
SCA 703: COMPUTER NETWORKS

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To produce a core knowledge of networking concepts and techniques to design simple network, provide in depth knowledge about the various communication technologies and enable the student to understand how information is transmitted in networks.

UNIT - I

Introduction: Data Communications, Networks, The Internet, Protocols and Standards.
Network Models: Layered Tasks, The OSI Model, Layers in the OSI Model, TCP/IP Protocol Suite, Addressing.
Digital Transmission: Transmission Modes. (8)

UNIT - II

Transmission Media: Guided Media, Unguided Media-Wireless Transmission.
Switching: Circuit Switched Networks, Datagram Networks, Virtual, Circuit Networks, Structure of a Switch.
Data Link Layer: Error Detection and Correction- Introduction, Block Coding, Linear Block Codes, Cyclic Codes, Checksum. (10)

UNIT - III

Data Link Control: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy Channels, HDLC, Point-to-Point Protocol.
Wired LANs: Ethernet-IEEE Standards, Standard Ethernet, Changes in the Standard, Fast Ethernet, Gigabit Ethernet.
Connecting LANs, Backbone Networks and Virtual LANs: Connecting Devices, Backbone Networks, Virtual LANs. (11)

UNIT - IV

Network Layer: Logical Addressing - IPv4 Addresses, IPv6 Addresses.
Internet Protocol: IPv4, IPv6.
Network Layer: Address Mapping, ICMP, IGMP, ICMPv6.
Delivery, Forwarding and Routing: Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing Protocols. (11)

UNIT - V

Transport Layer: Process to Process Delivery- UDP, TCP and SCTP.
Application Layer: Domain Name System-Namespace, Domain Name Space, Distribution of Name Space, DNS in the INTERNET, RESOLUTION, DNS Messages, Types of Records, Registrars, Dynamic Domain Name System(DDNS), Encapsulation. (9)

Text Books:

1. Data Communications and Networking by Behrouz A Forouzan, TMH, 4th edition, 2007.

Reference Books:

1. Data and Computer Communications by William Stallings, Pearson Publications, 9th edition, 2011.
2. Computer Networks by Andrew S. Tanenbaum, Prentice Hall, 5th edition, 2012.

MCA – III SEMESTER
SCA 705: OPTIMIZATION TECHNIQUES

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To introduce various optimization techniques and their computer implementation.

UNIT - I

Overview of Operations Research: OR Models, OR Techniques.

Linear Programming: Introduction, Mathematical Foundation, Graphical Solution, Basic Feasible Solutions, Simplex Algorithm, Artificial Variables, Big M and Two Phase Method, Degeneracy, Alternative Optima, Unbounded Solutions, Infeasible Solutions.

Dual Problems: Relation between Primal and Dual problems, Dual Simplex Method. (10)

UNIT - II

Integer Programming: Cutting Plan Algorithm, Branch and Bound Algorithm.

Job Sequencing: Introduction, Solution of Sequencing Problems, Processing of n Jobs through 2 Machines, n Jobs through 3 Machines and n Jobs through m Machines. (8)

UNIT - III

Transportation Model: Initial Solutions. North West Corner Rule, Lowest Cost Method, Vogels Approximation Method, Optimal Solution, MODI Method, Assignment Problem , Hungarian Method – Travelling Salesman Problem. (10)

UNIT - IV

Game Theory: Two Person Zero Sum Games, Mixed Strategy Games and their Algorithms. (8)

UNIT - V

Network Models: Definitions, CPM and PERT their algorithms.

Dynamic Programming: Recursive Nature of Dynamic Programming, Forward and Backward Recursion. (8)

Text Books:

1. Operations Research – An Introduction by Handy A. Taha, Pearson Education, 8th Edition, 2008.

Reference Books:

1. Operations Research by Sharma S.D., Keder Nath Ram Nath & CO, 1992.
2. Operations Research by Kanti Swaroop, Manmohan and P.K. Gupta, Sultan Chand & Sons,4th edition, 1990.

MCA – III SEMESTER
SCA 707: SOFTWARE ENGINEERING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: The main objective of this course is to introduce various software engineering concepts and principles and detailed study of various phases of software engineering. It includes study of various process models, requirement engineering, design engineering and various testing strategies & techniques. All these concepts are to be studied with procedural oriented features only.

UNIT - I

Software and Software Engineering - The Nature of Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How it all Starts.

Process Models: A Generic Process Model, Process assessment and improvement, Prescriptive process models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process. (12)

UNIT – II

Understanding Requirements: Requirements Engineering, Establishing the groundwork, Eliciting Requirements. Developing Use Cases, Building requirements model, Negotiating requirements, Validating Requirements.

Requirements Modeling - Scenarios, Information And Analysis Classes: Requirement Analysis, Scenario – Based Modeling, UML Models That Supplements the Use Case, Data Modeling Concepts, Class Based Modeling. (12)

UNIT - III

Design Concepts: Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model.

Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Assessing Alternative Architectural Design, Architectural Mapping Data Flow. (10)

UNIT - IV

Component level Design: What is Component, Designing Class Based Components, Conducting Component Level Design, Component-Level Design for Web Apps, Designing Traditional components, Component Based Development.

User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps. (12)

UNIT-V

Software Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging.

Testing Conventional Applications: Software Testing Fundamentals, Internal and External View of Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black Box Testing. (12)

Text Books :

1.Software Engineering- A Practitioners Approach by Roger S.Pressman, McGraw Hill Edition, 7th edition, 2010.

Reference Books:

1. Software Engineering by K.K. Agarwal and Yogesh Singh, New Age International Publishers, 2005.

2. Software Engineering principles and practice by Waman S Jawadekar, The McGraw-Hill Companies, 2006.

MCA – III SEMESTER
SCA 721: PROGRAMMING WITH JAVA LAB

Hours per week: 3 Examination: 100 Marks
Credits: 2

Objectives: The aim of this course is to make students to learn how to develop programs using JAVA. It also helps to implement arrays, control structures, inheritance, run time polymorphism, threads, exception handling, applet, event handling in java.

1. Program to demonstrate various data types
2. Program to demonstrate various variables
3. Program to demonstrate various arrays
4. Program to demonstrate various arithmetic operators
5. Program to demonstrate Bit wise operators
6. Program to demonstrate relational operators
7. Program to demonstrate various control structures or control statements.
8. Program to demonstrate classes and objects
9. Program to demonstrate constructors and overloading constructors.
10. Program to demonstrate overloading methods.
11. Program to demonstrate static variable and static class
12. Program to demonstrate single inheritance
13. Program to demonstrate super
14. Program to demonstrate multilevel inheritance
15. Program to demonstrate method over riding
16. Program to demonstrate dynamic method dispatch
17. Program to demonstrate Abstract Classes
18. Program to demonstrate packages
19. Program to demonstrate Interfaces
20. Program to demonstrate exception handling
21. Program to demonstrate Multiple Catch Statements
22. Program to demonstrate theads, multiple threads
23. Program to demonstrate simple applet program
24. Program to develop Swing application called SwingAdder. The "ADD" button adds two integers and display the result. The "CLEAR" button shall clear all the text fields.
25. Develop a program to calculate the future value of an investment at a given interest rate for a specified number of years. The formula :
    Future value = Investment Amount * (1+ Interest Rate) * ^{years}.
    Use text fields for interest rate, investment amount and years. Display the future amount in a text field when clicking the calculate button.
26. Program to display the mouse position when the mouse is pressed.

Reference Books:

1. Java 6 and J2EE 1.5 Black Book by Kogent Learning Solutions INC, Dream Tech, 2010.
2. Java 7 Programming Black Book by Kogent Learning, Dream Tech, 2013.

MCA – III SEMESTER

SCA 723: TECHNICAL ENGLISH LANGUAGE SKILLS LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

Objectives:

The language Lab focuses computer-aided multi-media instruction and language acquisition to achieve the following targets:

- To expose the students to a variety of self-instructional, learner-friendly modes of languages learning.
- To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To train the students to use language effectively to face interviews, group discussions, public speaking.
- To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.

The following course content is prescribed for the English Language Laboratory Practice

- Introduction to Phonetics.
- Introduction to Vowels and Consonants and associated Phonetic symbols.
- Introduction to Accent, Intonation and Rhythm.
- Situational Dialogues / Role Play.
- Public Speaking.
- Debate
- Group discussions
- Facing Interviews
- Resume preparation
- e-correspondence

Reference Books:

- Developing Communication Skills by Krishna Mohan & Meera Benerji (Macmillan)
- Speaking English Effectively by Krishna Mohan & NP Singh (Macmillan)
- Better English Pronunciation by JDO Connor (UBS-Cambridge)
- Oxford Practice Grammar with Answers, John Eastwood, Oxford
- Handbook of English Grammar and Usage, Mark Leaster and Larry Beason, Tata MCGraw-Hill
- A text book of English Phonetics for Indian Students by T. Blalsubramanian (Macmillan)
- Lingua TOEFL CBT Insider, by Dreamtech
- TOEFL & GRE(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- English Skills for Technical Students, WBSCTE with British Council, Ol
- A Handbook of English for Competitive Examiniations, by B Shyamala Rao, Blakie Books, Chennai.

MCA – III SEMESTER
SCA 791: MINOR PROJECT

Hours per week: 3 Examination: 50 Marks
Credits: 2 Sessionals: 50 Marks

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MCA IV SEMESTER

SCA 702: DESIGN AND ANALYSIS OF ALGORITHMS

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Objectives:

- To introduce students, the concepts of algorithm analysis to find out the space and time complexity of different algorithms.
- Different design techniques such as greedy method, divide and conquer, backtracking, dynamic programming, branch and bound are to be studied for finding the solution to the different problems.
- Ability to solve problems independently and think critically and to understand, estimate the performance of algorithm.

UNIT - I

Introduction to Algorithms: Algorithm Specification, Performance Analysis, Introduction to Randomized Algorithms.

Divide And Conquer: The General Method, Binary Search, Finding Maximum and Minimum, Quick Sort, Selection, Strassen's Matrix Multiplication. (10)

UNIT - II

The Greedy Method: The General Method, Knapsack Problem, Tree Vertex Splitting, Job Sequencing With Deadlines, Minimum Cost Spanning Trees, Single Source Shortest Paths. (7)

UNIT - III

Dynamic Programming: The General Method, Multistage Graphs, All Pairs Shortest Paths, Optimal Binary Search Trees, String Editing, Reliability Design, The Traveling Sales Person Problem. (10)

UNIT - IV

Basic Traversal and Search Techniques: Techniques for Graphs, Connected Components and Spanning Trees, Bi-connected Components and DFS.

Back Tracking: The General Method, Eight Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles. (10)

UNIT - V

Branch And Bound: The Method, 0/1 Knapsack Problem, Traveling Salesperson Problem

Algebraic Problems: The General Method, Evaluation and Interpolation.

NP Hard and NP Complete Problems: Basic Concepts. (8)

Text Books:

1. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, University Press, 2nd Edition, 2008.

Reference Books:

1. Fundamentals of Algorithmics by G. Brassard and P.Bratley, PHI, 2011.
2. Introduction to Algorithms by T.H. Cormen, C.E. Leiserson, R.L.Rivest, 3rd edition, PHI, 2010 .
3. Introduction to Design Analysis of Algorithms by Anany Levitin, 2nd edition, Pearson Publications, 2009.

MCA – IV SEMESTER
SCA 704: NETWORK SECURITY

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: To make students learn symmetric algorithms, asymmetric algorithms and hash functions. A student will learn the concepts of key distribution, different mechanisms implemented for e-mail, web, network and IP security.

UNIT- I

Introduction: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Standards.

Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, DES, AES, Stream Ciphers and RC4, Cipher Block Modes of Operation. . (8)

UNIT - II

Public-Key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions, Message Authentication Codes, Public Key Cryptography Principle, Public-Key Cryptography Algorithms, RSA, Diffie Hellman key Exchange, Digital Signatures.

Key Distribution and User Authentication: Symmetric Key Distribution Using Symmetric Encryption, Kerberos, Key Distribution Using Asymmetric Encryption, X.509 Certificates, Public Key Infrastructure. (10)

UNIT - III

Transport-Level Security: Web Security Issues, Secure Sockets Layer (SSL), Transport Layer Security (TLS), HTTPS, Secure Shell (SSH).

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security. (10)

UNIT -IV

Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME, Domain Keys Identified Mail (DKIM).

IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange, Cryptographic Suites. (10)

UNIT - V

Malicious Software: Types of Malicious Software, Propagation, Infected Content, Viruses Propagation, Vulnerability Exploit, Worms, Propagation, Social Engineering, SPAM, Trojans, Payload – System Corruption, Payload, Attack Agent, Zombie, Bots, Payload, Information Theft, Keyloggers, Phishing, Spyware, Payload, Stealthing, Backdoors, Rootkits Distributed Denial of Service Attacks. (10)

Text Books:

1. Network Security Essentials, Applications and Standards, 5th edition, William Stallings, Pearson Education, 2013.

Reference Books:

1. Cryptography & Network Security, Behrouz A. Forouzan, Tata McGraw-Hill, New Delhi, 2007.
2. Network Security: Private Communication in a Public World, Kaufman, Pearson Education Asia,New Delhi, 2002.
3. Cryptography and Network Security: Atul Kahate, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.

