Programme Ordinance, POs, PSOs and Course Outcomes (COs)

DEPARTMENT OF COMPUTER APPLICATION
FACULTY OF ENGINERRING & TECHNOLOGY
CH. CHARAN SINGH UNIVERSITY CAMPUS, MEERUT
2020-21

PROGRAMME ORDINANCE

1. Course Type & Duration

1.1 This Programme shall be known as MASTER OF COMPUTER APPLICATION, (MCA) 2-YEAR COURSE. This course shall be a full time MCA course under self-finance scheme.

1.2 Total duration of the course shall be two years, comprising of 4 semesters with 2 semesters in each year.

1.3 The maximum time allowed for completing MCA course shall be 4 years, failing which he/she shall not be allowed to continue for his/her MCA degree.

1.4 There will be one section with intake of 60 (Sixty) students. (Total seats 60)

2. Admission Criteria and Eligibility

2.1 Admission to MCA First Year through Entrance Examination:

The admission will be given to the candidate who will be allotted a seat through UPSEE counseling as per its rules.

2.2 Direct Admission:

If the seats remain vacant after admissions through 2.1 above, direct admissions will be made through merit and counseling. The eligibility criterion for direct admission is:

A minimum 3-year Bachelor degree or equivalent from a recognized University with Mathematics;

A minimum 3-year Bachelor degree or equivalent from a recognized University with Mathematics at 10+2 level;

OR

BCA/ B.Sc. (Computer Science)/ equivalent degree.

The student must have obtained at least 50% marks (45% for SC/ST candidates) in the qualifying examination.

3. Cancellation of Admissions

The admission of a student at any stage of study shall be cancelled if:

3.1 He/she is not found eligible as per the regulations.

3.2 He/she is found involved in creating indiscipline in the Institution/ College or in the University.

3.3 He/ she does not report in the institution within 10 days of the admission or commencement of classes, whichever is later

4. Attendance

4.1 Every student is required to attend all the lectures, tutorials, practical and other prescribed curricular and co-curricular activities.

4.2 No student shall be allowed to appear at a University examination in any of the courses unless he/she has put in 75% attendance in the paper/course concerned. The Vice Chancellor, however, may condone shortage in attendance upto 5% on the recommendation of the Head/Principal under special circumstances.

4.3 No student will be allowed to appear in internal and external examination if he/ she do not satisfy the attendance requirements mentioned in clause number 4.2.

4.4 The attendance shall be counted from the date of admission or the commencement of classes, whichever is later.

5. Curriculum& Medium of instruction

5.1 The two year curriculum has been divided into four semesters and shall include lectures, tutorials, practical, seminars, and projects etc., in addition to industrial visits, summer training and educational tours.

5.2 The curriculum will also include such other curricular, co-curricular and extracurricular activities as prescribed by the CCS University from time to time.

5.3 The medium of instruction and examination in MCA Course shall be English. However, instructions and conduct of class may be in Hindi and English both.

5.4 The Theory course will have one lecture hour per week for one credit. Each theory course shall normally comprise of 10 to 12 lecture hours per credit per semester i.e. a 4 credit course requires 40 to 48 lectures per semester.

6. Examination

6.1 The rules and regulations for the conduct of the End-Semester University Examinations and the Practical Examinations would be the same as prescribed by the University.

6.2 The performance of a student in the semester shall be evaluated through internal (continuous) assessment and end semester external examination. The internal assessment shall be based on class tests, assignments, seminars, quizzes, practical and/or viva-voce etc. The evaluated answer scripts, quizzes, assignments etc. shall be shown and displayed to the students at the specified time and date.

6.3 The end semester examination shall be conducted by means of written paper, viva-voce, project work, practical and design reports.

6.4 Each theory paper will be of 100 marks. In each theory paper the 30% marks will be assigned through internals assessment and 70% marks through external examination.

6.5 The minimum pass marks in each theory paper shall be 30% in internal assessment and end semester examination, separately. If there is no provision of internal marks in any paper, the minimum pass marks in that paper shall be 30% as required in end semester examination. But, in order to pass in a semester a candidate must secure at least 50% marks in aggregate.

6.6 In theory papers continuous internal assessment will be based on two sessional exams of 9 marks each, two quizzes of 3 marks each, a seminar of 3 marks and an assignment of 3 marks.

6.7 The minimum passing marks in a comprehensive viva voce/ practical shall be 50%. It will be conducted by one internal and one external examiner.

6.8 A student will be allowed to appear in the external examination of a theory paper only if he obtains minimum 30% passing marks in the internal assessment.

6.9 In case a student is failed in an external theory paper, he/she will appear as a back paper /ex-student, but his/her pass marks of internal will be carried over as obtained earlier. There will be no criterion of the improvement in the pass result of internal examinations.

6.10 If a student fails in internal assessment, he will have to take the internal examinations again as a back paper in the later corresponding semester, with the syllabus available for that paper at that time.

7. Promotion

"General rules regarding semester system for all courses applicable with effect from 2017-18" dated 9 January 2018 released by controller of examinations, C. C. S. University Meerut will prevail. If the University makes any changes in these rules, the changed rules will be applicable from time to time.

8. Result and Award of Division

8.1 The result and division shall be declared on the basis of the grand total of all the years of study including the aggregate of all the 4 semester marks.

8.2 The award of division shall be as under

First division	–	60% or above marks.
Second division	–	50% or above but less than 60% marks.

9. Grace Marks

There shall be no provision of grace marks in any PG program as prescribed by the CCS University rules.

10. Scrutiny/ Challenge evaluation and Unfair Means (UFM) cases shall be dealt with as per the University rules.

11. Application of CCS University rules & regulations:

(a) In case of any doubt or the cases not covered by the above rules, the rules and regulations prescribed by the CCS University, from time to time, will prevail.

(b) The C. C. S. University rules/ ordinances shall over-ride any rules by any other national regulatory body.

PROGRAMME OUTCOMES (PO's)

PO 1. Apply knowledge of Computing fundamentals, Computing specialization, Mathematics and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

PO 2. Identify, formulate, research literature, and solve complex Computing problems reaching substantiated conclusions using fundamental principles of Mathematics, Computing sciences, and relevant domain disciplines.

PO 3. Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO 4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

PO 5. Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

PO 6. Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

PO 7. Recognize the need, and have the ability, to engage in independent learning for continual development as a Computing professional.

PO 8. Demonstrate knowledge and understanding of computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 9. Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PO 10. Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

PO 11. Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

PO 12. Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PROGRAMME SPECIFIC OUTCOMES (PSO's)

PSO 1. To prepare graduates who will create systems through software development to solve problems in Industry domain areas.

PSO 2. To Prepare Graduates who will contribute to societal growth through research in their chosen field.

PSO 3. To prepare graduates who will perform both as an individual and in a team through good analytical, design and implementation skills.

PSO 4. To prepare graduates who will be lifelong learners through continuous professional development.

PSO 5. Candidate will be able to apply in Govt., Private and semi Govt Sectors for employability, competitive examinations and social problems. This course will be helpful to generate the employability skills in the students.

Course Structure and Evaluation Scheme for MCA

SEMESTER–I

S.No.	Subject Code	Subject Name	Hours			Sessional Marks			External Marks	Total Marks	Credit
			L	T	P	CT	TA	Total			
1.	**MCA- 111**	Fundamental of Computers & Emerging Technologies	4	0	0	18	12	**30**	**70**	**100**	4
2.	**MCA- 112**	Problem Solving using C	3	1	0	18	12	**30**	**70**	**100**	4
3.	**MCA- 113**	Principles of Management & Communication	4	0	0	18	12	**30**	**70**	**100**	4
4.	**MCA- 114**	Discrete Mathematics	4	0	0	18	12	**30**	**70**	**100**	4
5.	**MCA- 115**	Computer Organization & Architecture	3	1	0	18	12	**30**	**70**	**100**	4
6.	**MCA- 151**	Problem Solving using C **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
7.	**MCA- 152**	Office Automation **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
8.	**MCA- 153**	Professional Communication **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
		Total						**300**	**500**	**800**	**26**

CT: Class Test **TA**: Teacher Assessment **/T/P:** Lecture/ Tutorial/Practical

SEMESTER-II

S. No.	Subject Code	Subject Name	Hours			Sessional Marks			External Marks	Total Marks	Credit
			L	T	P	CT	TA	Total			
1.	**MCA-211**	Theory of Automata & Formal Languages	4	0	0	18	12	**30**	**70**	**100**	4
2.	**MCA- 212**	Object Oriented Programming	3	1	0	18	12	**30**	**70**	**100**	4
3.	**MCA- 213**	Operating Systems	4	0	0	18	12	**30**	**70**	**100**	4
4.	**MCA- 214**	Database Management Systems	4	0	0	18	12	**30**	**70**	**100**	4
5.	**MCA- 215**	Data Structures & Analysis of Algorithms	3	1	0	18	12	**30**	**70**	**100**	4
6.	**MCA – 216**	Cyber Security* **(Qualifying Course)**	2	0	0	18	12	***30**	***70**	***100**	0
7.	**MCA- 251**	Object Oriented Programming **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
8.	**MCA- 252**	DBMS **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
9.	**MCA- 253**	Data Structures & Analysis of Algorithms **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
		Total						**300**	**500**	**800**	**26**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/Practical*** Qualifying Non-credit Course**

SEMESTER –III

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Sessional			ESE	Total	
						CT	TA	Total			
1.	MCA-311	Operating Systems	3	1	0	20	10	30	70	100	04
2.	MCA-312	Web Technology	3	1	0	20	10	30	70	100	04
3.	MCA-313	Design & Analysis of Algorithms	3	1	0	20	10	30	70	100	04
4.	MCA-314	Computer Based Optimization Techniques	3	1	0	20	10	30	70	100	04
5.	MCA-315	Cyber Security	3	0	0	20	10	30	70	100	03
6.*	MCA -316	Introduction to Programming and Computer Organization*	3	0	0	20	10	30	70	100	--
Practical											
7.	MCA-351	Operating Systems Lab	0	0	3	30	20	50	50	100	02
8.	MCA-352	Design & Analysis of Algorithms Lab	0	0	6	30	20	50	50	100	03
Total										700	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/Tutorial/Practical

SEMESTER-IV

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Sessional			ESE	Total	
						CT	TA	Total			
1.	MCA-411	Database Management Systems	3	1	0	20	10	30	70	100	04
2.	MCA-412	Computer Networks	3	1	0	20	10	30	70	100	04
3.	MCA-413	Artificial Intelligence	3	1	0	20	10	30	70	100	04
4.	MCA-414	Compiler Design	3	1	0	20	10	30	70	100	04
5.	MCA-415	Mobile Computing Elective–I	3	1	0	20	10	30	70	100	03
6.*	MCA416	Fundamental of Data Structure, Numerical and Computational Theory*	3	0	0	20	10	30	70	100	--
Practical											
7.	MCA-451	Mini Project	0	0	6	30	20	50	50	100	03
8.	MCA-452	Database Management Systems Lab	0	0	3	30	20	50	50	100	02
		Total	15	5	6					700	24

CT: Class Test TA: Teacher Assessment**L/T/P**: Lecture/Tutorial/Practical

** The Mini Project (6 weeks) conducted during summer break after II semester and will be assessed during III semester. The Course will be carried out at the Institute under the guidance of a Faculty Members.