MCA –IV SEMESTER
SCA 706: DATA MINING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: The objective is to introduce the basic concepts and techniques of data mining a promising and flourishing frontier in database systems and new database applications.

UNIT – I

Introduction: What is Data Mining? Kind of data on which mining is done, Kinds of patterns can be mined, Technologies used, Kinds of Applications targeted, Major Issues of Data mining System.
Data Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction, Transformation and Discretization. (10)

UNIT - II

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse basic concepts, Data warehouse modeling, Data warehouse design and usage, Implementation, Generalization by Attribute oriented Induction.
Data Cube Computation: Concepts, Methods, Processing Advanced Queries by exploring Cube Technology, Multi dimensional Data analysis in CUBE space. (10)

UNIT - III

Mining Frequent patterns, Associations and Correlations: Basic Concepts, Frequent Item set Mining Methods, Interesting Patterns and Pattern evaluation methods.
Advanced pattern Mining : Pattern mining in multi level and Multi dimensional Space, Constraint based frequent pattern mining, Mining high dimensional data and Colossal Patterns, Mining Compressed or Approximate patterns, Pattern Exploration and Application**.** (10)

UNIT - IV

Classification: Basic Concepts, Decision Tree Induction, Bayesian Classification, Rule based Classification, Model Evaluation and Selection, Techniques to improve classification Accuracy.
Cluster Analysis: Requirements, Overview, Partitioning Methods, Hierarchical Methods, Density-based Methods, Grid-based Methods, Evaluation of Clustering. (10)

UNIT - V

Outlier Detection: Types of Outliers and Challenges in outlier detection, Outlier detection methods, Statistical Approaches, Proximity based approaches, Cluster and Classification based approach.
Data mining Trends: Mining complex Data Types, Other Methodologies for Mining, Applications of Data mining, Data Mining and Society**.** (10)

Text Books:

1. Data Mining Concepts and Techniques by Jiawei Han, Micheline Kamber, and Jian Pei, Elsevier Publications,3rd Edition, 2013.

Reference Books:

1. Introduction to Data Mining by Pang- Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education, Low Price Edition.
2. Insight to Data Mining Theory and Practice by K.P.Soman, Shyam Diwakar and V. Ajay, Prentice Hall of India, 2006.

MCA – IV SEMESTER
SCA 708: TECHNICAL ENGLISH SKILLS – II

Hours per week: 3 End Examination: 60 Marks
Credits: 2 Sessionals: 40 Marks

Objectives:

- To make the students learn the formation of sentences and improve the communication skills.
- To familiarize the students with the use of English in communication and help them to acquire the ability to expand their linguistic resources to enhance communicative competence.
- To develop listening, speaking, reading and writing skills in such a way that they improve the ability to exchange information, grasp and express ideas, feelings etc. with clarity and confidence.
- To make them interview ready and to increase the employability of the students by improving their overall communicative efficiency.

UNIT - I

Features of Indian English: Correction of sentences, Structures, Tenses, ambiguity, idiomatic distortions and misappropriations. (8)

UNIT - II

Informal conversation Vs Formal expression: Features of good communication, Different flows of communication, Verbal and Non verbal communication, Barriers to effective communication – ways to overcome the barriers. (10)

UNIT - III

Types of Communication: Oral, aural, Writing and reading, Word-Power, Vocabulary, Jargon, rate of speech, pitch, tone, Clarity of voice, Group discussion, Personality traits, types of group discussion, Team player, Leadership qualities. (12)

UNIT - IV

Formal and informal interviews: Ambiance and polemics, Interviewing in different settings and for different purposes e.g., Eliciting and giving information, Preparation for a job interview, Personality traits assessment, Recruiting, Performance appraisal. (12)

UNIT - V

Technical presentations: Types of presentation, Video conferencing, Participation in meetings, chairing sessions.

Letter-writing, business letters, Proforma culture, Format, Style, Effectiveness, Promptness, Analysis of sample letters collected from industry, email. (12)

Text Books :

1. Essentials of Business Communication by Rajendra Pal and J S KorlahaHi, Sultan Chand & Sons, New Delhi.
2. Advanced Communication Skills by V. Prasad, Atma Ram Publications, New Delhi.

MCA – IV SEMESTER
OPEN ELECTIVE-II

Hours per week: 3 End Examination: 60 Marks
Credits: 3 Sessionals: 40 Marks

MCA – IV SEMESTER

SCA 722: UML LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

Objective: The purpose of the UML Lab course is to familiarize the students with modern software engineering methods and tools, Rational Products. The course is realized as a project like assignment that can, in principle, by a team of three/four students working full time. Typically the assignments have to be completed during the semester.

Projects

Term projects are projects that a student might take through from initial specification to implementation.

The project deliverables include:

Documentation including

A Requirements Analysis Document. (RAD).

A problem statement.

A requirements document.

A Software Design Description and a System Design Document (SDD).

A System Design (sub system decomposition) An Object Design Document (ODD).

An Object Design.

A Software/Hardware Requirement.

A Sample Screen Shots.

A Sample Test Specification.

Reference Books:

1. The Unified Modeling Language User Guide by Grady Booch, James Rumbaugh and Ivar Jacobson, Person Publications, 2nd Edition, 2013.

2. UML Reference Guide by James Rumbaugh, Ivar Jacobson, Grady Booch, Addison Wesley, 2000.

3. Project Based Software Engineering: An Object Oriented Approach by Evelyn Stiller, Pearson education.

MCA – IV SEMESTER
SPRCA 724: DATA MINING LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

(I) Data mining concepts:

1. Construction of the fact and Dimension Tables for the Multi dimensional data.
2. Perform different measures on the data warehouse data.
3. Represent the data in graphical form using any software.(At least 8 Graphs)

(II) Exercises using R:

1. Introductory commands in R
2. Descriptive Statistics
3. Probability and Probability distributions
4. Statistical Inference
5. Correlation and Regression Analysis

Reference Books:

1. Data Mining Concepts and Techniques by Jiawei Han Micheline Kamber, and Jian Pei, Elsevier Publications, 3rd Edition, 2013.
2. Statistics Using R by Sudha G.Purohit, Narosa Publications, 2015.

MCA – V SEMESTER
SCA 801: CLOUD COMPUTING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives : The objective is to educate the students about various facts of Cloud Computing by discussing the features such as cloud computing basics, architecture, components, behavior, platforms, user's perspective, security, SaaS model, IaaS model, migration and introducing to various technologies and tools for cloud computing.

UNIT - I

Introduction to Cloud Computing: Cloud Computing in a Nutshell, Roots of Cloud Computing, Layers and Types of Clouds, Desired features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks.

Migrating Into a Cloud: Introduction, Broad approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud. (10)

UNIT - II

Enriching the 'Integration as a Service' Paradigm for the Cloud Era: An Introduction, The Onset of Knowledge Era, The Evolution of SaaS, The Challenges of SaaS Paradigm, Approaching the SaaS Integration Enigma, New Integration Scenarios, The Integration Methodologies, SaaS Integration Products and Platform, SaaS Integration Services, Business-to-Business (B2B) Integration services, A Framework of Sensor-Cloud Integration, SaaS Integration Appliances.

The Enterprise Cloud Computing Paradigm: Introduction, Background, Issues for Enterprise Applications on the Cloud, Transition Challenges, Enterprise Cloud Technology and Market Evolution, Business Drivers towards a Marketplace for Enterprise Cloud Computing, The Cloud Supply Chain. (12)

UNIT - III

Virtual Machines Provisioning and Migration Services: Introduction and Inspiration, Background and Related work, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in the Cloud Context.

On the Management of Virtual Machines for Cloud Infrastructures: The Anatomy of Cloud Infrastructures, Distributed Management of Virtual Infrastructures, Scheduling Techniques for Advance Reservation of Capacity, Capacity Management to meet SLA Commitments. (12)

UNIT - IV

Aneka-Integration of Private and Public Clouds: Introduction, Technologies and Tools for Cloud Computing, Aneka Cloud Platform, Aneka Resource Provisioning Service, Hybrid Cloud Implementation.

Comet Cloud -An Autonomic Cloud Engine: Introduction, Comet Cloud Architecture, Autonomic Behavior of Comet Cloud, Overview of Comet Cloud-based Applications, Implementation and Evaluation. (10)

UNIT - V

Data Security in the Cloud: An Introduction to the idea Data Security, The Current State of Data Security in Cloud, Homo Sapiens and Digital Information, Cloud Computing and Data Security Risk, Cloud Computing and Identity, The Cloud, Digital Identity and Data Security, Content Level Security-Pros and Cons.

Secure Distributed Data Storage in Cloud Computing: Introduction, Cloud Storage from LANs, to WANs, Technologies for Data Security in Cloud Computing. (8)

Text Books:

1. Cloud Computing Principles and Paradigms by Raj Kumar Buyya, James Broberg and Andrzej Goscinscinki, Wiley Publications, 2011.

Reference Books:

1. Cloud Computing, Principles, Systems and Applications by Nick Antonopoulos and Lee Gillam, Springer International Edition, 2015.
2. Cloud Computing Explained by John Rhoton, Recursive Press, 2nd edition, 2013.

MCA – V SEMESTR
GENERIC ELECTIVE - I
SCA 841: J2EE TECHNOLOGIES

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To enable the student to understand the importance of various advanced java features like jdbc, XML, java servlets, jsp. Also acquainting the student with a framework like Spring3.0. The main emphasis is to make the students to develop a web application.

UNIT - I

JDBC: ODBC – Definition, Features, Components, Architecture, JDBC- Features, Components, Architecture, JDBC API-introduction, Types , Major Classes and Interfaces, Communicating with Databases by using JDBC APIs, Creating Simple Application, Exploring the Methods of Statement, Using Statement, Working with the Prepared Statement and Callable Statement, ResultSet, ResultSetMetaData interface, Advanced Concepts in ResultSet, Closing the Connection.

XML: Basics of XML, Well-Formed XML, XML Namespaces ,Defining Namespaces, Document Type Definitions , XML Schemas, XSLT. (10)

UNIT - II

Java Servlet: Introduction, Exploring the Servlet Container, Servlet API, Implementing a Servlet Object, Servlet Life Cycle, Developing First Servlet Application, Understanding Request Processing Workflow, Working with Generic Servlet Class, Implementing Servlet Request Interface, Working with Initialization Parameters, Context Initialization Parameters, Understanding Servlet Response, Understanding Request Dispatch, Dispatching the Request, Describing Request Attributes, HttpServletRequest and HttpServletResponse Interfaces, HttpServlet LifeCycle.

Handling Sessions in Servlet: Session Tracking, Describing URL rewriting, Exploring and working Hidden Form Field, Describing Cookies, Using Cookies, Exploring and Working HttpSession, Describing Servlet Context Attributes.

Filters: Filter API, Working with Filters, Describing Listeners and Wrappers in Servlets, Applet to Servlet Communication. (10)

UNIT - III

JSP: Introduction, Advantages, JSP Life Cycle, Types of Scripting Tags, Implicit Objects, Directive Tags, Java Bean, Action Tags, Declaring a Bean in a JSP, Custom Tags- Need, Elements, Empty Tags, Body Content Tag Interface, Iteration Tag Interface, Simple Tags. (8)

UNIT - IV

JSP Expression Language: Syntax, Types of EL Expressions, Resolving EL Expressions, EL Operators, Implicit EL Objects.

Implementing Internationalization: Introduction, Java and Internationalization, Internationalizing Web Applications.

JSTL: Describing JSTL Core, SQL, Formatting, XML tags. (8)

UNIT - V

Spring 3.0 : Introduction, Spring Bean- Bean Life Cycle, Bean Scopes, Inner Bean, Collection Bean, Bean Reference, Spring Auto Wiring- by Type, Name, Constructor, AutoDetect, Spring IOC tutorial – Spring DI using Setter Method(No ArgConstructor, No ArgFactory Method), Spring DI using Constructor, Spring AOP, Spring Annotation, Spring Validation, Example, Spring Transaction Management, Spring MVC. (12)

Text Books:

1. JDBC, Servlet, and JSP includes JSF and Design Patterns by Santosh Kumar K, DreamTech Press, New edition, 2013.
2. Beginning XML by Liam R. E. Quin, Joe Fawcett, Danny Ayers, Wiley, 5th editon, 2012.
3. Web reference - http://javabeginnerstutorial.com/spring.

Reference Books:

1. Head First Servlets and JSP by Bryan Basham, Kathy Sierra and Bert Bates, Oreilly, 2nd edition, 2008.
2. Spring in Action by Craig Walss, Manning publications, 4th edition, 2014.
3. Beginning XML by David Hunter, Jeff Rafter , Andrew Watt , Joe Fawcett , Jon Duckett, Daniel J. Ayers, Wiley, 4th edition,2007.

MCA – V SEMESTER
GENERIC ELECTIVE - I
SCA 843: .NET TECHNOLOGIES

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives:

- The ability to effectively use visual studio .NET.
- Understand the goals and objectives of the .NET Framework.
- Understand how to use forms to develop GUI programs under .NET.
- Knowledge of some of the tools available in the .NET Framework class library. (FCL)
- Improved object-oriented programming skill through practice and insights gained by studying a new programming language.

UNIT – I

Essential Visual Basic .Net: Upgrading from Visual Basic 6.0, The .Net framework and the Common language Runtime, Building VB.Net Applications, The Visual Basic Integrated Development Environment. (12)

UNIT – II

Operators, Conditionals and Loops: Keywords, Visual Basic statements, if-else, Select case, Switch and choose, Do loop, For loop, For each, Next loop, While loop, With statement.

Procedures, scope and exception handling: Sub procedures and functions, Understanding scope, Handling exceptions, Unstructured exception handling, Resume Next and Resume Line, On error GoTo. (12)

UNIT – III

Windows Forms: About windows MDI forms, Creating windows applications, Adding controls to forms, Handling events.

Windows forms- tools: Text boxes, Rich text boxes, Labels, Link labels, Buttons, Radio buttons, Check boxes, Panels, Group boxes, List boxes, Checked list boxes, Combo boxes, Picture boxes, Scroll bars, Splitters, Track bars, Pickers, Notify icons, Tool tips and timers. (10)

UNIT – IV

Menus: Menu items, Context menus, Built-in dialog boxes, Open file dialogs, Save file dialog, Font dialog, Color dialog, Print dialog, Page setup dialog.

Object – Oriented programming: Object oriented inheritance, Graphics and file handling. (12)

UNIT – V

Web Forms: Working with web forms,Working with web form controls, Web forms and HTML, Creating a web application, Adding controls to web form, Running a web application, Creating a multiform web project.

Validation controls, HTML controls, Data access with ADO.Net, Binding controls to databases, Handling databases in code, Databases access in web application. (12)

Text Books:

1. Visual Basic .Net Programming Black Book by Steven Holzner, Paraglyph press, Dream tech press, New edition, Reprint edition, 2009.

Reference Books:

1. C# programming: From problem analysis to program design by Barbara Doyle, Cengage learning, 2nd edition, 2011.

MCA – V SEMESTER
GENERIC ELECTIVE - I
SCA 845: IMAGE PROCESSING AND ANALYSIS

Hours per week: 3 End Examination: 50 Marks
Credits: 2 Sessionals: 50 Marks

Objectives: To enable the students to understand the various image models, restoration of images, segmentation of images and concepts of image compression.

UNIT - I

Introduction: What is Digital Image Processing, The Origins of Digital Image Processing, Fields that use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

Digital Image Fundamentals: Image Sampling and Quantization, Some Basic Relationships between Pixels. An Introduction to the Mathematical Tools Used in Digital Image Processing. (8)

UNIT - II

Intensity Transformations and Spatial Filtering: Background, Some Basic Intensity Transformation Functions, Histogram Processing.

Filtering in the Frequency Domain: Preliminary Concepts, Some Properties of 2-D Discrete Fourier Transform. Image Smoothing using Frequency Domain Filters, Image Sharpening using Frequency Domain Filters- Ideal Highpass Filters, Butterworth Highpass Filters, Gaussian Highpass Filters. (11)

UNIT - III

Image Restoration and Reconstruction: Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.

Color Image Processing: Color Fundamentals, Color Models, Pseudo color Image Processing. (11)

UNIT - IV

Image Compression: Fundamentals, Some basic Compression Methods-Huffman Coding, Arithmetic Coding, Run Length Coding.

Morphological Image Processing: Erosion and Dilation, Opening and Closing, Basic Morphological Algorithms. (10)

UNIT - V

Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region Based Segmentation.

Representation and Description: Representation - Boundary (Border) Following, Chain Codes, Boundary Descriptors- Some Simple Descriptors, Shape Numbers, Fourier Descriptors, Statistical Moments. (9)

Text Books:

1. Digital Image Processing by Rafael C. Gonzalez & Richard E. Woods, Pearson Publications, 3rd Edition, 2011.

Reference Books:

1. Digital Image Processing and Analysis by B. Chanda & D. Dutta Majumder, PHI, Second Edition, 2011.

MCA – V SEMESTER
GENERIC ELECTIVE –I
SCA 847: ADVANCED DATABASE MANAGEMENT SYSTEMS

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: The objective of this course is to have overall view on various advanced databases concepts like query processing, advanced data types, advanced SQL and new applications.

UNIT - I

Object-Based Databases: Overview, Complex data types, Structured types and inheritance in SQL, Table inheritance, Array and multiset types in SQL, Object identity and reference types in SQL, Implementing O-R features, Persistent programming languages, Object oriented verses object relational.

XML: Motivation, Structure of XML data, XML document schema, Querying and Transformation. (10)

UNIT - II

Query Processing: Overview, Measures of query cost, Selection operation, Sorting, Join operation, Other Operations, Evaluation of expression.

Query Optimization: Introduction, Transformation of relational expressions, Estimating statistics of expression results, choice of evaluation plans, materialized views, Advanced Topics in Query Optimization. (10)

UNIT - III

Database System Architectures: Centralized and Client-Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems, Network types.

Distributed Databases: Homogenous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing, Heterogeneous Distributed Databases, Cloud Based Databases, Directory Systems. (10)

UNIT – IV

Parallel Databases: Introduction, I/O parallelism, Inter Query Parallelism, Intra Query Parallelism, Intra Operation Parallelism, Inter Operation Parallelism, Query Optimization, Design of Parallel Systems.

Advanced SQL: Accessing SQL From a Programming Language, Functions and Procedures, Triggers, Recursive Queries, Advanced Aggregation Features, OLAP. (10)

UNIT - V

Spatial and Temporal Data and Mobility: Motivation, Time in Databases, Spatial and Geographic data, Multimedia Databases, Mobility and Personal Databases.

Advanced Transaction Processing: Transaction-processing monitors, Transactional work flows, E-commerce, Main memory databases, Real time transaction systems, Long duration transactions. (10)

Text Books:

1. Database System Concepts by Abraham Silberschatz, Henry F.Korth,S. Sudarshan, TMH, 6th edition, 2011.

Reference Books:

1. Fundamentals of Database Systems by Ramez Elmasri and Sharnkanth B.Navathe, Pearson Publications, 6th edition, 2011.
2. An Introduction to Database Systems by C.J.Date, Addison Wesley, 8th edition, 2003.

MCA – V SEMESTER
GENERIC ELECTIVE – II
SCA 849: TCP/IP

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To introduce the different network models, different types of networks, network addressing, different protocols and the concepts of multicasting protocols which involves multimedia.

UNIT - I

Introduction: A Brief History, Protocols and Standards, Standards Organizations, Internet Standards, Internet Administration.

The OSI Model and the TCP/IP Protocol Suite: Protocol Layers, OSI Model, TCP/IP Protocol Suite, Addressing. (10)

UNIT - II

IPv4 Addresses: Introduction, Classful Addressing, Classless Addressing, Special Addresses, NAT.

Internet Protocol Version4 (IPv4): Introduction, Datagrams, Fragmentation, Options, Checksum, IP Over ATM, Security, IP Package. (10)

UNIT - III

Transmission Control Protocol (TCP): TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, Congestion Control, TCP Timers, Options, TCP Package. (10)

UNIT - IV

Host Configuration, DHCP: Introduction, DHCP Operation, Configuration.

File Transfer: FTP and TFTP.

Electronic Mail: SMTP, POP, IMAP and MIME - Architecture, User Agent, Message Transfer Agent, Message Access Agent, MIME, Web-Based Mail, E-Mail Security. (10)

UNIT - V

IPv6 Addressing: Introduction, Address Space Allocation, Global Unicast Addresses, Auto configuration, Renumbering.

IPv6 Protocol: Introduction, Packet Format, Transition From IPv4 to IPv6. (10)

Text Books:

1. TCP/IP Protocol Suite by Behrouz A. Forouzan, TMH, 7th reprint, 2012.

Reference Books:

1. TCP/IP Illustrated The Protocols by Kevin R, Richard Stevens, Pearson education, 2nd Edition, 2014.

MCA – V SEMESTER
GENERIC ELECTIVE – II
SCA 851: FORMAL LANGUAGES AND AUTOMATA THEORY

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To understand the logical and mathematical foundations of computer science and abstract models of computation.

UNIT - I

The Theory of Automata : Definition of an Automata, Description of a Finite Automation, Transition systems, Properties of transition functions, Acceptability of a string by a finite automaton, Non Deterministic finite state machines, The equivalences of DFA and NDFA, Mealy and Moore models, Minimization of finite automata. (12)

UNIT - II

Formal languages: Basic definitions and examples, Chomsky classification of Languages, Languages and their relation, Recursive and recursively enumerable sets, Operations of languages, Languages and automata. (10)

UNIT - III

Regular sets and regular grammars: Regular expressions, Finite automata and regular expressions, Pumping lemma for regular sets, Application of pumping lemma, Closure properties of regular sets, Regular sets and regular grammars. (8)

UNIT - IV

Context –free Languages: Context- free languages and derivation trees, Ambiguity in context-free Grammars, Simplification of context-free grammars, Normal forms for context-free grammars. (8)

UNIT - V

Turing Machines and Linear Bounded Automata: Turing Machine model, Representation of Turing Machines, Language acceptability by Turing Machines, Design of Turing Machines, Universal Turing Machines and other modifications. (10)

Text Books:

1. Theory of Computer Science (Automata, Languages and computation) by K.L.P.Mishra and N.Chandrasekaran, PHI, 2nd edition, 2007.

Reference Books:

1. Introduction to Automata Theory, Languages and Computation by John E. Hopcroft and Jeffrey D. Ullman, Narosa Publishers, 2002.
2. Introduction to the Theory of Computations by Michael Sipser, Brooks/Cole, 2nd edition, Thomson Learning, 2012.

MCA – V SEMESTER
GENERIC ELECTIVE – II
SCA 853: ENTERPRISE RESOURCE PLANNING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: In this course students shall learn various components of an application software that help computerize functioning of an enterprise such as sales, materials, production, financial , customer relationship and supply chain modules.

UNIT - I

Enterprise-An Overview: Business Functions and Business Processes, Integrated Management Information, Role of the Enterprise in implementing the ERP system.

Introduction to ERP: Common ERP myths, History of ERP, Advantages of ERP, Why ERP packages now, Over Expectations in ERP.

Risks and Benefits of ERP: Justifying ERP investments, Quantifiable benefits from an ERP system, Risks of ERP, Risk factors of ERP implementation, People issues, Process risks, Technological Risks, Implementation issues, Operation and Maintenance issues, Managing risk on ERP projects, Benefits of ERP. (12)

UNIT - II

ERP Marketplace and Marketplace Dynamics: Marketplace Dynamics, The changing ERP Market, Indian Scenario.

ERP-Functional Modules: Introduction, Functional modules of ERP software, Integration of ERP, Supply Chain and Customer Relationship Applications**.** (12)

UNIT - III

ERP Implementation Basics: Why ERP, Technological, Operational, and business reasons for implementing ERP, Implementation challenges.

ERP Implementation Life Cycle: Objectives of ERP Implementation, Different phases of ERP implementation, Why do many ERP implementations fail, ERP Package Selection.

ERP (Implementation) Transition Strategies: Big Bang Strategy, Phased Implementation, Parallel Implementation, Process line transition strategy, Hybrid transition strategy, choosing a strategy.

ERP Implementation Process: Implementation methodologies, Managing the implementation, Organization of the ERP project team, Implementation strategy, ERP implementation plan, Risk Assessment, Budget, Cost, Performance Measurement, Problem resolution, System issues. (12)

UNIT - IV

ERP Project Teams: ERP package implementation, People involved in the ERP implementation, ERP implementation team, Composition of the implementation team, Organization of the implementation team.

Consultants, Vendors and Employees: In-house implementation-Pros and Cons, Vendors, Consultants, Employees and employee resistance.

Success & Failure Factors of an ERP Implementation: Success factors, Failure factors.

ERP Operation and Maintenance: Ongoing implementation efforts, Upgrading versus new software, Operation and maintenance of the ERP system. (12)

UNIT - V

ERP and eBusiness: ERP and eBusiness, eBusiness-supply chain integration, eBusiness Process model, Components of the eBusiness supply chain.