MCA III Semester Electives

Elective-1 (MCA-415)

1. RCA-E11:Design & Development of Applications
2. RCA-E12:Client-ServerComputing
3. RCA-E13:Data Warehousing & Data Mining
4. RCA-E14:Advanced Computer Architecture
5. RCA-E15: Mobile Computing

SEMESTER –V

Sl. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Sessional			ESE	Total	
						CT	TA	Total			
1.	MCA-511	Computer Graphics & Animation	3	1	0	20	10	30	70	100	04
2.	MCA-512	Software Engineering	3	1	0	20	10	30	70	100	04
3.	MCA- 513	Software Testing Elective–II	3	1	0	20	10	30	70	100	04
4.	MCA- 514	Cloud computing Elective-III	3	1	0	20	10	30	70	100	04
5.	MCA- 515	Big Data Elective–IV	3	1	0	20	10	30	70	100	03
Practical											
7.	MCA-551	Computer Graphics & Animation Lab	0	0	6	30	20	50	50	100	03
8.	MCA-552	Project Based on Software Engineering	0	0	3	30	20	50	50	100	02
		Total	15	5	9					700	24

SEMESTER –VI

Sl. No.	Subject Code	Subject Name	Period			Evaluation Scheme					Credit
			L	T	P	Session Exams			ESE	Total	
						CT	TA	Total			
1	MCA-611	Colloquium	0	0	8	-	100	100	-	100	04
2	MCA-612	Industrial Project	0	0	40	-	250	250	350	600	20
		Total	0	0	48					700	24

MCA V Semester Electives (For Three Years MCA Batch) Old Course

Elective: II

1. MCA-E21: Cryptography and Network Security
2. MCA-E22: Natural language Processing
3. MCA-E23: Human Computer Interaction
4. MCA-E24: Software Testing
5. MCA-E25: Modern Application Development

Elective: III

1. MCA-E31: Cloud Computing
2. MCA-E32: Soft Computing
3. MCA-E33: Information Storage Management
4. MCA-E34: Digital Image Processing
5. MCA-E35: Distributed Systems

Elective: IV

1. MCA-E41: Distributed Database Systems
2. MCA-E42: Simulation and Modeling
3. MCA-E43: Real Time Systems
4. MCA-E44: Pattern Recognition
5. MCA-E45: Big Data

Fundamental of Computers & Emerging Technologies (MCA-111)

Course Outcome:

At the end of course, the student will be able to understand

1. Discuss the impact of disruptive technologies on project design, implementation, and transformation.
2. Identify major areas where technologies can be applied and their implications for organizationa change.
3. Recognize current and emerging disruptive technologies and their potential to impact socia conditions, the economy, and daily life.
4. Design a project plan that incorporates a new and emerging technology and illustrates its impact or organizations and industries.
5. Review current literature on the selection, implementation, and evaluation of new and emerging technologies and their impacts.
6. Conduct and present a project on a technologies analysis that incorporates audio, video, and images.
7. Compare and contrast current and emerging technologies and their implications for social ethics and the global workplace.
8. Appreciate the unique characteristics of and differences between disruptive technologies and thei impacts.
9. Recognize the importance of ethical practices with new technologies.

MCA–111: FUNDAMENTAL OF COMPUTERS & EMERGING TECHNOLOGIES

L-T-P:4-0-0 ExternalMax.Marks:70

Unit	Topic	Proposed Lecture
I	**Introduction to Computer:** Definition, Computer Hardware & Computer Software **Components:** Hardware – Introduction, Input devices, Output devices, Central Processing Unit, Memory- Primary and Secondary. Software - Introduction, Types –System and Application. **Computer Languages:** Introduction, Concept of Compiler, Interpreter &Assembler **Problem solving concept:** Algorithms – Introduction, Definition, Characteristics, Limitations, Conditionsinpseudo-code, Loopsinpseudocode.	**08**
II	**Operating system:** Definition, Functions, Types, Classification, Elements ofcommand based and GUI based operating system. **Computer Network:** Overview, Types (LAN, WAN and MAN), Datacommunication, topologies.	**08**
III	**Internet :**Overview, Architecture, Functioning, Basic services like WWW, FTP,Telnet,Gopher etc., Search engines,E-mail, Web Browsers. **Internet of Things (IoT):**Definition, Sensors, their types and features, SmartCities, Industrial Internet of Things.	**08**
IV	**Block chain:** Introduction, overview, features, limitations and application areasfundamentals of Block Chain. **Cryptocurrencies:**Introduction,Applicationsandusecases **Cloud Computing:** It nature and benefits, AWS, Google, Microsoft & IBMServices	**08**
V	**Emerging Technologies:** Introduction, overview, features, limitations and application areas of Augmented Reality , Virtual Reality, Grid computing, Green computing,Bigdataanalytics,QuantumComputingandBrainComput	**08**

	Interface	

Suggested Readings:

1. RajaramanV.,–FundamentalsofComputers‖,Prentice-HallofIndia,6th EditionDec2014.
2. NortonP.,–IntroductiontoComputers‖,McGrawHillEducation,7th EditionJuly2017
3. GoelA.,–ComputerFundamentals‖,Pearson,Nov2017
4. BalagurusamyE.,—FundamentalsofComputers‖,McGrawHill,secondreprint2010
5. TharejaR.,–FundamentalsofComputers‖,OxfordUniversityPress2016

Problem Solving using C (MCA-112)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. To learn the basics of different types of programming
2. To understand the syntax and building blocks of the C- program.
3. To learn to solve a problem using the C-Program.
4. To compile and debug a C- Program.
5. To generate an executable file from program.

MCA-112:PROBLEM SOLVING USING C		
L-T-P:3-1-0	ExternalMax.Marks:70	
Unit	**Topic**	**Proposed Lecture**
I	**Basics of programming:** Approaches to problem solving, Use of high level programming language for systematic development of programs, Concept of algorithm and flowchart, Concept and role of structured programming. **Basics of C**: History of C, Salient features of C, Structure of C Program, CompilingCProgram,LinkandRunCProgram,Characterset,Tokens, Keywords,Identifiers,Constants,Variables,Instructions,Datatypes, Standard Input/Output, Operators and expressions.	**08**
II	**Conditional Program Execution:** if, if-else, and nested if-else statements, Switch statements, Restrictions on switch values, Use ofbreak and default with switch, Comparison of switch andif-else. **Loops and Iteration:** for, while and do-while loops, Multiple loop variables, Nested loops, Assignment operators, break and continue statement. **Functions:** Introduction, Types, Declaration of a Function, Functioncalls,Definingfunctions,FunctionPrototypes,Passingarguments toa functionReturnvaluesandtheirtypes,Writingmultifunctionprogram, Calling function by value, Recursive functions.	**08**
III	**Arrays:** Array notation and representation, Declaring one-dimensional array, Initializing arrays, Accessing array elements, Manipulating array elements, Arrays of unknown or varying size, Two-dimensional arrays, Multidimensional arrays. **Pointers:** Introduction, Characteristics, * and & operators, Pointer type declaration andassignment, Pointer arithmetic, Call byreference,Passing pointers to functions, arrayof pointers, Pointers to functions, Pointer to pointer, Array of pointers. **Strings:** Introduction, Initializing strings, Accessing string elements, Array of strings, Passing strings to functions, String functions.	**08**
IV	**Structure:** Introduction, Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure, Pointers to structure. **Union:** Introduction, Declaring union, Usage of unions, Operations on union. Enumerated data types **Storageclasses**:Introduction,Types-automatic,register,staticand external.	**08**

V	**Dynamic Memory Allocation**: Introduction, Libraryfunctions– malloc, calloc, realloc and free. **File Handling:** Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files. **Graphics:**Introduction,Constant,Datatypesandglobalvariablesused ingraphics,Libraryfunctionsused indrawing,Drawingand filling images, GUI interaction within the program.	**08**

SuggestedReadings:

1. KanetkarY.,―LetUsC‖,BPBPublications.RevisedandUpdated2017edition.
2. HanlyJ. R.andKoffmanE.B.,–ProblemSolvingandProgramDesigninC‖,PearsonEducation . 5th Edition, 2008
3. SchildtH.,―C-TheCompleteReference‖,McGraw-Hill.4thEdition(December10,2002)
4. GoyalK.K.andPandeyH.M.,TroubleFreeC‖,UniversitySciencePress,2017
5. GottfriedB.,–Schaum'sOutlines-ProgramminginC‖,McGraw-HillPublications.
6. KochanS.G.,–ProgramminginC‖,Addison-Wesley.4thEdition,2015
7. DeyP.andGhoshM.,―ComputerFundamentalsandProgramminginC‖,Oxford University Press. Second Edition, July 2013

Principles of Management & Communication (MCA-113)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Exhibit adequate verbal and non-verbal communication skills .
2. Demonstrate effective discussion, presentation and writing skills.
3. Increase confidence in their ability to read, comprehend, organize, and retain written information. Improve reading fluency.
4. Write coherent speech outlines that demonstrate their ability to use organizational formats with a specific purpose; Deliver effective
5. speeches that are consistent with and appropriate for the audience and purpose.
6. Develop proper listening skills; articulate and enunciate words and sentences clearly and efficiently.
7. Show confidence and clarity in public speaking projects; be schooled in preparation and research skills for oral presentations.