ERP, Internet and WWW-ERP II: The internet Explosion, ERP, Internet and WWW.
Future Directions and Trends in ERP: New markets, New channels, Faster implementation methodologies, Easier customization tools, Business models and BAPIs, ERP Case Studies. (12)

Text Books:

1. Enterprise Resource Planning by Alexis Leon, Tata MC Graw Hill Publishing, 2nd edition, 2008.

Reference Books:

1. Enterprise Resource Planning: Concepts And Practice by Vinod Kumar Garg,
N. K. Venkitakrishnan, Eastern Economy Edition, 2nd Edition, PHI, 2006.
2. Enterprise Resource Planning by Mary Sumner, Prentice Hall, Paperback, 2004.

MCA – V SEMESTER
GENERIC ELECTIVE – II
SCA 855: Principles of Information Security

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessonals:40 Marks

Objectives: To make the student to analyse and assess emerging information security threats, timely action to mitigate risks and planning for information security.

UNIT - I

Introduction to Information Security: Introduction, The History of Information Security, What Is Security? Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing Components, Balancing Information Security and Access, Approaches to Information Security Implementation, The Systems Development Life Cycle, The Security Systems Development Life Cycle, Security Professionals and the Organization, Information Security: Is it an Art or a Science? Information Security Terminology.

The Need for Security: Introduction, Business Needs First, Threats, Attacks. (10)

UNIT – II

Legal, Ethical and Professional Issues in Information Security: Introduction, Law and Ethics in Information Security, Types of Law, Relevant Indian Laws, International Laws and Legal Bodies, Policy versus Law, Ethics and Information Security, Codes of Ethics and Professional Organizations, Organizational Liability and the need of Counsel .

Risk Management: Introduction, An Overview of Risk Management, Risk Identification, Risk Assessment, Risk Control Strategy, Selecting a Risk Control Strategy, Risk Management Discussion Points, Documenting Results, Recommended Practices in Controlling Risk. (10)

UNIT-III

Planning for Security: Introduction, Information Security Policy, Standards and Practices, The Information Security Blueprint, Security Education, Training and Awareness Program, Continuity Strategies.

Security Technology: Firewalls & VPNs: Introduction, Physical Design, Firewalls, Protecting Remote Connections. (10)

UNIT-IV

Security Technology: Intrusion Detection, Access Control and Other Security Tools: Introduction, Intrusion Detection Systems (IDS), Honey Pots, Honey Nets and Padded Cell Systems, Scanning and Analysis Tools, Access Control Devices.

Physical Security: Introduction, Physical Access Controls, Fire Security and Safety, Failure of Supporting Utilities and Structural Collapse, Interception of Data, Mobile and Portable Systems, Special Considerations for Physical Security Threats. (10)

UNIT -V

Implementing Information Security: Introduction, Project Management for Information Security, Technical Topics of Implementation, Non-technical Aspects of Implementation.

Information Security Maintenance: Introduction, Security Management Models, he Maintenance Model. (10)

Text Books:

1. Principles of Information Security by Michael E. Whitman and Herbert J.Mattord, Thomas India Edition, 2011.

Reference Books:

1. Computer Security: Art and Science by Mathew Bishop, Addison-Wesley, 2003.
2. Computer Security Principles and Practice by William Stallings and Lawrie Brown, Pearson Eduaction, 2 nd edition 2012.
3. Computer Security Fundamentals by William (Chuck) Easttom, Pearson Education, 2011.
4. Information Assurance Handbook: Effective Computer Security and Risk Management Strategies by Steven Hernandez and Corey Schou, McGraw-Hill, 2014.

MCA – V SEMESTER
GENERIC ELECTIVE -II
SCA 857: MACHINE LEARNING

Hours per week: 4 End Examination: 60Marks
Credits: 4 Sessionals: 40Marks

Preamble : Machine Learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves which is used in decision-making processes based on data inputs.

Course Objectives:

- To understand the basic theory underlying machine learning and its applications.
- To learn the Steps involved in designing and interpreting Model Performance.
- To Understand and apply different Learning models.
- To Understand the concept of Artificial Neural Network and its learning process.
- To Learn Different Learning models.

UNIT - I

Introduction: Human Learning definition, Types of Human Learning, Problems not to be solved using Machine Learning, Applications of Machine Learning, Tools in Machine Learning, Issues in Machine Learning.

Preparing to Model: Machine Learning Activities, Basis types of Data in Machine Learning, Exploring structured data, Data Quality and Remediation, Data Preprocessing. (10 hours)

Learning Outcomes:

By the end of the unit, the student is able to

- Identify basic data types in Machine learning. (L3)
- Develop methods for exploring structured data. (L3)
- Relate data quality and remediation. (L1)

UNIT-II

Modelling & Evaluation: Introduction, Selecting a model, Training a model, Model Representation and Interpretability, Evaluating Model Performance, Improving model performance.

Feature Engineering: Introduction, Feature Transformation, Subset selection. (8 hours)

Learning Outcomes:

By the end of the unit, the student is able to

- Learn how to select a model. (L1)
- Interpret Model Performance. (L2)
- Select the subset. (L3)

UNIT-III

Introduction, Importance of Bayes Theorem, Bayes theorem and concept learning, Bayesian Belief Network.

Supervised Learning: KNN, Decision Tree, Random forest model, Support vector Machines, Regression. (10 hours)

Learning Outcomes:

By the end of the unit, the student is able to

- Demonstrate the importance of Bayes Theorem. (L2)
- Make use of Bayesian Belief Networks(L3)
- Analyze KNN, Random Forest (L4)

UNIT-IV

Unsupervised Learning: Supervised Vs Unsupervised Learning, Applications of Unsupervised Learning, Clustering, Association Rule.

Basic Neural Networks: Neural Network, Understanding Biological Neuron, Exploring Artificial Neuron, Types of activation function, Early implementation of ANN, Architecture of Neural Networks, Learning process in Artificial Neural Networks, Back Propagation, Deep Learning.

(12 hours)

Learning Outcomes:

By the end of the unit, the student is able to

- Compare Supervised Learning and Unsupervised Learning. (L2)
- Construct Artificial Neural Network. (L3)
- Make use of Deep Learning. (L3)

UNIT-V

Other Types of Learning: Introduction, Representation Learning, Active Learning, Instance Based learning, Association Rule Learning, Ensemble Learning Algorithm, Regularization algorithm.

(8 hours)

Learning Outcomes:

By the end of the unit, the student is able to

- Outline Learning. (L2)
- Develop Instance based Learning. (L3)
- Utilize regularization algorithm. (L3)

Text Book:

- Machine Learning by Subramanian, Chandra Mouli, Amit Kumar Das , Saikant Dutt, Pearson Publications, I edition, 2018.

Reference Book:

- Machine Learning by Tom Mitchell, McGraw Hill, 2007

Course Outcomes:

By the end of the Course, the student is able to

1. Understand the basic concepts machine learning algorithms. (L3)
2. Develop the ability to formulate machine learning techniques to respective problems. (L3)
3. Apply machine learning algorithms to solve problems of moderate complexity. (L4)

MCA – V SEMESTER
GENERIC ELECTIVE – III
SCA 859: INTRODUCTION TO MICROPROCESSORS

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: The objective of this course is to understand about Microprocessor and become familiar with the architecture and the instruction set of an Intel microprocessor and to provide extensive knowledge of microprocessor based systems.

UNIT - I

Microprocessors, Microcomputers and Assembly Language:
Microprocessor, Microprocessor Instruction Set and Computer languages, From large computers to single chip microcontrollers, Application – Microprocessor Controlled Temperature System(MCTS)
Introduction to 8085 Assembly Language programming: The 8085 programming model, Instruction classification, Instruction, Data format and storage, How to write, Assemble and Execute a simple program, Overview of the 8085 Instruction Set, Writing and hand assembling a program. (15)

UNIT - II

Microprocessor Architecture and Microcomputer Systems: Microprocessor Architecture & its Operations, Memory, Input & Output Devices, Examples of a Microcomputer System, Review of Logic devices for interacting, Microprocessor-based system Applications. (10)

UNIT - III

Introduction to 8085 Instructions: Data Transfer(copy) operations, Arithmetic operations, Logic operations, Branch operations, Writing Assembly Language Program, Debugging a program. (10)

UNIT - IV

Programming Techniques with Additional Instructions: Programming Techniques - Looping, Counting and Indexing, Additional data transfer and 16-bit Arithmetic Instructions, Arithmetic operations related to Memory, Logic operations, Rotate, Logic operations - compare, Dynamic debugging. (10)

Unit - V

The 8051 Architecture : Introduction, 8051 Microcontroller Hardware, Input / Output Pins**,** Ports & Circuits, External memory, Counters and Timers Serial data Input/Outputs, Interrupts. (10)

Text books:

1. Microprocessor Architecture, Programming and Applications with 8085 by Ramesh Gaonkar, Penram International Publishing Pvt Ltd, 5th edition, 2012. (UNIT I to UNIT IV).
2. The 8051 Microcontroller by Kenneth Ayala, Cengage Learning Pvt Ltd., 3rd edition, 2012 (UNIT V).

Reference Books:

1. Advanced Microprocessor and Peripheral by Ray A.K. Bhurchandi, Tata McGraw Hill, 2000.
2. The Intel Microprocessors – Architecture, Programming, and Interfacing by Barry B. Brey and C.R. Sarma, Pearson Education Pvt. Ltd., 2005.
3. Microprocessor and Microcontrollers by U.S. Shah, Tech-Max Publications, 2005.

MCA – V SEMESTER
GENERIC ELECTIVE – III
SCA 861: INFORMATION RETRIEVAL

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To outline basic terminology and components in information storage and retrieval systems. To compare and contract information retrieval models and also internal mechanisms.

UNIT - I

Information Retrieval - Boolean retrieval: An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval.

The term vocabulary and posting lists: Document delineation and character sequence decoding, Determining the vocabulary of terms, Faster postings list intersection via skip pointers, Positional postings and phrase queries.

Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, Spelling correction, Phonetic correction. (12)

UNIT - II

Index construction: Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing, Other types of indexes**.**

Index Compression: Statistical properties of terms in information retrieval, Dictionary compression, Postings file compression.

Scoring, term weighting and the vector space model: Parametric and zone indexes, Term frequency and weighting, The vector space model for scoring, Variant tf–idf functions. (12)

UNIT - III

Computing scores in a complete search system: Efficient scoring and ranking, Components of an information retrieval system, Vector space scoring and query operator interaction.

Evaluation in Information retrieval: Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results, Assessing relevance, A broader perspective-System quality and user utility.

Relevance feedback and query expansion - Relevance feedback and pseudo relevance feedback, Global methods for query reformulation. (10)

UNIT - IV

Text classification and Naive Baye: The text classification problem, Naive Bayes text classification, The Bernoulli model, Properties of Naive Bayes, Feature selection, Evaluation of text classification.

Vector space classification: Document representations and measures of relatedness in vector spaces, Rocchio classification, *k*- nearest neighbor, Linear versus nonlinear classifiers, Classification with more than two classes, The bias–variance tradeoff.

Support Vector Machines and machine learning on documents- The linearly separable case, Extensions to the support vector machine model, Issues in the classification of text documents, Machine-learning methods in ad hoc information retrieval. (10)

UNIT – V

Web search basics: Web characteristics, Advertising as the economic model, The search user experience, Index size and estimation, Near-duplicates and shingling.

Web crawling and indexes: Overview, Crawling, Distributing indexes, Connectivity servers.

Link Analysis: The Web as a graph, PageRank, Hubs and authorities. (10)

Text Books:

1**.** Introduction to Information Retrieval by Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze , Cambridge University Press, 2009.

References Books:

1**.** Modern Information Retrieval by Baeza-Yates and Ribeiro-Neto, Pearson edition, 2009.
2. Mining the Web: Discovering Knowledge from Hypertext Data by Soumen Charabarti, Morgan Kaufmann, 2003.

MCA – V SEMESTER
GENERIC ELECTIVE – III
SCA 863: SCHEDULING AND SUPPLY CHAIN MANAGEMENT

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives:

1. To develop an understanding of the strategic importance of Operations & SCM and how it can provide a competitive advantage in the marketplace
2. To understand the relationship between Operations & SCM and other business functions, such as Marketing, Human Resources, Finance and Accounting.
3. To develop Knowledge of the Issues related to designing and managing Operations & SCM and the Techniques to do so.

UNIT - I

Operations Management: Introduction to operations management, Current trends in manufacturing India, Services as a part of operations, Operations as a key functional area in an organization, Challenges faced by operation management, Priority for operations management.

Operations Strategy: Strategy formation process, Strategic options for operations, World class Manufacturing practices, Emerging trends and implementations for operations. (12)

UNIT- II

Designing operations: Determinants of process characteristics in operations, Types of processes and operations systems, Process product matrix, Process design issues in service systems, Technology issues in process design, Planning premises and process, Complexity of operational management.

(10)

UNIT- III

Product development Process: Role of product development in competitiveness, Product **d**evelopment process, Organization for product development, Tools for efficient product development understanding customer needs.

Total Quality management: The quality revolution, Definitions of quality, Total quality management, Quality management tool, Quality certifications and awards, Service quality, Design of quality assurance system.