MCA-113:PRINCIPLES OF MANAGEMENT & COMMUNICATION

L-T-P:4-0-0 ExternalMax.Marks:70

Unit	Topic	Proposed Lecture
I	**Management**:Need,Scope,MeaningandDefinition.TheprocessofManagement, Development of Management thought F.W. Taylor and Henry Fayol, HorothorneStudies, Qualities of an Efficient Management.	08
II	**Planning &Organising:**Need, Scope and Importance of Planning, Steps in planning,Decisionmakingmodel.OrganisingneedandImportance,OrganisationalDesign,Organisationalstructure,centralisationandDecentralisation,Deligation.	08
III	**Directing & Controlling:** Motivation—Meaning, Importance, need.Theories of Motivation, Leadership—meaning, need and importance, leadership style, Qualities of effective leader, principles of directing, Basic control process, Different control Techniques.	08
IV	**Introduction to Communication:** What is Communication, Levels of communication, Barrierstocommunication,ProcessofCommunication,Non-verbalCommunication, The flowof Communication:Downward, Upward, Lateralor Horizontal (Peer group) Communication,TechnologyEnabledcommunication,ImpactofTechnology, Selection of appropriate communication Technology, Importance ofTechnicalcommunication.	08
V	**Businessletters:** Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. **Reports:**Types;Structure,Style&WritingofReports. **TechnicalProposal:**Parts;Types;WritingofProposal;Significance. Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguisticfeatures ofvoice; Communication skills, Presentation strategies, Group Discussion; Interview skills;Workshop; Conference; Seminars.	08

SuggestedReadings:

1. P.C.Tripathi,P.N.Reddy,"PrinciplesofManagement",McGrawHillEducation6th Edition 2017.
2. C.B.Gupta,"ManagementPrinciplesandPractice",SultanChand&Sons3rd edition2012.
3. T.N.Chhabra,"BusinessCommunication",SunIndiaPublication.
4. V.N.AroraandLaxmiChandra,"ImproveYourWriting",OxfordUniv.Press,2001,NewDelhi.

5. MadhuRaniandSeemaVerma,"TechnicalCommunication:APracticalApproach", Acme Learning, New Delhi-2011.
6. Meenakshi Raman &Sangeeta Sharma, "Technical Communication- Principles and Practices",Oxford Univ. Press, 2007, New Delhi.
7. KoontzHarold&WeihrichHeinz,"EssentialsofManagement",McGrawHill5th Edition2008.
8. RobbinsandCoulter,"Management",PrenticeHallofIndia,8thEdition(January14,2004).
9. JamesA.F.,Stoner,"Management",PearsonEducationDelhi.SeventhEdition,2009.
10. P.D.Chaturvedi,"BusinessCommunication",PearsonEducation.2011

Discrete Mathematics (MCA-114)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Be familiar with constructing proofs.
2. Be familiar with elementary formal logic.
3. Be familiar with set algebra.
4. Be familiar with combinatorial analysis.
5. Be familiar with recurrence relations.
6. Be familiar with graphs and trees, relations and functions, and finite automata.
7. Be exposed to the strategies for compare relative efficiency of algorithms

MCA-114: DISCRETE MATHEMATICS

L-T-P:4-0-0 ExternalMax.Marks:70

Unit	Topic	Proposed Lecture
I	**Set Theory:** Introduction, Size ofsets and Cardinals, Venn diagrams, Combination of sets, Multisets, Ordered pairs and Set Identities. **Relation:** Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. **Functions:** Definition, Classification of functions, Operations on functions,Recursively defined functions.	08
II	**Posets, Hasse Diagram and Lattices:**Introduction,Partial orderedsets, Combinationof Partial ordered sets, Hasse diagram, Introduction of lattices, Properties of lattices –Bounded, Complemented, Modular and Complete lattice. **Boolean Algebra:** Introduction, Axioms and Theorems of Boolean algebra, Boolean functions.SimplificationofBooleanfunctions,Karnaughmaps,Logicgates.	08
III	**Propositional:** Propositions, Truth tables, Tautology, Contradiction, Algebra ofPropositions, Theory of Inference and Natural Detection. **Predicate Logic:** Theory of Predicates, First order predicate, Predicate formulas,Quantifiers, Inference theory of predicate logic.	08
IV	**Algebraic Structures:**Introduction to algebraic Structures and properties. Types of algebraic structures: Semi group, Monoid, Group, Abelian group and Properties ofgroup. Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism and Isomorphism of groups. **RingsandFields:**DefinitionandelementarypropertiesofRingsandFields.	08
V	**Natural Numbers:** Introduction, Piano's axioms, Mathematical Induction, Strong Induction and Induction with Nonzero Base cases. **Recurrence Relation & Generating functions:** Introduction and properties of GeneratingFunctions.SimpleRecurrencerelationwithconstantcoefficients and Linearrecurrencerelationwithoutconstantcoefficients.Methodsofsolving recurrences. **Combinatorics:** Introduction, Counting techniques and Pigeonhole principle, Polya's Counting theorem.	08

SuggestedReadings:

1. KennethH.Rosen,"DiscreteMathematicsandItsApplications",McGrawHill,2006.
2. B.Kolman,R.CBusbyandS.CRoss,"DiscreteMathematicsStructures",PrenticeHall,2004.
3. R.PGirimaldi,"DiscreteandCombinatorialMathematics",AddisonWesley,2004.
4. Y.N.Singh,"DiscreteMathematicalStructures",Wiley-India,Firstedition,2010.
5. SwapankumarSarkar,"ATextbookofDiscreteMathematics‖,S.Chand&Company PVT.LTD.V.
6. Krishnamurthy,"CombinatoricsTheory &Application",East-WestPressPvt.Ltd.,NewDelhi.
7. Liptschutz,Seymour,"DiscreteMathematics",McGrawHill.
8. J.P. Trembely&R.Manohar, "Discrete Mathematical Structure with application to Computer Science",McGraw Hill.

Computer Organization & Architecture (MCA-115)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Understand the theory and architecture of central processing unit.
2. Analyze some of the design issues in terms of speed, technology, cost, performance.
3. Design a simple CPU with applying the theory concepts.
4. Use appropriate tools to design verify and test the CPU architecture.
5. Learn the concepts of parallel processing, pipelining and interprocessor communication.
6. Understand the architecture and functionality of central processing unit.
7. Exemplify in a better way the I/O and memory organization.
8. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

MCA-115: COMPUTER ORGANIZATION & ARCHITECTURE

L-T-P:3-1-0 ExternalMax.Marks:70

Unit	Topic	Proposed Lecture
I	**Introduction:** Functional units of digital system and their interconnections, buses, busarchitecture,typesofbusesandbusarbitration.Register,busandmemorytransfer. **Processor organization:** general registers organization, stack organization andaddressing modes.	08
II	**Arithmetic and logic unit:** Look ahead carries adders. Multiplication: Signed operandmultiplication,Boothsalgorithmandarraymultiplier.Divisionandlogicoperations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard forFloating Point Numbers.	08
III	**Control Unit:** Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, ReducedInstructionSetComputer,Pipelining.Hardwireandmicroprogrammed control: micro-program sequencing, concept of horizontal and vertical microprogramming.	08
IV	**Memory:** Basic concept and hierarchy, semiconductor RAM memories,2D & 2 1/2Dmemory organization. ROM memories. Cache memories: concept and design issues &performance, address mapping andreplacement Auxiliary memories: magnetic disk,magnetictapeandopticaldisksVirtualmemory:conceptimplementation.	08
V	**Input / Output:** Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware,typesofinterruptsandexceptions.ModesofDataTransfer:Programmed I/O,interruptinitiatedI/OandDirectMemoryAccess.,I/Ochannelsandprocessors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	08

SuggestedReadings:

1. KennethH.Rosen,"DiscreteMathematicsandItsApplications",McGrawHill,2006.
2. B.Kolman,R.CBusbyandS.CRoss,"DiscreteMathematicsStructures",PrenticeHall,2004.
3. R.PGirimaldi,"DiscreteandCombinatorialMathematics",AddisonWesley,2004.
4. Y.N.Singh,"DiscreteMathematicalStructures",Wiley-India,Firstedition,2010.
5. Swapankumar Sarkar,"A Textbook of Discrete Mathematics‖, S. Chand& Company PVT. LTD.5 edition 2009.
6. Krishnamurthy,"CombinatoricsTheory&Application",East-WestPressPvt.Ltd.,NewDelhi.
7. Liptschutz,Seymour,"DiscreteMathematics",McGrawHill.Thirdedition,2009
8. J.P. Trembely&R.Manohar, "Discrete Mathematical Structure with application to ComputerScience", McGraw Hill. 30th Reprint (2007)

Problem Solving Using C Lab (MCA-151)

Course Outcome:

At the end of course, the student will be able to understand

1. Write, compile, debug and execute programs in a C programming environment.
2. Write programs that incorporate use of variables, operators and expressions along with data types.
3. Write programs for solving problems involving use of decision control structures and loops.
4. Write programs that involve the use of arrays, structures and user defined functions.
5. Write programs using graphics and file handling operations.

MCA-151: PROBLEM SOLVING USING C LAB

L-T-P:0-0-4 ExternalMax.Marks: 50

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Write, compile, debug and execute programs in a C programming environment.
2. Write programs that incorporate use of variables, operators and expressions along with data types.
3. Write programs for solving problems involving use of decision control structures and loops.
4. Write programs that involve the use of arrays, structures and user defined functions.
5. Write programs using graphics and file handling operations.

Programs Assignments: -

1. Programtoperformgraphicaloperationsin Clanguage.
2. Programtoimplementconditionalstatementsin Clanguage.
3. Programtoimplementswitch-casestatementin Clanguage
4. Programtoimplementloopingconstructsin Clanguage.
5. Programtoperformbasicinput-outputoperationsin Clanguage.
6. Programtoimplementuserdefinedfunctionsin Clanguage.
7. Programtoimplementrecursivefunctionsin Clanguage.
8. Programtoimplementone-dimensionalarraysin Clanguage.
9. Programtoimplementtwo-dimensionalarraysin Clanguage.
10. Programtoperformvariousoperationsontwo-dimensionalarraysin Clanguage.
11. Programtoimplementmulti-dimensionalarraysin Clanguage.
12. Programtoimplementstringmanipulationfunctionsin Clanguage.
13. Programtoimplementstructurein Clanguage.
14. Programtoimplementunionin Clanguage.
15. Programtoperformfilehandlingoperationsin Clanguage.

Note:TheInstructormayadd/delete/modifyexperiments,whereverhe/shefeelsina justified manner.