(10)

UNIT-IV

Plant Layout: Implementations of layout planning, Types of layouts, Performance measures for layout design, Design of process layouts, Layout design for services.

Capacity planning: Measures of Capacity, Time horizon in capacity planning, Capacity planning framework. (10)

UNIT- V

Forecasting: Forecasting as a planning tool, Why do we forecast, Forecasting time horizon, Design of forecasting system, Developing a forecasting logic, Models for forecasting, Casual method for forecasting, Accuracy of forecasts , Using the forecasting System.

Aggregate production planning: Planning hierarchies in operations, A framework for aggregate production planning, Alternatives for managing supply inventory based alternatives, master production scheduling.

(10)

Text Books:

1. Operations Management Theory and Practice by B. Mahadevan, Pearson, 2nd edition, 2010.

Reference Books:

1**.** Production and Operations Management by R B Khanna, PHI, 2011.
2. Supply Chain Logistics Management by Donald Bowersox, David Closs and M Bix cooper, Tata McGraw Hill, 2nd edition, 2002.
3. Supply Chain Management- Strategy, Planning and Operation by Sunil Chopra, Peter meindl and D.V.Kalra, Person Education, 2013.

MCA – V SEMESTER
GENERIC ELECTIVE - III
SCA 865: DISTRIBUTED OPERATING SYSTEMS

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To provide a basic foundation in the design of Distributed Operating Systems. The course aims to cover the fundamental concepts and mechanisms which form the basis of the design of distributed operating system.

UNIT - I

Architectures of Distributed Systems: Introduction, Motivations, System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Networks, Communication Primitives.

Theoretical Foundations: Introduction - Inherent Limitations of a Distributed system, Lamport's Logical Clocks, Vector Clocks, Casual Ordering of Messages, Global State, Cuts of a Distributed Computation, Termination Detection. (10)

UNIT - II

Distributed Mutual Exclusion : Introduction, The Classification of Mutual Exclusion Algorithms, Preliminaries - A Simple Solution to Distributed Mutual Exclusion, Non – Token-based Algorithms, Lamport's Algorithm, The Ricart Agrawala Algorithm, Mackawa's Algorithm, A Generalized Non Token-Based Algorithm, Token Base Algorithms, Suzuki-Kasami's Boardcast Algorithm, Singhal's Heuristic Algorithm, Raymond's Tree-Based Algorithm, A Comparative Performance Analysis.

Distributed Deadlock Detection : Introduction, Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized Deadlock - Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms. (12)

UNIT - III

Agreement Protocols : Introduction, The System Model, A Classification of Agreement Problems, Solutions to the Byzantine Agreement Problem, Applications of Agreement Algorithms.

Distributed Resource Management : Distributed File System: Introduction, Architecture, Mechanism for Building Distributed File Systems, Design Issues, Case Studies, Log Structured File Systems. (10)

UNIT - IV

Distributed Shared Memory: Introduction, Architecture and Motivation, Algorithms for implementing DSM, Memory Coherence, Coherence Protocols, Design Issues, Case Studies.

Distributed Scheduling : Introduction, Motivation-Issues in Load, Distributing, Components of a Load Distributing Algorithm, Stability Load Distributing Algorithm, Performance Comparison, Selecting a suitable Load Sharing Algorithm, Requirements for Load Distributing, Task Migration, Issues in Task Migration. (10)

UNIT - V

Failure - Recovery : Introduction, Basic Concepts, Classification of Failures, Backward and Forward Error Recovery, Backward - Error Recovery - Basic Approaches, Recovery in Concurrent Systems, Consistent Set of Check points, Synchronous Check-pointing and Recovery,

Asynchronous check pointing and recovery, Check-pointing for Distributed Database Systems, Recovery in Replicated Distributed Database Systems.

Fault Tolerance: Introduction, Issues, Atomic Actions and Committing, Commit Protocols, Non-blocking Commit Protocols, Voting Protocols, Dynamic Voting Protocols, The Majority Based Dynamic Voting Protocol, Dynamic Vote Reassignment Protocols, Failure Resilient Processes, Reliable Communication, case studies. (10)

Text Books:

1. Advanced Concepts in Operating Systems: Distributed, Database and multiprocessor operating systems by Mukesh Singhal, Niranjan and Shivaratri, TMH, 2001.

Reference Books:

1. Modern Operating System by AndrewS.Tanenbaum, PHI, 2003.
2. Distributed operating system - Concepts and design by Pradeep K.Sinha, PHI, 2003.
3. Distributed operating system by Andrew S.Tanenbaum, Pearson education, 2003.

MCA – VI SEMESTER
GENERIC ELECTIVE - V
SCA 867: SOFTWARE TESTING AND METHODLOGIES

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To understand the purpose of testing and model for testing. To know about basic concepts of path testing, predicates and application of path testing. To understand the concept of transaction flow testing and data flow testing and to visualize the transaction flow and data flow in a software system. To understand the concept of logic based testing and to learn about decision tables and their applications. To know about of power of a matrix, node reduction algorithm and various building tools.

UNIT - I

Introduction: The purpose of testing, Some dichotomies, A model for testing, Playing pool and Consulting Oracles, Is complete testing possible?

Flow Graphs and Path Testing: Path testing basics, Predicates - Path predicates and Achievable path, Path sensitizing, Path instrumentation, Implement and Application of path testing. (10)

UNIT - II

Transaction Flow Testing: Generalizations**,** Transaction flows, Transaction flow testing techniques.

Data Flow Testing: Basics, Data flow testing strategies, Application, Tools, Effectiveness. (10)

UNIT - III

Domain Testing: Domains and paths, Nice and ugly domain, Domain testing, Domains and Interface testing, Domains and testability.

Metrics and Complexity: Metrics, What and Why, Linguistic metrics, Structural metrics, Hybrid metrics, Metrics implementation. (10)

UNIT - IV

Paths, Paths Products and Regular Expressions: Motivation, Path products and Path expressions, A reduction procedure, Applications, Regular expression and Flow anomaly Detection.

Logic Based Testing: Motivational over view, Decision tables, Path expression again, KV Charts, Specifications. (10)

UNIT - V

State, State graphs and Transition testing: Motivational overview, State graphs, Good and Bad state graphs, State testing.

Graph Matrices and Applications: Motivational overview, The Matrix of a graph, Relations, The powers of a matrix, Non-reduction algorithm, Building tools. (10)

Text Books:

1. Software Testing Techniques by Boris Beizer, Dreamtech Press, 2nd edition, 2003.

Reference Books:

1. The Craft Of Software Testing by Brian Marick, Pearson Education, 3rd edition, 2009.
2. Effective methods of Software Testing by Perry, John Wiley, 2nd edition, 2006.

MCA – V SEMESTER
GENERIC ELECTIVE - I LAB
SCA 881: J2EE TECHNOLOGIES Lab

Hours per week: 3 Examination: 100 Marks
Credits: 2

Objectives: The objective of this course is to make students to develop web based applications. Students able to build web interfaces with HTML,XML,JSPs and Servlets, make servlets cooperate and share data, able to create jsp pages using built in jsp objects, using directives, using scripting elements, java beans, custom tags.

1. Write HTML document to display the word ―WEBDESIGNING in horizontal Scrolling format.
2. HTML document to demonstrate Ordered Lists, Unordered Lists, Nested Lists.
3. Write HTML document to divide the window into two halves using frames.
4. Write HTML document to demonstrate tables.
5. Write a XML program to maintain the student database.
6. Write the XML program to implement the Internal DTD and External DTD.
7. Program on JDBC for insertion, deletion, updation of data in the database.
8. Program for Multiple Insertions, Multiple Deletions, Multiple Updations of data in the database.
9. Program on Prepared Statement and Callable Statements.
10. Program to demonstrate life cycle of a servlet.
11. Program to demonstrate handling of request parameters using servlets.
12. Program to demonstrate handling of init parameters using servlets.
13. Program to create a login page using HTML and check Database values in Servlet using JDBC.
14. Program to demonstrate include() and forward() methods of request dispatcher.
15. Program to create a Filter in Servlets.
16. Program to create a session in Servlets.
17. Program to demonstrate cookies in servlets.
18. Program to demonstrate scripting tags.
19. Program to demonstrate implicit objects.
20. Program to create login page &check values of Database in JSP using JDBC, handle exception.
21. Program to demonstrate jsp:include, jsp:forward action tags.
22. Program to create a login page and check the values of Database in jsp using jdbc and also handle the exception.
23. Program to create a bean, also demonstrate setting and accessing the bean properties.
24. Program to demonstrate custom tags.
25. Program to demonstrate core tags.
26. Program to demonstrate sql tags.
27. Program to demonstrate internationalization tags.
28. Program to demonstrate EL operators.

Reference Books:

1. JDBC, Servlet and JSP includes JSF and Design Patterns Black Book by Santhosh Kumar K., New Edition, Dreamtech Press, 2013.
2. Web Technology and Design by C. Xavier, New Age International Publishers, 2003.
3. JSP and Servlets - A comprehensive Study by Mahesh P. Matha, PHI, 2013.

MCA – V SEMESTER
GENERIC ELECTIVE - I LAB
SCA 883: .NET TECHNOLOGIES LAB

Hours per week: 3 Examination: 100 Marks
Credits: 2

1. Create a simple application in Visual Basic using windows application.

2. Create and manage multiple forms in a simple application along with some controls.

3. Interact with a user by using the message box function both using msgbox() and class.

4. Create an application to demonstrate static variables.

5. Implement the programs a) Creating a structure. b) Creating and using arrays.

6. Implementation of functions and procedures.

7. Program to implement validation controls using user input.

8. Implement the programs a). Create a new class, including its methods, properties, and data members with appropriate access levels. b). Create and use an instance of a class, including instance and shared data members, and shared and non-shared methods.

9. Implement the programs using Try….Catch….Finally Blocks.

10. Implement the programs a). Create custom menus to group application commands. b). Create a status bar to provide users with feedback about an application. c). Create a toolbar to provide a graphical interface with which users can access key functions of an application.

11. Create, build, and run an application that uses web forms.

12. Implement the programs a). Create and open a connection o a database. b). Create, read, update, and delete records in a database. c). Use the data form wizard to create a simple data access application. d). Display and modify data extracted from a database.

Reference Books:

1. Visual Basic .Net Programming Black Book by Steven Holzner, Paraglyph press, Dream tech press, New edition , R print edition, 2009.

MCA – V SEMESTER
GENERIC ELECTIVE - I LAB
SCA 885: IMAGE ANALYSIS USING MATLAB

Hours per week: 3 Examination: 100 Marks
Credits: 2

Objectives: To make the students understand the functionalities of basic Image processing Techniques implemented using MATLAB.

1. Program to display an image and its histogram.
2. Program for mirror image generation.
3. Program to find negative of an image.
4. Program to show shrinking of an image.
5. Program to show zooming of an image.
6. Program to learn Image Segmentation.
7. Program to show Image Enhancement.
8. Program to show histogram equalization.
9. Program to illustrate bit plane slicing.
10. Program to show edge detection.
11. Program to filter image using a high pass filter.
12. Program to blur and de-blur an image.

Reference Book :

1. Digital Image Processing Using MATLAB by Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Tata McGraw Hill, 2nd Edition, First Reprint, 2010.

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MCA – V SEMESTER
GENERIC ELECTIVE - I LAB
SCA 887: ADVANCED DATABASE MANAGEMENT SYSTEM LAB

Hours per week: 3 Examination: 100 Marks
Credits: 2

1. Implementing simple insert, delete, query operations on relations using PL/SQL
2. Implement Composite Structures using PL/SQL
3. Implement Exceptions using PL/SQL - Predefined Exceptions, User Defined Exceptions, Handling Raised Exceptions
4. Implementing Cursors- implicit, explicit cursors
5. Implementing Triggers in SQL – apply on insert, delete, update operations
6. Programs development using creation of procedures, passing parameters IN, OUT, INOUT of PROCEDURES
7. Program development using creation of stored functions, invoke functions in SQL Statements.
8. Implementing Import/ Export Commands
9. Implementing Locks, Analyzing v$lock, Monitoring locks on the system
10. Implementing V$session, V$sysstat using lock concepts
11. Generating XML Using SQL Functions

    - XMLELEMENT and XMLATTRIBUTES SQL Functions
    - XMLFOREST SQL Function
    - XMLCONCAT SQL Function
    - XMLAGG SQL Function
    - XMLPI SQL Function
    - XMLCOMMENT SQL Function
    - XMLROOT SQL Function
    - XMLSERIALIZE SQL Function
    - XMLPARSE SQL Function

Reference Books:

1. Programming Oracle Triggers and Stored Procedures by Kevin Owens, 3rd Edition, PHI, 2003.
2. http://docs.oracle.com

MCA – V SEMESTER

SCA 891: SUMMER INTERNSHIP

Credits: 2 End Examination: 50 Marks

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MCA – VI SEMESTER
GENERIC ELECTIVE – IV
SCA 842: BIOINFORMATICS

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives:

- This course helps students to understand the fundamentals of Bioinformatics.
- All key areas of bioinformatics including biological databases, sequence alignment, gene and promoter prediction, molecular phylogenetics, structural bioinformatics.
- This course emphasizes how computational methods work and compares the strengths and weaknesses of different methods.