Office Automation Lab (MCA-152)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. To provide a formal connection between algorithmic problem solving and the theory of languages and automata and develop them into a mathematical (abstract) view towards algorithmic design and in genera computation itself.
2. The course should in addition clarify the practical view towards the applications of these ideas in the engineering part as well.
3. Become proficient in key topics of theory of computation, and to have the opportunity to explore the current topics in this area

MCA–152:OfficeAutomationLAB

L-T-P:0-0-4 ExternalMax.Marks:50

1. Basic operating system windows working environment. Working on various office advance component available in MS-Office/ Open-Office for Documents, Excel and Power point ***(Minimum Ten Labs)***.
2. Introduction to HTML Language and itsbasic tagstomake static pagesasform,table, and simple text data formatted ***(Minimum Two Labs)***.
3. InstallandconfigurePythononsystemandknowhowtoexecutebasicprogramsfor condition and loop structures ***(Minimum Two Labs)***.
4. WriteaReportwithstandardformatandstylesusingMS-Office/Open-Office***(Minimum Two Labs)***.
5. WriteaResearchpaperwithstandardformatandstylesusingMS-Office/Open-Office. ***(MinimumTwoLabs)***.
6. PrepareMake aMark-Sheet/ Balance-Sheet in excel withall formattingand styles ***(Minimum One Lab)***.
7. PrepareapresentationinPowerPointonanyonetopicfromcurrentsemestersubjects ***(MinimumOneLab)***.

Note:TheInstructormayadd/delete/modify/tuneexperiments,whereverhe/shefeelsina justified manner.

Professional Communication Lab (MCA-153)

Course Outcome:
Atthe end ofcourse, the studentwill beableto understand

1. Develop the ability to work as a team member as an integral activity in the workplace.
2. Increase confidence in their ability to read, comprehend, organize, and retain written information. Improve reading fluency.
3. Write coherent speech outlines that demonstrate their ability to useorganizational formats with a specific purpose; Deliver effective
4. speeches that are consistent with and appropriate for the audience and purpose.
5. Develop proper listening skills; articulate and enunciate words andsentences clearly and efficiently.

MCA-153:PROFESSIONALCOMMUNICATIONLAB

L-T-P:0-0-4 ExternalMax.Marks:50

1. Group Discussion: participating in group discussions- understanding group dynamics.
2. GD strategies-activities to improve GD skills. Practical based on Accurate and Current Grammatical Patterns.
3. Interview Etiquette-dress code, body language attending job interview – Telephone/Skype interview one to one interview &Panelinterview.
4. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistic/ Kinesics, practicing word stress, rhythm in sentences, weak forms, intonation.
5. Oral Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics voice modulation ,Audience Awareness, Presentation plan visual aids.
6. Speaking:-Fluency & Accuracy in speech- positive thinking, Improving Self expression Developing persuasive speaking skills, pronunciation practice (foraccept neutralization) particularly of problem sounds, in isolated words as well as sentences.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. ArgumentativeSkills/RolePlayPresentationwithStressandIntonation.
9. Comprehension Skills based on Reading and Listening Practical's on a modelAudio-Visual Usage.

Note:TheInstructormayadd/delete/modify/tuneexperiments,whereverhe/shefeelsina justified manner.

THEORY OF AUTOMATA & FORMAL LANGUAGES(MCA – 211)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. To provide a formal connection between algorithmic problem solving and the theory of languages and automata and develop them into a mathematical (abstract) view towards algorithmic design and in general computation itself.
2. The course should in addition clarify the practical view towards the applications of these ideas in the engineering part as well.
3. Become proficient in key topics of theory of computation, and to have the opportunity to explore the current topics in this area

MCA - 211: THEORY OF AUTOMATA & FORMAL LANGUAGES

L-T-P : 4-0-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture
I	**Basic Concepts and Automata Theory:** Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-NerodeTheorem, Simulation of DFA and NFA.	**08**
II	**Regular Expressions and Languages:**RegularExpressions,TransitionGraph,Kleen'sTheorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automataand Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language.	**08**
III	**Regular and Non-Regular Grammars**: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms-Chomsky Normal Form(CNF), Greibach Normal Form(GNF),Chomsky Hierarchy, Programming problems based on the properties of CFGs.	**08**
IV	**Push Down Automata and Properties of Context Free Languages**: Nondeterministic Pushdown Automata (NPDA)-Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL),	**08**
	Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties	

	of CFLs.	
V	**Turing Machines and Recursive Function Theory** : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem,Post Correspondence Problem, Introduction to Recursive FunctionTheory.	**08**

Suggested Readings:

1. J.E. Hopcraft, R. Motwani, and Ullman, "Introduction to Automata theory, Languages and Computation", Pearson EducationAsia,3rd Edition, 2006.
2. J. Martin, "Introduction to languages and the theory of computation", McGraw Hill, 4thEdition 2010.
3. C. Papadimitrou and C. L. Lewis, "Elements and Theory of Computation",PHI.
4. K.L.P. Mishra and N. Chandrasekaran ,"TheoryofComputer Science Automata Languages and Computation" , PHI. 3rd Edition, 2006

OBJECT ORIENTED PROGRAMMING (MCA - 212)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2. Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
3. Understand object, garbage collection, classes and interfaces.
4. Understand the principles of inheritance, packages and interfaces.
5. Demonstrate the concepts of polymorphism and inheritance Demonstrate

MCA - 212 : OBJECT ORIENTED PROGRAMMING

L-T-P : 3-1-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture
I	**Introduction:** Object Oriented Programming: objects, classes, Abstraction, Encapsulation, Inheritance, Polymorphism, OOP in Java, Characteristics of Java, The Java Environment, Java Source File Structure, and Compilation. Fundamental Programming Structures in Java: Defining classes in Java, constructors, methods, access specifies, static members, Comments, Data Types, Variables, Operators, Control Flow, Arrays.	08
II	**Inheritance, Interfaces, and Packages:** Inheritance: Super classes, sub classes, Protected members, constructors in sub classes, Object class, abstract classes and methods.Interfaces:defininganinterface,implementinginterface,differencesbetween classes and interfaces and extending interfaces, Object cloning, inner classes. Packages: Defining Package, CLASSPATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import Naming Convention ForPackages, Networking java.net package.	08
III	**Exception Handling, I/O**: Exceptions: exception hierarchy, throwing and catching exceptions,built-inexceptions,creatingownexceptions,StackTraceElements.Input/ Output Basics: Byte streams and Character streams, Reading and Writing, Console Reading and WritingFiles.	08
IV	**Multithreading and Generic Programming:** Differences between multi-threading andmultitasking,threadlifecycle,creatingthreads,synchronizingthreads,Inter-threadcommunication, daemon threads, thread groups. Generic Programming: Generic classes, generic methods, Bounded Types: Restrictions and Limitations.	08
V	**EventDrivenProgramming:**Graphicsprogramming:Frame,Components,working with 2D shapes,Using colors, fonts, and images. Basics of event handling: event handlers,adapterclasses,actions,mouseevents,AWTeventhierarchy.Introductionto Swing: layout management, Swing Components: Text Fields, Text Areas, Buttons, Check Boxes, Radio Buttons, Lists, choices, Scrollbars, Windows Menus andDialogBoxes.	08

Suggested Readings:

1. HerbertSchildt,"JavaThecompletereference",McGrawHillEducation,8thEdition,2011.
2. Cay S.Horstmann, Gary Cornell, "Core Java Volume –I Fundamentals", Prentice Hall, 9th Edition, 2013.
3. Steven Holzner, "Java Black Book",Dreamtech.2005
4. BalagurusamyE,"ProgramminginJava",McGrawHill*4th Edition* 2009
5. Naughton,Schildt,"TheCompletereferencejava2",McGrawHill Seventh *Edition*, 2007

OPERATING SYSTEMS (MCA-213)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Explain main components, services, types and structure of Operating Systems.
2. Apply the various algorithms and techniques to handle the various concurrency control issues.
3. Compare and apply various CPU scheduling algorithms for process execution.
4. Identify occurrence of deadlock and describe ways to handle it.
5. Explain and apply various memory, I/O and disk management techniques.

MCA - 213 : OPERATING SYSTEMS

L-T-P : 4-0-0 External Max. Marks : 70

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

Suggested Readings:

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”,WileyPublication. Seventh *Edition 2004*
2. SibsankarHalder and Alex A Arvind, “Operating Systems”, PearsonEducation. 2nd *Edition2014*
3. Harvey M Dietel, “An Introduction to Operating System”, PearsonEducation.
4. William Stallings, “Operating Systems: Internals and Design Principles”, 6th Edition, PearsonEducation 2010.
5. Harris, Schaum's Outline Of Operating Systems, McGrawHillFirst *Edition 2001*

DATABASE MANAGEMENT SYSTEMS (MCA – 214)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Defines the basics of the relational data model.
2. Lists the database design process steps.
3. Will be able to design and implement properly structured databases that match the standards based under realistic constraints and conditions.
4. Develops an Entity-Relationship model based on user requirements.

MCA - 214 : DATABASE MANAGEMENT SYSTEMS

L-T-P : 4-0-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture
I	**Introduction:**Overview,DatabaseSystemvsFileSystem,DatabaseSystemConcept andArchitecture,DataModelSchemaandInstances,DataIndependence andDatabase Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of SuperKey,Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	**08**
II	**Relational data Model and Language:** Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. IntroductiontoSQL:CharacteristicsofSQL,AdvantageofSQL.SQLDataTypeand Literals.TypesofSQLCommands.SQLOperatorsandtheirProcedure.Tables,Views andIndexes.QueriesandSubQueries.AggregateFunctions.Insert,UpdateandDelete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, ProceduresinSQL/PL SQL	**08**
III	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**08**
IV	**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System	**08**
V	**Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	**08**

Suggested Readings:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGrawHill. Seventh Edition 2019
2. Date C J, "An Introduction to Database Systems", AddisionWesley. 3rd *Edition2018*
3. Elmasri,Navathe,"FundamentalsofDatabaseSystems",AddisionWesley. 7th *Edition2016*
4. O'Neil, "Databases", ElsevierPub. 1st *Edition2016*
5. Ramakrishnan, "Database Management Systems", McGrawHill. 3rd *Edition2002*
6. Leon &Leon,"Database Management Systems", Vikas PublishingHouse.
7. BipinC.Desai,"AnIntroductiontoDatabaseSystems",GagotiaPublications. 4th *Edition*, 2005

DATA STRUCTURES & ANALYSIS OF ALGORITHMS (MCA – 215)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
2. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
3. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs
4. Demonstrate different methods for traversing trees
5. Compare alternative implementations of data structures with respect to performance
6. Compare and contrast the benefits of dynamic and static data structures implementations
7. Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack
8. Design and implement an appropriate hashing function for an application
9. Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

MCA - 215: DATA STRUCTURES & ANALYSIS OF ALGORITHMS

L-T-P :3-1-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture
I	**Introduction to data structure:** Data, Entity, Information, Difference between Data and Information, Data type , Build in data type, Abstract data type, Definition of data structures, Types of Data Structures: Linear and Non-Linear Data Structure, Introduction to Algorithms: Definition of Algorithms, Difference between algorithm and programs, properties of algorithm, Algorithm Design Techniques, Performance Analysis of Algorithms, Complexity of various code structures, Order of Growth, Asymptotic Notations. **Arrays:** Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D Array Application of arrays, Sparse Matrices and their representations. **Linked lists:** Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable.	**08**
II	**Stacks**: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. **Queues:** Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and PriorityQueue. **Searching:** Concept of Searching, Sequential search, Index Sequential Search,BinarySearch.ConceptofHashing&Collision ResolutionTechniques used in Hashing.	**08**

III	**Sorting:** Insertion Sort, Selection Sort, Bubble Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time: Counting Sort and Bucket Sort. **Graphs:** Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component.	**08**
IV	**Trees:** Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Complete Binary Tree, A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search Tree. Threaded Binary trees, Huffman coding using Binary Tree, AVL Tree and B Tree.	**08**
V	Divide and Conquer with Examples Such as Merge Sort, Quick Sort, Matrix Multiplication: Strassen's Algorithm Dynamic Programming: Dijikstra Algorithm, Bellman Ford Algorithm, All- pair Shortest Path: Warshal Algorithm, Longest Common Sub-sequence Greedy Programming: Prims and Kruskal algorithm.	**08**

Suggested Readings:

1. Cormen T. H., Leiserson C. E., RivestR. L., and Stein C.,"Introduction to Algorithms", PHI. 3rd edition
2. Horowitz Ellis, SahniSartaj and Rajasekharan S., "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
3. DaveP.H.,H.B.Dave,"DesignandAnalysisofAlgorithms",2ndEdition,PearsonEducation 2013.
4. Lipschuts S., "Theory and Problems of Data Structures", Schaum'sSeries. 2nd *Edition*
5. GoyalK. K., Sharma Sandeep& Gupta Atul, "Data Structures and Analysis of Algorithms", HP Hamilton.
6. LipschutzDataStructuresWithC-SIE-SOS,McGrawHill3rd edition
7. SamantaD.,"ClassicDataStructures",2ndEditionPrenticeHallIndia.
8. Goodrich M. T. and Tomassia R., "Algorithm Design: Foundations, Analysis and Internet examples", John Wiley andsons.
9. Sridhar S., "Design and Analysis of Algorithms", Oxford Univ.Press. 3rd edition 2014
10. Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", PearsonEducation. 3rd *Edition*
11. R. Neapolitan and K. Naimipour, "Foundations of Algorithms",4th edition, Jones an Bartlett Studentedition.
12. ReemaThareja, Data Structures using C, Oxford Univ.Press 2nd edition 2014

CYBER SECURITY (MCA-216)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Follow a structured model in Security Systems Development Life Cycle (SDLC)
2. Detect attack methodology and combat hackers from intrusion or other suspicious attempts at connection to gain unauthorized access to a computer and its resources
3. Protect data and respond to threats that occur over the Internet
4. Design and implement risk analysis, security policies, and damage assessment
5. Plan, implement and audit operating systems' security in a networked, multi-platform and cross platform environment
6. Provide contingency operations that include administrative planning process for incident response disaster recovery, and business continuity planning within information security

MCA - 216 : CYBER SECURITY		
L-T-P :2-0-0	**(Qualifying Course)** External Max. Marks : 70	
Unit	**Topic**	**Proposed Lecture**
I	**Introduction-** Introduction to Information Systems, Types of Information Systems, Development of Information Systems, Introduction to Information Security and CIA triad, Need for Information Security, Threats to Information Systems, Information Assurance and Security RiskAnalysis, Cyber Security.	**08**
II	**Application Security-** (Database, E-mail and Internet), Data Security Considerations-(Backups, Archival Storage and Disposal of Data), Security Technology-(Firewall , VPNs, Intrusion Detection System), Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack.	**08**
III	Introduction to E-Commerce , Threats to E-Commerce, Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, Cryptography Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets - Access Control, CCTV,Backup Security Measures.	**08**
IV	**Security Policies**- Why policies should be developed, Policy Review Process, Publication and Notification Requirement of policies, Types of policies – WWW policies, Email Security policies, Corporate Policies, Sample SecurityPolicies. **Case Study –** Corporate Security	**08**
V	**Information Security Standards-**ISO, IT Act, Copyright Act, IPR. Cyber Crimes , Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law, Copy Right Law , Semiconductor Law and Patent Law , Software Piracy and Software License.	**08**

OBJECT ORIENTED PROGRAMMING LAB (MCA – 251)

Course Outcome :

Atthe end ofcourse, the studentwill beableto understand

1. Use the Concept of Data Abstraction and Encapsulation in C++ programs.
2. Design and Develop C++ program using the concept of OOPS.
3. Implement polymorphism, virtual function, exception handling and templates.
4. Apply object oriented techniques to analyze, design application
5. Develop acomplete software basedsolution for a given problem.

MCA – 251 : OBJECT ORIENTED PROGRAMMING LAB

L-T-P :0-0-4External Max. Marks : 50

1. Use Java compiler and eclipse platform to write and execute javaprogram.
2. Creating simple javaprograms,
3. Understand OOP concepts and basics of Javaprogramming.
4. Create Java programs using inheritance andpolymorphism.
5. Implement error-handling techniques using exception handling andmultithreading.
6. Understand the use of javapackages.
7. File handling and establishment of databaseconnection.
8. Develop a calculator application injava.
9. Develop a Client ServerApplication.
10. Develop GUI applications using Swingcomponents.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

DATABASE MANAGEMENT SYSTEMS LAB(MCA - 252)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Use the Concept of Database.
2. Write SQL commands to query a database.
3. Write PL/SQL programs for implementing stored procedures.
4. Write PL/SQL programs for storedfunctions, cursors, trigger and packages.
5. Know backend process of data in applications.

MCA - 252: DATABASE MANAGEMENT SYSTEMS LAB

L-T-P :0-0-4 External Max. Marks : 50

1. Installing oracle/MYSQL.
2. Creating Entity-Relationship Diagram using casetools.
3. Writing SQL statements Using ORACLE/MYSQL:
   a.Writing basic SQL SELECT statements. b.Restricting and sorting data. c.Displaying data from multiple tables. d.Aggregating data using group function. e.Manipulatingdata. f. Creating and managing tables.
4. Normalization.
5. Creatingcursor.
6. Creating procedure andfunctions.
7. Creating packages andtriggers.
8. Design and implementation of payroll processing system.
9. Design and implementation of Library Information System.
10. Design and implementation of Student Information System.
11. Automatic Backup of Files and Recovery ofFiles.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

DATA STRUCTURES & ANALYSIS OF ALGORITHMS LAB(MCA - 253)

Course Outcome:

Atthe end ofcourse, the studentwill beableto understand

1. Write and execute programs to implement various searching and sorting algorithms.
2. Write and execute programs to implement various operations on two-dimensional arrays.
3. Implement various operations of Stacks and Queues using both arrays and linked lists data structures.
4. Implement graph algorithm to solve the problem of minimum spanning tree

MCA – 253:DATA STRUCTURES & ANALYSIS OF ALGORITHMS LAB

L-T-P :0-0-4 External Max. Marks : 50

Program in C or C++ for following:

1. To implement addition and multiplication of two 2Darrays.
2. To transpose a 2Darray.
3. To implement stack usingarray
4. To implement queue usingarray.
5. To implement circular queue usingarray.
6. To implement stack using linkedlist.
7. To implement queue using linkedlist.
8. To implement BFS using linkedlist.
9. To implement DFS using linkedlist.
10. To implement LinearSearch.
11. 11.To implement BinarySearch.
12. To implement BubbleSorting.
13. To implement SelectionSorting.
14. To implement InsertionSorting.
15. To implement MergeSorting.
16. To implement HeapSorting.
17. To implement Matrix Multiplication by strassen'salgorithm
18. Find Minimum Spanning Tree using Kruskal'sAlgorithm

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

OPERATING SYSTEMS (MCA-311)

Course Outcomes

1. Explain main components, services, types and structure of Operating Systems.
2. Apply the various algorithms and techniques to handle the various concurrency control issues.
3. Compare and apply various CPU scheduling algorithms for process execution.
4. Identify occurrence of deadlock and describe ways to handle it.
5. Explain and apply various memory, I/O and disk management techniques.

Syllabus

UNIT I–INTRODUCTION: - Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.

UNIT II–PROCESSES: - Process States, Process Description and Process Control. Processes and Threads, Types of Threads, Multicore and Multithreading, Windows 7- Thread and SMP Management.

UNIT III-CONCURRENCY AND SCHEDULING:-Principles of Concurrency-Mutual Exclusion, Semaphores, Monitors, Readers/Writers problem. Deadlocks-prevention-avoidance-detection, Scheduling- Types of Scheduling-Scheduling algorithms.

UNIT IV–MEMORY:- Memory management requirements, Partitioning, Paging and Segmentation, Virtual memory - Hardware and control structures, operating system software, Linux memory management, Windows memory management.

UNIT V - INPUT/OUTPUT AND FILE SYSTEMS: - I/O management and disk scheduling – I/O devices, organization of I/O functions; OS design issues, I/O buffering, disk scheduling, Disk cache. File management – Organization, Directories, File sharing, and Record blocking, secondary storage management.

References:-

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. Andrew S. Tanenbaum, “Modern Operating System”, PHI Learning
3. Tanenbaum /Woodhaull “Operating System Design and Implementation”, Pearson Publication.
4. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
5. Flynn, “Understanding Operating System” , Cengage.
6. D M Dhamdhere, “Operating Systems : A Concept basedApproach”, McGraw Hill.
7. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”.
8. Stuart E. Madnick& John J. *Donovan.Operating Systems.*McGraw Hill.
9. A. K. Sharma, “Operating System”, University Press.
10. Achyut S Godbole, Atul kahate , “Operating System”, McGraw Hill

WEB TECHNOLOGY (MCA-312)

Course Outcomes

1. On completion of this course, a student will be familiar with client server architecture and able to develop a web application using web technologies.
2. Students will gain the skills and project based experience nee Course Outcomes □ : ded for entry into web application and development careers.
3. Students are able to develop a dynamic webpage by the use of java script and DHTML. Students will be able to write a well formed / valid XML document. Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
4. Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.
5. The course is intended for those who have never done anything with HTML or web pages (static and dynamic), and would like to build this basic knowledge for starting a career as a web developer or for learning how to program HTML for web pages HTML/ HTML5, CSS, JavaScript, VB Script.
6. Web development strategies using server side programming with ASP, JSP, Com/D-Com, PHP and at the end of the course you'll gain knowledge about where to go next to further your front-end web development skills.