UNIT - I

Introduction to Bioinformatics: Goal, Scope, Applications, Limitations, New Themes, Biological Sequences, Human Genome Project.

Introduction to Biological Databases: Types of Databases, Biological Databases, Pitfalls of Biological Databases, Information Retrieval from Biological Databases.

Pairwise Sequence Alignment: Evolutionary Basics, Sequence Homology versus Sequence Similarity, Sequence Similarity versus Sequence Identity, Methods, Scoring Matrices, Statistical Significance of Sequence Alignment.

Database Similarity Searching: Unique Requirements of Database Searching, Heuristic Database Searching,Basic Local Alignment Search Tool (BLAST), FASTA, Comparison of FASTA and BLAST, Database Searching with the Smith–Waterman Method. (12)

UNIT - II

Multiple Sequence Alignment: Scoring Function, Exhaustive Algorithms, Heuristic Algorithms.

Profiles and Hidden Markov Models: Position-Specific Scoring Matrices, Profiles, Markov Model and Hidden Markov Model.

Protein Motifs and Domain Prediction: Identification of Motifs and Domains in Multiple Sequence Alignment, Motif and Domain Databases Using Regular Expressions, Motif and Domain Databases Using Statistical Models, Protein Family Databases, Motif Discovery in Unaligned Sequences, Sequence Logos. (12)

UNIT - III

Gene Prediction: Categories of Gene Prediction Programs, Gene Prediction in Prokaryotes and Eukaryotes.

Promoter and Regulatory Element Prediction: Promoter and Regulatory Elements in Prokaryotes and Eukaryotes, Prediction Algorithms.

Phylogenetics Basics: Molecular Evolution and Molecular Phylogenetics, Terminology, Gene Phylogeny versus Species Phylogeny, Forms of Tree Representation, Finding a True Tree is Difficult, Procedure. (12)

UNIT - IV

Phylogenetic Tree Construction Methods and Programs: Distance-Based Methods, Character-Based Methods, Phylogenetic Tree Evaluation, Phylogenetic Programs.

Protein Structure: Basics, Amino Acids, Peptide Formation, Dihedral Angles, Hierarchy Secondary Structures, Tertiary Structures, Determination of Protein Three-Dimensional Structure, Protein Structure, Database, Protein Structure Visualization, Comparison and Classification. (10)

UNIT - V

Protein Secondary Structure Prediction: Secondary Structure Prediction for Globular proteins, Transmembrane Proteins, Coiled Coil Prediction.

Protein Tertiary Structure Prediction: Methods, Homology Modeling, Threading and Fold Recognition, Ab Initio Protein Structural Prediction, CASP.

RNA Structure Prediction: Introduction, Types of RNA Structures, RNA Secondary Structure Prediction Methods, Ab Initio Approach, Comparative Approach, Performance Evaluation. (12)

Text Books:

1. Essential Bioinformatics by Jin Xiong, Cambridge University Press, 1st edition, 2009.

Reference Books:

1. Introduction to Bioinformatics by T K Attwood & D J Parry-Smith, Pearson education 1st edition, 2007.

2. Bioinformatics – A practical Guide to the Analysis of Genes And Proteins by B. F. Francis, Ouellette Andreas, D. Baxevanis, Wiley Publishers, 3rd edition, 2011.

3. Developing Bioinformatics Computer Skills by Cynthia Gibas, Per Jambeck, O'Reilly Media, 2001.

MCA – VI SEMESTER
GENERIC ELECTIVE - IV
SCA 844: ETHICAL HACKING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: This course teaches the underlying principles and many of the techniques associated with the cyber security practice known as penetration testing or ethical hacking. Students will know about the entire penetration testing process including planning, reconnaissance, scanning, exploitation, post-exploitation, and result reporting. The course will provide the fundamental information associated with each of the methods employed and insecurities identified. Students will develop an excellent understanding of current cyber security issues and ways that user, administrator and programmer errors can lead to exploitable insecurities.

UNIT - I

Introduction: What is Penetration Testing, What is the need of Penetration Testing, Introduction to Kali Linux, Introduction to Kali Linux tools, Working with Kali Linux, Phases of a Penetration Test, Introduction to Social Engineering, Setting up Hacking Lab. (10)

UNIT - II

Reconnaissance or Information Gathering: HTTrack – The Website Copier, Hacking with Google (aka Google Hacking), Using "The Harvester" – Grabbing Email Addresses of any Organization, Utilizing Who is - Querying databases that store the registered users or assignees of an Internet resource, such as a domain name, an IP address block, Extracting information from DNS, Finding attackable target, Using Wire shark (aka Ethereal – Pulls lots of information from the wire) for Information Gathering. (12)

UNIT - III

Vulnerability Assessment: Scanning the target for vulnerabilities with the information gathered, Ping and Ping Sweeps, Port Scanning with N-map, Scanning for the services on a target server, Finding vulnerable service. (10)

UNIT - IV

Exploitation : Introduction, Introduction to Metasploit (Hack like a Pro with Metasploit), Sniffing the network traffic, Spying on network, Hacking a remote system with SET (Social Engineering Toolkit). (10)

UNIT - V

Maintaining Access: Introduction, Netcat (aka The Swiss Army Knife), Introduction to Rootkits, Detecting the presence of rootkit on a system. (8)

Text Books:

1. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy by Patrick Engebretson, Syngress Media, 2011.

Reference Books:

1. Penetration testing A Hands-On Introduction to Hacking by Georgia Weidman,William Pollock publisher, 2014.
2. Ethical Hacking and Penetration Testing Guide by Rafay Baloch, CRC Press, 2015.
3. Hacking Exposed 7: Network Security Secrets and Solutions by Stuart McClure, Joel Scambray, George Kurtz, McGraw Hill, 2012.

MCA – VI SEMESTER
GENERIC ELECTIVE -IV
SCA 846: REAL TIME OPERATING SYSTEMS

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: Identify multi tasking techniques in real time systems. Evaluate the performance of soft and hard real time systems. Analyze multi task scheduling algorithms.

UNIT - I

Real Time Applications: Digital Control, High Level Control , Signal Processing, Other Real-Time Applications.

Hard Versus Soft Real -Time Systems: Jobs and Processors, Release Times, Deadlines And Timing Constraints, Hard And Soft Timing Constraints, Hard Real Time Systems And Soft Real Time Systems.

A Reference Model For Real Time Systems : Processors And Resources, Temporal Parameters Of Real-Time Workload, Periodic Task Model, Precedence Constraints And Data Dependency, Functional parameters, Resource parameters of jobs and parameters of resources, Scheduling hierarchy. (12)

UNIT - II

Real Time Scheduling Approaches : Clock-Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Effective Release And Times And Deadlines, Optimality Of EDF And LST Algorithms, Challenges In Validating Timing Constraints In Priority Driven Systems, Offline Versus Online Scheduling.

Clock Driven And Priority Driven Schedulin: Static, Timer-Driven Scheduler, General Structure Of Cyclic Schedules, Cyclic Executives, Improving The Average Response Time Of A Periodic Jobs, Scheduling Sporadic Jobs, Practical Considerations and generalizations, pros and cons of clock-driven scheduling (12)

UNIT - III

Priority-Driven Scheduling of Periodic Tasks: Fixed-priority versus dynamic-priority algorithms, maximum schedulable utilization, optimality of the RM and DM algorithms, Sufficient schedulability conditions for the RM and DM algorithms.

Scheduling A periodic and sporadic jobs in priority-driven systems: Deferrable servers, Sporadic servers, constant utilization, total bandwidth and weighted fair-Queuing servers, scheduling of sporadic jobs, a two-level scheme for integrated scheduling. (10)

UNIT - IV

Resources and Resource Access Control : Assumptions On Resources And Their Usage, Effects Of Resource Contention And Resource Access Control, Non-Preemptive Critical Sections, Basic Priority-Inheritance Protocol, Basic Priority-Ceiling Protocol, Stack-Based, Priority-Ceiling (Ceiling-Priority) Protocol, Use Of Priority-Ceiling Protocol In Dynamic-Priority Systems, Preemption-Ceiling Protocol, Controlling Accesses To Multiple Unit Resources, Controlling Concurrent Accesses To Data Objects. (10)

UNIT - V

Operating Systems : Overview, Time Services And Scheduling Mechanisms, Other Basic Operating System Functions, Processor Reserves And Resource Kernel, Open System Architecture, Capabilities Of Commercial Real-Time Operating Systems, Predictability Of General-Purpose Operating Systems. (10)

Text Books:

1. Real-Time Systems by Jane W.S.Liu , Pearson Education , 13th Impression, 2012.

Reference Books:

1. Real Time System Design and Analysis by Philip. A.Laplante, PHI, 3/e, 2012.
2. Real-Time Systems by C.M.Krishna and Kangh,TMH, 2010.

MCA – VI SEMESTER
GENERIC ELECTIVE -IV
SCA 848: BIG DATA ANALYTICS

Hours per week: 4 End Examination: 60 Mark
Credits: 4 Sessionals: 40 Marks

Objective: The course aims to incorporates a deep-dive into Big Data, the Data Analytics lifecycle, Hadoop (MapReduce, HDFS).

UNIT - I

The Rise of Big Data:What Is Big Data and Why Does It Matter?
Web Data: The Original Big Data, A Cross-Section of Big Data Sources and the Value they Hold. (10)

UNIT - II

Taming Big Data: The Technologies, Processes & Methods: The Evolution of Analytic Scalability, The Evolution of Analytic Processes, The Evolution of Analytic Tools & Methods. (10)

UNIT - III

Related Technologies: Cloud Computing, IoT, Data Center, Hadoop.
Big Data Generation and Acquisition: Big Data Generation, Big Data Acquisition.
Big Data Storage: Storage System for Massive Data, Distributed Storage System, Storage Mechanism for Big Data.
Big Data Analysis: Traditional Data Analysis, Big Data Analytic Methods, Architecture for Big Data Analysis, Tools for Big Data Mining and Analysis.
Big Data Applications: Application Evolution, Big Data Analysis Fields, Key Applications, Applications of Healthcare and Medical Big Data, Collective Intelligence, Smart Grid. (10)

UNIT - IV

A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem, MapReduce, The Hadoop Distributed File system. (12)

UNIT - V

Hadoop I/O, Developing a Map Reduce Application, How Map Reduce Works. (12)

Text Books :

1. Taming The Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics by ,Bill Franks, 2012 (Unit I and Unit II).
2. Big Data: Related Technologies, Challenges and Future Prospects by Min Chen, Shiwen Mao, Yin Zhang, Victor CM Leung, Springer, 2014. (Unit III)
3. Hadoop: The Definitive Guide by by Tom Whit ,O'reilly, 2015(Unit IV and Unit V).

Reference Books:

1. Oracle Big Data HandBook by Tom Plunkett, BrainMac Donald, Oracle Press, 2014.
2. Big Data Analytics Turning Big Data Into Big Money by Ohlhorst, Frank J,Wiley Publications, 2014.
3. Big Data, Big Innovation Enabling Competitive Differentiation through Business Analytics by Evan Stubbs, Wiley, 2014.
4. Large Scale and Big Data: Processing and Management by Sherif Sakr and Mohamed Gab, 2014.
5. Big Data Glossary by Pete Warden, O'reilly, 2011.

MCA – VI SEMESTER
GENERIC ELECTIVE - IV
SCA 850: COMPILER DESIGN

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To study the basic principles involved in Compiler design and the role of lexical and syntax analyzers in a compiler.

UNIT- I

The Structure of a Compiler: Lexical Analysis, Syntax Analysis, Semantic Analysis, Intermediate Code Generation, Code Optimization, Code Generation, Symbol Table Management, The Grouping of Phases into Passes, Compiler-Construction Tools.

A Simple Syntax-Directed Translator: Syntax Definition, Definition of Grammars, Derivations, Parse Trees, Ambiguity, Associativity of Operators, Precedence of Operators, Syntax-Directed Translation, Postfix Notation, Synthesized Attributes, Simple Syntax-Directed Definitions, Tree Traversals, Translation Schemes, Parsing, Top-Down Parsing, Predictive Parsing, When to Use e-Productions, Designing a Predictive Parser, Left Recursion. (15)

UNIT- II

Lexical Analysis: The Role of the Lexical Analyzer, Lexical Analysis versus Parsing, Tokens, Patterns and Lexemes, Attributes for Tokens, Lexical Errors, Specification of Tokens, Strings and Languages, Operations on Languages, Regular Expressions, Regular Definitions, Extensions of Regular Expressions, Recognition of Tokens, Transition Diagrams, Recognition of Reserved Words and Identifiers. (8)

UNIT- III

Syntax analysis : Introduction, The Role of the Parser, Representative Grammars, Syntax Error Handling, Error-Recovery Strategies, Context-Free Grammars, The Formal Definition of a Context-Free Grammar, Notational Conventions, Derivations, Parse Trees and Derivations, Ambiguity, Verifying the Language Generated by a Grammar, Context-Free Grammars Versus Regular Expressions, Writing a Grammar, Lexical Versus Syntactic Analysis, Eliminating Ambiguity, Elimination of Left Recursion, Left Factoring, Non-Context-Free Language Constructs.