Syllabus

UNIT I- INTRODUCTION & WEB DESIGN:- Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0

Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

UNIT II- HTML & STYLE SHEETS:- HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML 5

Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

UNIT III- JAVESCRIPT & XML:- JavaScript : Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: JavaScript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and JavaScript, Events and buttons

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT

UNIT IV- PHP:- PHP : Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT V- MYSQL:- PHP and MySQL : Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs

References:-

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
2. Web Technologies, Black Book, Dreamtech Press

3. HTML 5, Black Book, Dreamtech Press
4. Web Design, Joel Sklar, Cengage Learning
5. Developing Web Applications in PHP and AJAX, Harwani, McGraw Hill
6. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson

DESIGN AND ANALYSIS OF ALGORITHMS (MCA-313)

Course Outcomes

1. Argue the correctness of algorithms using inductive proofs and invariants.
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
5. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
6. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.
7. Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.

Syllabus

UNIT-I INTRODUCTION: Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

UNIT-II ADVANCED DATA STRUCTURES: - Red-Black trees, B-trees, Binomial Heaps, Fibonacci Heaps.

UNIT-III DIVIDE AND CONQUER, GREEDY METHOD: Sorting, Matrix Multiplication, Convex hull and Searching. Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, and Minimum Spanning trees-Prim's and Kruskal's algorithms, Single source shortest paths – Dijkstra's and Bellman Ford algorithms.

UNIT–IV DYNAMIC PROGRAMMING, BACKTRACKING AND BRANCH AND BOUND: - Dynamic programming with examples such as Knapsack, All pair shortest paths – Warshall's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Colouring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit -V Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

References:-

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", McGraw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
4. Berman, Paul," Algorithms", Cengage Learning.
5. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" ,Pearson Education, 2008.
6. Jon Kleinberg, Eva Tardos, "Algorithm Design" ,Pearson Education.

COMPUTER BASED OPTIMIZATION TECHNIQUES (MCA-314)

Course Outcomes

1. Formulate and solve problems as networks and graphs.
2. Develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transport problems.
3. Solve the problems using special solution algorithms

Syllabus

UNIT I-PRELIMINARIES:- Inventory Models and Replacement problems: Inventory models – various costs-deterministic inventory models, Single period inventory model with shortest cost, stochastic models, Application of inventory models, Economic lot sizes-price breaks, and Replacement problems-capital equipment-discounting costs-replacement in anticipation of failure-group replacement-stochastic nature underlying the failure phenomenon.

UNIT II-LINEAR PROGRAMMING PROBLEMS (LPP):- Definition of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Charnes' Big-M Method, Sensitivity Analysis, Revised Simplex Method, Duality, Dual Simplex Method

UNIT III-INTEGER LINEAR PROGRAMMING PROBLEMS: - Integer Linear Programming Problems, Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method, 0-1 integer linear programming problem. Transportation Problems: Introduction to Transportation Model, Matrix Form of TP, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution. Assignment Problems: Definition, Hungarian Method for AP.

UNIT IV-INTRODUCTION TO NLP:- Definition of NLP, Convex Programming Problems, Quadratic Programming Problems, Wolfe's Method for Quadratic Programming, Kuhn-Tucker Conditions, Geometrical Interpretation of KT-Conditions, KT-Points etc. Dynamic Programming: Bellman's Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem

UNIT V-QUEUING THEORY:-Introduction to Queues, Basic Elements of Queuing Models, Queue Disciplines, Memoryless Distribution, Role of Exponential and Poisson Distributions, Markovian Process, Erlang Distribution, Symbols and Notations, Distribution Of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson Queues.

References:-

1. Hadley, G., "Linear Programming, and Massachusetts", Addison-Wesley
2. Taha, H.A, "Operations Research – An Introduction", Macmillian
3. Hiller, F.S., G.J. Lieberman, " Introduction to Operations Research", Holden-Day
4. Harvey M. Wagner, "Principles of Operations R search with e Applications to Managerial Decisions", Prentice Hall of India Pvt. Ltd.
5. Swarup K etal, "Operation Research", S. Chand

CYBER SECURITY (MCA-315)

Course Outcomes

1. Follow a structured model in Security Systems Development Life Cycle (SDLC)
2. Detect attack methodology and combat hackers from intrusion or other suspicious attempts at connection to gain unauthorized access to a computer and its resources
3. Protect data and respond to threats that occur over the Internet
4. Design and implement risk analysis, security policies, and damage assessment
5. Plan, implement and audit operating systems' security in a networked, multi-platform and cross platform environment
6. Provide contingency operations that include administrative planning process for incident response disaster recovery, and business continuity planning within information security

Syllabus

UNIT I

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

UNIT II

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control.

Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce- Electronic Payment System, e-Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

UNIT III

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.

UNIT IV

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement of the Policies.

Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

References:-

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security", Pearson Education India.
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
4. Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill.
5. CHANDER, HARISH, "Cyber Laws And It Protection", PHI Learning Private Limited, Delhi, India

OPERATING SYSTEMS LAB (MCA-351)

Course Outcomes

1. Know how data is transmitted and checking of errors.,
2. Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, MultilevelQueuing)
3. Simulation of Banker's Algorithm for Deadlock Avoidance, Prevention
4. Program for FIFO, LRU, and OPTIMAL page replacement algorithm
5. The students, after the completion of the course, are expected to
6. Compare the performance of various CPU Scheduling Algorithms.

Lab Assignments

1. To implement CPU Scheduling Algorithms

    - FCFS
    - SJF
    - SRTF
    - PRIORITY
    - ROUND ROBIN

2. Simulate all Page Replacement Algorithms

    - FIFO
    - LRU

3. Simulate Paging Technique of Memory Management

WEB TECHNOLOGY LAB(MCA- 352)

Course Outcome:

CO 1
Develop static web pages using HTML
CO 2
Develop Java programs for window/web-based applications.
CO 3
Design dynamic web pages using Javascript and XML.
CO 4
Design dynamic web page using server site programming Ex. ASP/JSP/PHP
CO 5
Design server site applications using JDDC,ODBC and section tracking API

Subject: Mini Project:

Course Outcome:

1. Understand, plan and execute a Mini Project with team.
2. Implement electronic hardware by learning PCB artwork design, soldering techniques
esting and troubleshooting etc.
3. Prepare a technical report based on the Mini project.
4. Deliver technical seminar based on the Mini Project work carried out.

DATABASE MANAGEMENT SYSTEMS (MCA-411)

Course Outcomes

5. Defines the basics of the relational data model.
6. Lists the database design process steps.
7. Will be able to design and implement properly structured databases that match the standards based under realistic constraints and conditions.
8. Develops an Entity-Relationship model based on user requirements.

UNIT I–INTRODUCTION:-The Evolution of Database Systems- Overview of a Database ManagementSystem-Outline of Database-System Studies-The Entity- RELATIONSHIP DATA MODEL: Elements of theE/RModel-Design Principles-The Modellingof Constraints-WeakEntitySets

UNIT II - THE RELATIONAL DATA MODEL & ALGEBRA: - Basics of the Relational Model-FromE/R Diagrams to Relational Designs Converting Subclass Structures to Relations Functional Dependencies-Rules About Functional Dependencies-Design of Relational Database Schemas - Multivalued Dependencies.RELATIONAL ALGEBRA: Relational Operations-Extended Operators of Relational Algebra-Constraints onRelations

UNITIII-SQL:-SimpleQueriesinSQL-Subqueries-Full-RelationOperations-DatabaseModifications-Defining a Relation Schema-View Definitions- Constraints and Triggers: Keys and Foreign Keys-Constraintson Attributes and Tuples Modification of Constraints-Schema-Level Constraints and Triggers -Java DatabaseConnectivity-SecurityandUserAuthorization in SQL

UNIT IV -INDEX STRUCTURE,QUERYPROCESSING:-IndexStructures:Indexeson SequentialFiles-Secondary Indexes-B-Trees-Hash Tables-Bitmap Indexes. QUERY EXECUTION: Physical-Query-PlanOperators-One-Pass,two-pass&indexbasedAlgorithms,BufferManagement,ParallelAlgorithms-EstimatingtheCost of Operations-Cost-Based PlanSelection-Order forJoins-Physical-QueryPlan

UNIT V - FAILURE RECOVERY AND CONCURRENCY CONTROL:-Issues and Models for ResilientOperation-Undo/Redo Logging-ProtectingagainstMedia Failures

CONCURRENCYCONTROL:SerialandSerializableSchedules-ConflictSerializability-EnforcingSerializability by Locks-Locking Systems with Several Lock Modes-Concurrency Control by Timestamps,validation.

TRANSACTIONMANAGEMENT: SerializabilityandRecoverability-ViewSerializability-ResolvingDeadlocks-DistributedDatabases:Commitand Lock

References:-

1. HectorGarcia-Molina, JeffUllman,and JenniferWidom,"DatabaseSystems:TheCompleteBook",Pearson Education,Second Edition,2008.
2. Silberschatz,H.KorthandSudarshanS.,"DatabaseSystemConcepts",6thEdition,McGraw-HillInternational,2010.
3. Elmasri R. and Shamakant B.Navathe, "Fundamentals of Database Systems", 6th Edition,AddisionWesley, 2011.

COMPUTER NETWORK(MCA-412)

Course Outcomes

1. Describe communication models TCP/IP, ISO-OSI model, network topologies along with communicating devices and connecting media.
2. Apply knowledge of error detection, correction and learn concepts of flow control along with error control.
3. Classify various IP addressing techniques, subnetting along with network routing protocols and algorithms.
4. Understand various transport layer protocols and their design considerations along with congestion control to maintain Quality of Service.
5. Understand applications-layer protocols and elementary standards of cryptography and network security.

UNITI-DATACOMMUNICATIONS:-

Data communication Components – Data representation and Data flow – Networks – Types of Connections – Topologies – Protocols and Standards – OSI model – Transmission Media – LAN –Wired LANs, WirelessLANs,ConnectingLANs,VirtualLANs.

UNITII–DATALINK LAYER:-

Error Detection and Error Correction – Introduction–Block coding–Hamming Distance – CRC–Flow Controland Error control – Stop and Wait – Go back – N ARQ – Selective Repeat ARQ – Sliding Window – Piggybacking– RandomAccess – CSMA/CD,CDMA/CA.

UNITIII–NETWORKLAYER:-

Switching–Logical addressing – IPV4 – IPV6–Address mapping–ARP, RARP, BOOTP and DHCP– Delivery,Forwardingand UnicastRoutingprotocols.