Top-Down Parsing: Recursive-Descent Parsing, FIRST and FOLLOW, LL(1) Grammars, Non recursive Predictive Parsing, Error Recovery in Predictive Parsing.

Bottom-Up Parsing: Reductions, Handle Pruning, Shift-Reduce Parsing, Conflicts during Shift-Reduce Parsing.

Introduction to LR Parsing: Simple LR, Why LR Parsers? Items and the LR(0) Automation, The LR-Parsing Algorithm, Constructing SLR-Parsing Tables, Viable Prefixes. (15)

UNIT - IV

Syntax-Directed Translation: Syntax-Directed Definitions , Inherited and Synthesized Attributes, Evaluating an SDD at the Nodes of a Parse Tree ,Evaluation Orders for SDD's, Dependency Graphs, Ordering the Evaluation of Attributes, S-Attributed Definitions, L-Attributed Definitions, Applications of Syntax-Directed Translation, Construction of Syntax Trees, The Structure of a Type, Syntax-Directed Translation Schemes, Postfix Translation Schemes. (10)

UNIT - V

Intermediate-Code Generations: Variants of Syntax Trees, Directed Acyclic Graphs for Expressions, The Value-Number Method for Constructing DAG's, Three-Address Code, Addresses and Instructions, Quadruple, Triples, Static Single-Assignment Form, Type Equivalence,

Declarations, Storage Layout for Local Names, Sequences of Declarations, Fields in Records and Classes.

Run-Time Environments: Storage Organization, Static Versus Dynamic Storage Allocation, Stack Allocation of Space, Activation Trees, Activation Records, Calling Sequences, Variable-Length Data on the Stack. (12)

Text Books:

1. Compilers – Principles, Techniques and Tools by Alfred V Aho, Ravi Sethi and Jeffrey D Ullman, Pearson Education, 2nd edition, 2004.

Reference Books:

1. Principles of Compiler Design, Alfred V.Aho and J.D.Ullman, Narosa Publication, 2nd edition, 2002.
2. Compiler Design by Sudha Sadasivam G, Scitech Publications Private Limited, 2008.

MCA – VI SEMESTER
GENERIC ELECTIVE - IV
SCA 852: SOFTWARE PROJECT MANAGEMENT

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To understand about project management and its application in delivering successful IT projects. To know about life cycle phases for the projects with different artifacts and the project scope of work, provide accurate cost estimates and to plan the various activities to identify and analyze software project activities using contemporary work breakdown techniques, plan evolution of organizations and responsibilities, process automation and apply metrics for quality and automation of projects and process.

UNIT-I

PROJECT MANGEMENT CONCEPTS: The Management Spectrum, People, The Product, The Process, The Project. (10)

UNIT-II

PROCESS AND PROJECT METRICS: Metrics in the Process and Project Domains, Software Measurement, Metrics for Software Quality, Integrating Metrics Within the Software Process, Metrics for Small Organizations, Establishing a Software Metrics Program. (10)

UNIT - III

ESTIMATION FOR SOFTWARE PROJECTS: Observations on Estimation, Project Planning Process, Software Scope and feasibility, Resources, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models.

(10)

UNIT - IV

RISK MANAGEMENT: Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Monitoring, and Management, The RMMM Plan. (10)

UNIT - V

PROJECT SCHEDULING: Basic Concepts, Project Scheduling, Defining a Task Set for the Software Project, Defining a Task Network, Scheduling, Earned Value Analysis. (10)

Text Books:

1. Software Engineering by Roger S. Pressman, McGraw-Hill,7th Edition, 2010.

Reference Books:

1. Software Engineering by IAN Sommerville, Pearson Publications, 8th Edition.
2. Software Project Management by Bob Hughes, Mike Cotterell and Rajib Mall, McGraw-Hill, 5th Edition, 2013.

MCA – VI SEMESTER
GENERIC ELECTIVE -V
SCA 854: MOBILE COMPUTING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: To provide students an overview of the basics and issues in mobile computing. To make students to familiarize with various mobile communication mechanisms. To make them understand the importance of applications of mobile computing.

UNIT – I

Basics of Wireless Communication: Introduction**,** Wireless transmission, Frequencies for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum , Cellular systems.

Medium Access Control: Motivation for a specialized MAC, SDMA, FDMA, TDMA, CDMA, and its comparative study. (10)

UNIT – II

GSM: Mobile Services, System Architecture, Radio Interface, Protocols, Localization and Calling, Handover, Security and New data services. (10)

UNIT – III

Mobile Network Layer: Mobile IP**,** Dynamic Host Configuration Protocol, Mobile Ad-hoc networks. (10)

UNIT – IV

Mobile transport layer : Traditional TCP, Classical TCP improvements - Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/timeout freezing, Selective retransmission, Transaction oriented TCP. (10)

UNIT – V

Support for Mobility: World Wide Web – Hypertext Transfer Protocol, Hypertext Markup Language, Some approaches that might help wireless access, System Architecture, Wireless Application Protocol. (10)

Text Books:

1. Mobile Communications by Jochen Schiller, Pearson Education, PHI, 2nd edition , 2009.

Reference Books:

1. Wireless Communications and Networks by William Stallings, Pearson Education, 2nd edition, 2005.
2. Adhoc and Sensor Networks: Theory and applications by C D M Cordeiro, D. P. Agarwal World Scientific, 2nd edition, 2011.
3. Mobile Computing–Technology, Applications and Service Creation by Asoke K Talukder and Roopa R. Yavagal, TMH Publications, 2008.

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MCA – VI SEMESTER
GENERIC ELECTIVE – V
SCA 856: E-COMMERCE

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To study the basic concepts of E-Commerce network Infrastructure- Information publishing Technology security and search Engine Service

UNIT - I

Introduction: Electronic commerce and physical commerce, The DIGITAL phenomenon, Looking at e-commerce from different perspectives, Different types of e-commerce, Examples of the types of e-commerce, Some e-commerce scenarios, Changes brought by e-commerce, Advantages of e-commerce, Myths about e-commerce development and implementation.

Internet and world wide web: An Overview of internet, Brief history of the web, Web system architecture, Uniform resource locator, Overview of the hypertext transfer protocol (HTTP), Generation of dynamic web pages, Cookies. (10)

UNIT - II

Client-side programming : Important factors in client-side or web programming, Web page design and production, Overview of HTML, Basic structure of an HTML document, Basic text formatting, Links, Images, ImageMap, Tables, Frames, Form, Cascading style sheets, JavaScript.

Server-side programming: servlet fundamentals: The three-tier model, Common gateway interface (CGI), Active server pages (ASP), Overview of Java servlet and API, Building the virtual bookstore –step by step. (10)

UNIT - III

Server-side programming - Database connectivity: Introduction, Relational database systems, JDBC perspectives, A JDBC program example- simple servlet book query, An advanced book query- ServletBookquerymulti, Advanced JDBC servlet- VBS advanced book search engine.

Server-side programming- session tracking: Introduction, Traditional session tracking techniques, The servlet session tracking API, A practical cas:-VBS shopping cart. (10)

UNIT - IV

Basic cryptography for enabling e-commerce: Security concerns, Security requirements, Encryption, Two basic principles for private key encryption, The key distribution problem, Diffie-Hellman key exchange protocol, Public key encryption, RSA encryption algorithm, Hybrid encryption, Other public key encryption methods, Stream cipher and block cipher, Message digest, Message authentication code, Digital signature, Digital signature standard, Authentication.

Internet security: IPSec protocol, Setting up security associations, The authentication header(AH) service, The encapsulating security payload (ESP) service, Preventing replay attack, Application of IPSec- virtual private network, Firewalls, Different types of firewalls, Examples of firewall systems, Secure socket layer (SSL).

Advanced technologies for e-commerce: Introduction to mobile agents, WAP- the enabling technology for mobile commerce, XML (eXtensible Markup Language), Data mining. (10)

UNIT - IV

Internet payment systems : Characteristics of payment systems, 4C payment methods, SET Protocol for credit card payment, E-cash, E-check, Micro payment system, Overview of smart card, Overview of Mondex, Putting it all together for payments in the VBS.

Consumer-oriented e-commerce: Introduction, Traditional retailing and E-retailing, Benefits of e-retailing, Key success factor, Models of e-retailing, Features of e-retailing, Developing a consumer-oriented e-commerce system, The PASS model.

Business-oriented e-commerce: Features of B2B e-commerce, Business models, Integration. (10)

UNIT – V

E-services: Categories of e-services, Web-enabled services, Matchmaking services, Information-selling on the web, E-entertainment, Auctions and other specialized services.

Web advertising and web publishing: Traditional versus internet advertising, Internet advertising techniques and strategies, Business models for advertising and their revenue streams, Pricing models and measurement of the effectiveness of advertisements, Web publishing-goals and criteria, Web site development methodologies, Logical design of the user interface I, abstract user interface object, Logical design of the user interface II , flow of interaction, Usability testing and quality assurance, Web presence and visibility. (10)

Text Books:

1. E-Commerce, Fundamentals and Applications by Henry Chan, Raymond Lee, Tharam Dillon and Elizabeth Chang , Wiley Publications, 2013.

Reference Books:

1. E-business by Gary P. Schneider, Cengage Learning, 2011.
2. E-Commerce by Kenneth C. Laubon and Carol Traver, 11th edition, 2015.

MCA – VI SEMESTER
GENERIC ELECTIVE -V
SCA 858: WEB SERVICES

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To enable the students to understand the core principles of the Service Oriented Architecture. To enable students to learn to produce well designed, effective integration of applications using web services.

UNIT - I

SOA and Web Services Fundamentals: Introducing SOA, Evolution of SOA, Web Services and Primitive SOA, Principles of Service Orientation, Service Layers, SOA Delivery Strategies. (8)

UNIT - II

Introduction: Services, Web Services, Web Services Application opportunities.
Emergence of Web Services: Server Side, Client Side Architecture Progression, Service Oriented Architecture and Web Services.
Web Services Application Scenario: Web Services Hype and the Industry, Web Services and the Industry Acceptance. (8)

UNIT - III

Simple Object Access Protocol: Introduction to SOAP, SOAP - interaction, Modeling, Encoding, Binding.
Web Services Description Language: Introduction to WSDL, Web Service Invocation and WSDL, Web Service Description Details, Service Description through WSDL. (7)

UNIT - IV

Registries- Universal Description, Discovery and Integration: Introduction to UDDI, UDDI Nomenclature, core UDDI, Service Publication, Service Discovery.
Remote Procedure Call and Messaging: Synchronous and Asynchronous Web Services, Remote Procedure Call or Messaging. (8)

UNIT - V

Orchestration and Cheoreography: Business Process/Workflow, Importance of Business Process, Orchestration and Choreography, Choreography.
Advanced Web Services for the Enterprises: First Generation Web Services, WS-*-Overview, Detailed treatment, Importance in SOA, WS-I Basic Profile. (9)

Text Books:

1. Service Oriented Architecture: Concepts, Technology and Design by Thomas Erl, First Edition, Pearson, 2006. (UNIT - 1)
2. Web Services: An Introduction by B.V.Kumar and S.V.Subrhamanya, TMH, 2nd Edition , 2012. (UNIT - II, UNIT - III, UNIT - IV, UNIT - V)

Reference Books:

1. Web Services: Concepts, Architectures and Applications by Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju, Springer, I st edition, 2009.
2. SOA Principles of Service Design by Thomas Erl, Pearson publications, 2007.

MCA – VI SEMESTER
GENERIC ELECTIVE -V
SCA 860: HUMAN COMPUTER INTERACTION

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: The aim is to design and develop processes and life cycle of Human Computer Interaction, Analyze product usability evaluations and testing methods. Apply the interface design standards/guidelines for cross cultural and disabled users. Categorize, Design and Develop Human Computer Interaction in proper architectural structures

UNIT - I

HCI foundations: Input–output channels, Human memory, Thinking: Reasoning and problem solving, Emotion, Individual differences, Psychology and the design of interactive systems.

The Computer: Introduction Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction, Physical controls, sensors and special devices, Paper: printing and scanning, memory, processing and networks.

The Interaction: Introduction, Models of interaction, Frameworks and HCI, Ergonomics, Interaction styles, Elements of the WIMP interface, Interactivity, The context of the interaction, Experience, engagement and fun. (12)

UNIT - II

Paradigms : Paradigms for interaction.