UNITIV–TRANSPORTLAYER:-

Process to Process Delivery – User Datagram Protocol – Transmission Control Protocol – SCTP – CongestionControl with Examples.

UNITV–APPLICATIONLAYER:-

DomainNameSpace–DDNS–TELNET–EMAIL–FiletransferWWW–HTTP–SNMP–Cryptography –Basicconcepts.

References:-

1. BehrouzA.Forouzan,"DatacommunicationandNetworking",TataMcGraw–Hill,FourthEdition,2011.
2. LarryL.Peterson,PeterS.Davie,"ComputerNetworks",Elsevier,FifthEdition,2012.
3. WilliamStallings,"DataandComputer Communication", EighthEdition,PearsonEducation,2007.
4. JamesF.Kurose,KeithW.Ross,"ComputerNetworking:ATop–DownApproachFeaturingtheInternet",Pearson Education, 2005.

ARTIFICIAL INTELLIGENCE(MCA-413)

Course Outcomes

1. Define the meaning of intelligence and study various intelligent agents.
2. Understand, analyze and apply AI searching algorithms in different problem domains.
3. Study and analyze various models for knowledge representation.
4. Understand the basic concepts of machine learning to analyze and implement widely used learning methods and algorithms.
5. Understand the concept of pattern
6. Classification and clustering techniques

Unit-I INTRODUCTION:- Introduction to Artificial Intelligence, Foundations and History of ArtificialIntelligence,ApplicationsofArtificialIntelligence,IntelligentAgents,StructureofIntelligentAgents.Computer vision, NaturalLanguage Possessing.

UNIT-II INTRODUCTION TO SEARCH:- Searching for solutions, Uniformed search strategies, Informedsearch strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games,Alpha -Beta pruning.

UNIT-III KNOWLEDGE REPRESENTATION & REASONING:- Propositional logic, Theory of firstorder logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning,Utilitytheory, Hidden MarkovModels (HMM),BayesianNetworks.

UNIT-IVMACHINELEARNING:-Supervisedandunsupervisedlearning,Decisiontrees,Statisticallearning models, Learning with complete data - Naive Bayesmodels, Learning with hidden data - EMalgorithm,Reinforcementlearning,

UNIT-VPATTERNRECOGNITION:-Introduction,Designprinciplesofpatternrecognitionsystem,Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) andLinear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbour (NN) Rule, BayesClassifier,SupportVectorMachine(SVM),K–means clustering.

References:-

1. StuartRussell,PeterNorvig,"ArtificialIntelligence–AModernApproach",PearsonEducation
2. ElaineRichandKevinKnight,"ArtificialIntelligence",McGraw-Hill
3. ECharniakandDMcDermott,"IntroductiontoArtificialIntelligence",PearsonEducation
4. DanW.Patterson,"Artificial IntelligenceandExpert Systems",PrenticeHallofIndia

COMPILER DESIGN(MCA-414)

Course Outcomes

1. Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc.
2. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.
3. Understand the parser and its types, Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.
4. Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.
5. Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.
6. Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization

UNIT I - COMPILERS: GRAMMARS & AUTOMATA:- Languages – Grammars – Types of grammars – Context free grammar - regular expression - Recognizing of patterns - finite automation (deterministic & nondeterministic) Conversion of NDFA to DFA - Conversion of regular expression of NDFA – Thompson'sconstruction-minimizationofNDFA–Derivation -parse tree– ambiguity

UNITII-LEXICALANALYSIS:-Lexicalanalysis-handles-tokenspecification-designoflexicalanalysis (LEX) - Automatic generation of lexical analyzer - input buffering - A language for specifying lexicalanalyzers-implementationoflexicalanalyzer

UNIT III - SYNTAX ANALYSIS – PARSING:- Definition - role of parsers - top down parsing - bottom-upparsing - Left recursion - left factoring - Handle pruning , Shift reduce parsing - operator precedence parsing –FIRST-FOLLOW-LEADING-TRAILING-Predictiveparsing-recursivedescentparsing.LRparsing–LR (0) items - SLR parsing – Canonical LR - LALR parsing - generation of LALR - Ambiguous grammars - errorrecovery

UNITIV-SYNTAXDIRECTEDTRANSLATION:-IntermediateLanguages-prefix-postfix-Quadruple - triple - indirect triples – syntax tree- Evaluation of expression - three-address code- Synthesizedattributes – Inherited attributes – Conversion of Assignment statements- Boolean expressions –Backpatching -Declaration-CASEstatements.

UNITV-CODEOPTIMIZATION:-Localoptimization-LoopOptimizationtechniques–DAG–Dominators-Flowgraphs –Storage allocations-Peepholeoptimization – IssuesinCode Generation.

References:-

1. AlfredVAho,JefferyDUllman,RaviSethi,"Compilers,Principlestechniquesandtools",PearsonEducation2011
2. RaghavanV.,"Principlesof Compiler Design",TataMcGrawHill EducationPvt.Ltd.,2010.
3. DavidGalles,"ModernCompilerDesign",PearsonEducation,Reprint2012.
4. DasaradhRamaiah.K.,"IntroductiontoAutomataandCompiler Design",PHI, 2011

MOBILECOMPUTING(MCA-415)

Course Outcomes

1. Study and aware fundamentals of mobile computing.
2. Study and analyze wireless networking protocols, applications and environment.
3. Understand various data management issues in mobile computing.
4. Analyze different type of security issues in mobile computing environment.\
5. Study, analyze, and evaluate various routing protocols used in mobile computing

UNIT– I

Introduction,issuesinmobilecomputing,overviewofwirelesstelephony:cellularconcept,GSM:air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation incellularsystems, CDMA, GPRS.

UNIT-II

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multipleaccess protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture,protocolstack, applicationenvironment, applications.

UNIT– III

Data management issues, data replication for mobile computers, adaptive clustering for mobile wirelessnetworks,Filesystem, Disconnected operations.

UNIT-IV

MobileAgentscomputing,securityandfaulttolerance,transactionprocessinginmobilecomputingenvironment.

UNIT– V

Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destinationsequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distancevectorrouting(AODV),Temporaryorderedroutingalgorithm(TORA),QoSinAdHocNetworks,applications.

References:-

1. J.Schiller,MobileCommunications,AddisonWesley.
2. A.Mehrotra,GSMSystemEngineering.
3. M.V.D.Heijden,M.Taylor,UnderstandingWAP,ArtechHouse.
4. CharlesPerkins,MobileIP,AddisonWesley.
5. CharlesPerkins,AdhocNetworks,AddisonWesley.

MCA-451 MINI PROJECT LAB

Course Outcomes

1. Learn to define objective and motivation of your mini - project Work in
2. reference of your Project Title.
3. Learn to explain Hardware and Software technologies used in your project work.
4. Learn to present and explain DFDs of Project (DFD-0, DFD-1, DFD-2 …).
5. Learn to present and explain ER Diagram of Project.
6. Learn to explain Front-End or User Interfaces (One by One) with Purpose and working.
7. Learn to explain Back-End or Database Tables used in your project.
8. Learn to explain Usability or Ultimate output of your project work.
9. Learn to explain Drawback or limitations of your project work.
10. Learn to explain how this work can be carried out in future for improvement.

MCA-452 DATABASE MANAGEMENT SYSTEMS LAB

Course Outcomes

Objectives:-

1. Installingoracle.
2. CreatingEntity-RelationshipDiagramusingcasetools.
3. WritingSQLstatements UsingORACLE/MYSQL:
    a) WritingbasicSQLSELECTstatements.
    b) Restrictingandsortingdata.
    c) Displayingdata frommultipletables.
    d) Aggregatingdatausinggroupfunction.
    e) Manipulatingdata.
    f) Creatingandmanagingtables.
4. NormalizationinORACLE.
5. Creatingcursorinoracle.
6. Creatingprocedure andfunctionsinoracle.
7. Creatingpackagesandtriggersinoracle.

ELECTIVE - Design & Development of Applications

UnitI-INTRODUCTION:

IntroductiontoAndroid,ActivitiesandIntents,TestingandDebugging,andBackwardsCompatibility.

Unit2-UserInterface:

UserInteractionandintuitivenavigation,DelightfulUserExperience,Testing yourUI

Unit3-BackgroundTasks:

Connect to the Internet, Notifications and Background Tasks, Triggering, Scheduling and OptimizingBackgroundTasks

Unit4-DataSaving,Retrieving,Loading:

StoringDatainyourapp,StoringDatausingSQLite,SharingData:ContentResolversandContentProviders, LoadingDatausing Loaders

Unit5-PolishandPublish:

PermissionsandLibraries,Securitybestpractices,Widgets,PublishingyourApp,MultipleFormFactors, GoogleServices,Firebase,GoogleCloudMessaging,Makingyourappdatasearchable

References:-

1.TrishCornez&Richard Cornez “AndroidProgrammingConcepts”,Jones&BartlettLearning.

CLIENT SERVER COMPUTING

UNIT I CLIENT/SERVER COMPUTING:-DBMS concept and architecture, Single system image, ClientServer architecture, mainframe-centric client server computing, downsizing and client server computing,preserving mainframe applications investment through porting, client server development tools, advantages ofclientservercomputing.

UNITIICOMPONENTSOFCLIENT/SERVERAPPLICATION:-The client:services,requestforservices, RPC, windows services, fax, print services, remote boot services, other remote services, UtilityServices & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), CommonObjectRequestBrokerArchitecture(CORBA).Theserver:Detailedserverfunctionality,thenetworkoperating system, available platforms, the network operating system, available platform, the server operatingsystem.

UNIT III CLIENT/SERVER NETWORK:-connectivity, communication interface technology, Interposescommunication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI)networkmanagement,Client-serversystemdevelopment:Software,Client–ServerSystemHardware:Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals,server hardware.

UNIT IV DATA STORAGE:-magneticdisk, magnetic tape, CD-ROM, WORM, Opticaldisk, mirroreddisk,faulttolerance,RAID,RAID-Disknetworkinterfacecards.Networkprotectiondevices,PowerProtectionDevices,UPS,Surgeprotectors.ClientServerSystemsDevelopment:ServicesandSupport,system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Networkmanagement,HelpDisk,RemoteSystemsManagement Security,LANandNetworkManagement issues.

UNITVCLIENT/SERVERSYSTEMDEVELOPMENT:-Training,TrainingadvantagesofGUIApplication, System Administrator training, Database Administrator training, End-user training. The future ofclientserverComputingEnablingTechnologies,The transformationalsystem.