Design Process - Interaction design basics : What is design ?The process of design, User focus, Scenarios, Navigation design, Screen design and layout, Iteration and prototyping.

HCI in the software process: Introduction, the software life cycle, usability engineering, Interactive design and prototyping, Design rationale.

Design Rules: Principles to support usability, Standards and Guidelines, Golden rules and heuristics, HCI patterns. (12)

UNIT - III

Implementation support: Elements of windowing systems, Programming the application, Using toolkits, User interface management systems.

Evaluation techniques: Evaluation through expert analysis, Evaluation through user participation.

Universal design: Universal Design Principles, Multi-modal Interaction, Designing for diversity.(10)

UNIT - IV

User support: Requirements of user support, Approaches to user support, Adaptive help systems, Designing user support systems.

Cognitive models: Goal and task hierarchies, Linguistic models, The challenge of display-based systems, Physical and device models, Cognitive architectures. (10)

UNIT - V

Communication and Collaboration models: Face-to-face communication, Conversation, Text-based communication, Group working.

Dialog notations and design: Dialog design notations Diagrammatic notations, Textual dialog notations, Dialog semantics, Dialog analysis and design. (10)

Text Books:

1. Human-Computer Interaction b**y** Alan Dix, Janet Finlay, Gregory D. Abowd and R Beal., Pearson Publishers, 3rd edition, 2008.

Reference Books:

1. Human-Computer Interaction by Dan R.Olsen, Cengage Learning, Indian Edition, 2010.
2. Designing the User Interface: Strategies for Effective Human Computer Interaction by Shneiderman, Plaisant, Cohen and Jacobs, Pearson Publishers, 5th edition, 2010.

MCA – VI SEMESTER
GENERIC ELECTIVE -V
SCA 862: CLOUD SECURITY AND PRIVACY

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: This course is to introduce the students to the security and privacy concern of cloud in infrastructure security, data security and security management in cloud.

UNIT - I

Introduction: Mind the Gap, The Evolution of Cloud Computing.

What Is Cloud Computing? Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model, Cloud Deployment Models, Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise. (8)

UNIT - II

Infrastructure Security: The network level, the host level, the application level.

Data Security and Storage: Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security.

Identity and Access Management: Trust Boundaries and IAM, Why IAM? IAM Challenges, IAM Definitions, IAM Architecture and Practice, Getting Ready for the Cloud, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management, Cloud Service Provider IAM Practice, Guidance. (10)

UNIT - III

Security Management in the Cloud: Security Management Standards, Security Management in the Cloud, Availability Management, SaaS Availability Management, PaaS Availability Management, IaaS Availability Management, Access Control, Security Vulnerability, Patch and Configuration Management.

Privacy: What is Privacy?, What is the data Life Cycle?, What are the Key Privacy Concerns in the Cloud? Who is Responsible for Protecting Privacy? Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications. (12)

UNIT - IV

Audit and Compliance: Internal Policy Compliance, Governance, Risk and Compliance (GRC), Illustrative Control Objectives for Cloud Computing, Incremental CSP-Specific Control Objectives, Additional Key Management Control Objectives, Control Considerations for CSP Users, Regulatory/External Compliance, Other Requirements, Cloud Security Alliance, Auditing the Cloud for Compliance.

Examples of Cloud Service Providers: Amazon Web Services (IaaS), Google (SaaS, PaaS), Microsoft Azure Services Platform (PaaS), Proofpoint (SaaS, IaaS), RightScale (IaaS), Salesforce.com (SaaS, PaaS), Sun Open Cloud Platform, Workday (SaaS).

Security-As-a-[Cloud] Service: Origins, Today's Offerings. (12)

UNIT - V

The Impact of Cloud Computing on the Role of Corporate IT: Why Cloud Computing will Be Popular with Business Units, Potential Threats of Using CSPs, A Case Study Illustrating Potential Changes in the IT Profession Caused by Cloud Computing, Governance Factors to Consider When Using Cloud Computing.

Conclusion &Future of Cloud: Analyst Predictions, Survey Says? Security in Cloud Computing, Program Guidance for CSP Customers, The Future of Security in Cloud Computing. (12)

Text Books:

1**.** Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance by Tim Mather, Subra Kumaraswamy and Shahed Latif, O'Reilly Media, 2009.

Reference Books:

1. Auditing Cloud Computing: A Security and Privacy Guide by Ben Halpert, Wiley publications, 2011.

2. Cryptography for Security and Privacy in Cloud Computing by Stefan Rass, Daniel Slamanig, Artech House, 2014.

MCA – VI SEMESTER
GENERIC ELECTIVE -V
SCA 864: COMPUTATIONAL INTELLIGENCE

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objectives: To impart the students the knowledge on computerized reasoning and to guide students in the aspect of search processes and Artificial Intelligence techniques. Also introduce the different methods of Knowledge representation in computer.

UNIT - I

Artificial Intelligence: Overview of AI application areas, Artificial Intelligence - A Summary.
Predicate calculus: Introduction, Propositional Calculus, Predicate Calculus, Using Inference rules to Produce Predicate Calculus Expressions. (8)

UNIT - II

Structures and strategies for state space search: Introduction, Graph Theory, Strategies for state Space Search, Using the state space to represent reasoning with the predicate calculus.
Heuristic search: Introduction, Hill-climbing and dynamic programming, The best-First Search Algorithm, Using Heuristics in Games, Complexity Issues. (10)

UNIT - III

Stochastic methods: Introduction, The Elements of Counting, Elements of Probability Theory, Applications of the stochastic methodology, Baye's theorem.
Building control algorithms for state space search: Introduction, Recursion-based search, production systems, The black board Architecture for Problem Solving. (10)

UNIT - IV

Neuron: Neuron introduction, The feed forward Neural Network, Learning methods,
Data Normalization: Statistical or Z-Score Normalization, Min-Max Normalization, Sigmoidal or SoftMax Normalization, Energy Normalization, Principle components Normalization.
Data Collection, Preparation, Labelling, and Input Coding: Data Collection, Feature Selection and extraction, classifier coding, estimator coding, post processing. (12)

UNIT - V

Supervised Training Methods: The effects of training data on Neural Network Performance, Rules of Thumb for Training Neural Networks, Training and Testing.
Unsupervised Training Methods: Self-Organizing Maps, SOM Training, Adaptive Resonance theory network. (12)

Text Books:

1. Artificial Intelligence by George F Luger, Person Education, Second impression, 2010.
2. Artificial Neural Networks An Introduction by Kevin L. Priddy and Paul E. Keller, 4th edition, 2005.

Reference Books:

1) Artificial Intelligence - A modern Approach by Stuart Russell and Peter Norvig, Pearson Education, 2nd edition, 2011.

MCA – VI SEMESTER

SCA 892: COMPREHENSIVE VIVIA

Credits: 2 End Examination: 50 Marks

MCA – VI SEMESTER
SCA 894: PROJECT WORK

Credits: 8 End Examination: 50 Marks
Continuous Evaluation: 150 Marks

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OPEN ELECTIVE

SOE 750: OBJECT ORIENTED PROGRAMMING WITH C++

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

Objectives: This course presents the Object Oriented Programming concept in C++, data types, arrays, pointers, files, classes, inheritance, polymorphism, exception handling.

UNIT - I

Principles of Object Oriented Programming: Software Crisis, Software Evolution, A look at Procedure Oriented Programming, Object Oriented Programming Paradigms, Basic concepts and benefits of OOP, Application of OOP, OOP languages. Structure of C++ Program, Applications of C++, Tokens, Keywords, Identifiers and Constants, Basic data types, User Defined data types, Storage Classes, Derived Data Types, Symbolic constants, Type Compatibility, Declaration of Variables, Dynamic initialization, Reference variables, Operators, Scope resolution, Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Casting, Expressions and their types, Special Assignment Expressions, Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures. (12)

UNIT - II

Functions: Main Function, Function Prototyping, Call by Reference, Return By Reference, Inline functions, Default arguments, const Arguments, Recursion, Function overloading, Friend and virtual functions, Math Library Functions**.**

Classes and Objects: Class specification, Member function definition, Making outside function inline, Nesting Of Member Functions, Private Member Function, Arrays Within a Class, Memory Allocation For Objects, Static Data Members And Member Functions, Array of Objects, Objects As Arguments, Friend Functions, Returning Objects, const Member Function, Pointer To Members, Local Classes. (10)

UNIT - III

Constructors and Destructors: Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic initialization of Objects, Copy constructors, Dynamic Constructors, Constructing Two Dimensional Arrays, const Objects, Destructors.

Operator Overloading and Type Conversions: Defining Operator Overloading, Overloading Unary And Binary Operator, Overloading Binary Operators Using Friends, Manipulation Of String Using Operators, Rules For Overloading Operators, Type Conversion. (10)

UNIT - IV

Inheritance Extending Classes: Introduction, Defining Derived Classes, Single Inheritance, Making a Private Member Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors In Derived Classes, Member Classes, Nesting of Classes.

Pointers, Virtual Functions and Polymorphism: Pointers, Pointer to objects, this pointer, Pointer To Derived Classes, Virtual Functions, Pure Virtual Functions, Virtual Constructors and Destructors.

Templates: Introduction, Class Template, Class Template With Multiple Parameters, Function Templates, Function Templates With Multiple Parameters, Overloading of Template Functions, Member Function Templates, Non type Template Arguments. (10)

UNIT - V

Managing Console I/O Operations: Streams in C++, Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output With Manipulators.

Working With Files: Introduction, Classes For File Stream Operations, Opening And Closing A File, Detecting End-Of-File, File Modes, File Pointers And Their Manipulations, Sequential Input and Output Operations, Updating a File: Random Access, Error Handling During File Operations, Command Line Arguments.

Exception Handling: Introduction, Basics Of Exception Handling, Exception Handling Mechanism, Throwing And Catching Mechanism, Rethrowing an Exception, Specifying Exceptions, Exceptions In Constructors And Destructors, Exception In Operator Overloaded Functions. (10)

Text Books:

1. Object Oriented Programming with C++ by E.Balagurusamy, Tata MC GrawHill, 6th edition, 2013.

Reference Books:

1. Mastering C++ by Venugopal K R, Rajkumar Buyya , Tata Mc Graw Hill, 2nd edition, 2013.
2. C++ Programming Language by Bjarne Stroustrup, Addison-Wesley Professional, 4th edition, 2013.
3. C++ Primer by Barbara E Moo , Stanley B. Lippman , Josee Lajoie, Pearson Education, 4th edition, 2007.

OPEN ELECTIVE

SOE 853: DATABASE MANAGEMENT SYSTEMS

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

Objectives: The objective of this course is to introduce the students to basic concepts of databases and database management systems with emphasize on relational databases.

UNIT - I

Introduction and Conceptual Modeling:

Databases and Database Users: Introduction, Characteristics of Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of using DBMS Approach.

Database System, Concepts and Architecture: Data Models, Schemas and Instances, Three Schema Architecture and Data Independence, Database Language and Interfaces, The Database System Environment, Centralized and Client/Server Architecture of Database Management Systems, Classification of Database Management Systems. (10)

UNIT - II

Data Modeling Using The ER Model: High Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraint, Weak Entity Types, ER Diagrams, Naming Conventions and Design Issues. The Enhanced Entity Relationship modeL, UML Class Diagrams, Relationship Types of Degree Higher Than Two.

The Relational Data Model and Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraints Violations. (12)

UNIT – III

The Relational Algebra: Unary Relational Operations - SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations - JOIN and DIVISION; Additional Relational Operations, Examples of Queries in Relational Algebra.

Relational Database Design By ER And EER To Relational Mapping: Relational Database Design using ER to Relational Mapping, Mapping EER Model Constructs to Relations. (8)

UNIT – IV

SQL-Schema Definition, Constraints, Queries and Views: SQL Data Definition and Data types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE, UPDATE Statements in SQL, Additional Features of SQL, Specifying Constraints As Assertions and triggers, Views, Additional features of SQL.

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relational Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of 2nd and 3rd Normal Forms, Boyce-Codd Normal Form

Relational Database Design Algorithms and Further Dependencies : Properties of Relational Decomposition, Algorithms for Relational Database Schema Design, Multi valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form. (12)

UNIT – V

Transaction Processing Concepts- Introduction to Transaction Processing, Transaction and System Concepts, Desirable properties of transactions, Characterizing Schedules based on recoverability, Characterizing Schedules based on serializability.

Concurrency Control Techniques and Database Recovery Techniques. (10)

Text Books:

1.Fundamentals of Database Systems by Ramez Elmasri and Shamkant B. Navathe, Pearson education, 5th edition, 2009.

Reference Books:

1. Database Concepts by Abraham Silberschatz, Henry F Korth, S.Sudarshan, McGraw,Hill, 6th edition, 2014.
2. An Introduction to Database Systems by C.J. Date, Addison Wesley, 8th edition, 2008.
3. Database Management Systems by Raghu Ramakrishnan, Johannes Gehrke, TMH, 2nd edition, 2000.