References:

1. PatrickSmith&SteaveGuengerich,"Client /ServerComputing",PHI
2. DawnaTravisDewire,"Client/Server Computing",TMH
3. Majumdar&Bhattacharya,"DatabasemanagementSystem",TMH
4. Korth,Silberchatz,Sudarshan,"DatabaseConcepts",McGrawHill
5. Elmasri,Navathe,S.B,"Fundamentalsof DataBaseSystem",AddisonWesley

RCA-E13 DATAWARE HOUSING AND MINING

UNIT I DATA WAREHOUSING:-Overview, Definition, Data Warehousing Components, 8 Building aDataWarehouse,WarehouseDatabase,Mapping theData Warehouse toa MultiprocessorArchitecture,Difference between Database System and Data Warehouse, MultiDimensionalData Model, Data Cubes,Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, DataMarting.

UNITIIDATAWAREHOUSEPROCESSANDTECHNOLOGY:-WarehousingStrategy,Warehouse8 /management and Support Processes, Warehouse Planning and Implementation, Hardware and OperatingSystems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors &Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design,DataExtraction, Cleanup &TransformationTools,Warehouse Metadata

UNIT III - DATA MINING:- Overview,Definition & Functionalities, Data 8 Processing, Form of DataPreprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer andHumaninspection),InconsistentData,DataIntegrationandTransformation.DataReduction:- DataCubeAggregation,Dimensionalityreduction, DataCompression, NumerosityRed

UNIT IV - DATA MINING TECHNIQUES:- Classification: Definition, Data Generalization, AnalyticalCharacterization, 8 Analysis of attribute relevance, Mining Class comparisons, Statistical measures in largeDatabases,Statistical-BasedAlgorithms,Distance-BasedAlgorithms,DecisionTree-BasedAlgorithms.Clustering:Introduction,SimilarityandDistanceMeasures,HierarchicalandPartitionalAlgorithms.Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid BasedMethods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction,LargeItemsets,BasicAlgorithms,Parallel andDistributedAlgorithms,Neural Networkapproach.

UNITV-DATAVISUALIZATIONANDOVERALLPERSPECTIVE:-Aggregation,Historical8 information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, DataMininginterface,Security,BackupandRecovery,TuningDataWarehouse,TestingDataWarehouse.Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, SpatialMiningandTemporalMining.

References:-

1. AlexBerson,StephenJ.Smith“DataWarehousing,Data-Mining&OLAP”, TMH
2. MarkHumphries,MichaelW.Hawkins,MichelleC.Dy,“DataWarehousing:ArchitectureandImplementation”, Pearson
3. MargaretH.Dunham,S.Sridhar,”DataMining:IntroductoryandAdvancedTopics”PearsonEducation
4. ArunK.Pujari,“DataMiningTechniques”UniversitiesPress
5. PieterAdriaans,DolfZantinge,“Data-Mining”,PearsonEducation

RCA-E14AdvancedComputerArchitecture

UNIT-I:INTRODUCTION:-
ParallelComputing,ParallelComputerModel,ProgramandNetworkProperties,ParallelArchitecturalClassificationSchemes,Flynn's&Feng'sClassification,PerformanceMetrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks;IEEEPOSIXThreads:CreatingandExitingThreads,SimultaneousExecutionofThreads,ThreadSynchronizationusingSemaphore andMutex, Cancellingthe Threads.

UNIT – II: PIPELINING AND MEMORY HIERARCHY:-Basic and Intermediate Concepts, InstructionSet Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; SuperScalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance,MemoryTechnologyandOptimization,Cache Coherenceand SynchronizationMechanisms.

UNIT–III:THREADANDPROCESSLEVELPARALLELARCHITECTURE:-Introductionto
MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared MemoryMIMDArchitecture,Clustering,InstructionLevelDataParallelArchitecture,SIMDArchitecture,FineGrained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel PipelinedandSystolic Architectures,VectorArchitectures.

UNIT – IV: PARALLEL ALGORITHMS:-PRAM Algorithms: Parallel Reduction, Prefix Sums, PreorderTree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, BlockOriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination,Jacobi Algorithm;ParallelAlgorithmDesign Strategies.

UNIT–V:DEVELOPINGPARALLELCOMPUTINGAPPLICATIONS:-OpenMPImplementationin
'C': Execution Model, Memory Model; Directives: Conditional Compilation, Internal Control Variables,ParallelConstruct,WorkSharingConstructs,CombinedParallelWork-SharingConstructs,MasterandSynchronization Constructs; Run-Time Library Routines: Execution Environment Routines, Lock Routines,TimingRoutines;Simple Examples in'C'. Basics ofMPI.

References:-

1. KaiHwang,"AdvanceComputerArchitecture",TMH
2. Matthew,"BeginningLinuxProgramming",SPD/WROX
3. HennessyandPatterson,"ComputerArchitecture:AQuantitativeApproach",Elsevier
4. DezsoandSima,"AdvancedComputerArchitecture",Pearson
5. Quinn,"ParallelComputing:Theory&Practice",TMH6.Quinn,"ParallelProgramminginCwithMPIand OpenMP",TMH

Computer Graphics and Animation (MCA-511)

Course Outcomes

1. Understand the basics of computer graphics, various graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.
4. Extract scene with different clipping methods and its transformation to graphics display device.
5. Explore projections and visible surface detection techniquesfordisplayof3D scene on 2D screen.
6. Render projected objects to naturalize the scene in 2 D view and use of illumination models for this.

UNIT-I: **(8)**

IntroductiontoComputerGraphics: WhatisComputerGraphics,ComputerGraphicsApplications,ComputerGraphicsHardwareandsoftware,two-dimensionalGraphicsPrimitives:PointsandLines,Linedrawingalgorithms:DDA, Bresenham's Circle drawing algorithms: Using polar coordinates, Bresenham's circle drawing, mid-point circledrawingalgorithm; Filledareaalgorithms:Scanline: Polygonfillingalgorithm, boundaryfilledalgorithm.

UNIT-II: **(8)**

Two/Three-Dimensional Viewing: The 2-D viewing pipeline, windows, viewports, window to view port mapping;Clipping: point, clipping line (algorithms): - 4-bit code algorithm, Sutherland-Cohen algorithm, parametric line clippingalgorithm(CyrusBeck).Polygonclippingalgorithm:Sutherland-Hodgemanpolygonclippingalgorithm.Twodimensional transformations: transformations, translation, scaling, rotation, reflection, composite transformation. Threedimensionaltransformations:Three-dimensionalgraphicsconcept,Matrixrepresentationof3DTransformations,Compositionof 3-Dtransformation.

UNIT-III: **(8)**

Viewing in 3D: Projections, types of projections, mathematics of planner geometric projections, coordinate systems.Hiddensurfaceremoval:Introductiontohiddensurfaceremoval.Z-bufferalgorithm,scanlinealgorithm,areasub-divisionalgorithm.

UNIT-IV: **(8)**

RepresentingCurvesandSurfaces: Parametricrepresentationofcurves:Beziercurves,B-Splinecurves.Parametricrepresentationofsurfaces;Interpolation method.

Illumination,shading,imagemanipulation: Illuminationmodels,shadingmodelsforpolygons,shadows,transparency.Whatisanimage? Filtering,image processing, geometrictransformation ofimages.

UNIT-V: **(8)**

Animation; Fundamentals of computer animation, Animation Techniques. Animation and Flash Overview, Using LayerandCreatingAnimation

REFRENCES:

1. ProceduralElementsforComputer Graphics –DavidF.Rogers,2001,T.M.HSecondEdition.
2. Fundamentalsof3Dimensional ComputerGraphicsbyAlanWatt,1999,AddisionWesley.
3. ComputerGraphics:SecretsandSolutionsbyCorrignJohn,BPB
4. M.C.Trivedi,NNJani,Computer Graphics,JaicoPublications
5. RishabhAnand,ComputerGraphics-Apractical Approach,KhannaPublishingHouse
6. Graphics,GUI,Games&MultimediaProjectsinCbyPilania&Mahendra,StandardPubl.
7. ComputerGraphicsSecretsandsolutionsbyCorrignJohn,1994,BPV
8. PrinciplesofMultimediabyRanjanParekh,McGrawHill Education
9. ComputerGraphicsPrinciplesandPracticessecondeditionbyJamesD.Foley,AndeiesvanDam,StevanK.Feineran dJohbF. Hughes,2000, Addision Wesley.
10. Computer GraphicsbyDonaldHearnandM.PaulineBaker, 2ndEdition,1999,PHI
11. Computer graphics,MultimediaandAnimationbyMalay.K.Pakhira,PHI,2nd Edition,2010

Software Engineering (MCA-512)

Course Outcomes

1. Explain various software characteristics and analyze different software Development Models.
2. Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards.
3. Compare and contrast various methods for software design.
4. Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing.
5. Manage software development process independently as well as in teams and make use of various software management tools for development, maintenance and analysis.

UNIT-I: **(8)**

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis,Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software QualityAttributes. SoftwareDevelopmentLifeCycle(SDLC)Models:WaterFallModel, PrototypeModel,SpiralModel,EvolutionaryDevelopment Models, Iterative EnhancementModels.

UNIT-II: **(8)**

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation,ReviewandManagementofUserNeeds,FeasibilityStudy,InformationModeling,DataFlowDiagrams,EntityRelationshipDiagrams, DecisionTables, SRSDocument, IEEE Standardsfor SRS.

SoftwareQualityAssurance :(SQA): VerificationandValidation,SQAPlans,SoftwareQualityFrameworks,ISO9000Models,SEI-CMMModel.

UNIT-III:

SoftwareDesign: **(8)**

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts,Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, ObjectOrientedDesign,Top-DownandBottom-UpDesign.SoftwareMeasurementandMetrics:VariousSizeOrientedMeasures:Halestead'sSoftwareScience,FunctionPoint(FP)BasedMeasures,CyclomaticComplexityMeasures:Control FlowGraphs

UNIT-IV: **(8)**

Software Testing: Testing Objectives, UNIT Testing, Integration Testing, 8 Acceptance Testing, Regression Testing,Testing for functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers andTest Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation,Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through,CodeInspection, Compliancewith Design and CodingStandards.

UNIT-V: **(8)**

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for maintenance,Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, SoftwareVersionControl,AnOverviewofCASETools.EstimationofVariousParameterssuchasCost,Efforts,Schedule/Duration, Constructive Cost Models (COCOMO), Resource allocation Models, Software Risk Analysis andManagement.

REFRENCES:

1. R.S.Pressman,SoftwareEngineering:APractitionersApproach,McGrawHill.
2. RajibMall,FundamentalsofSoftwareEngineering,PHIPublication.
3. K.K.Aggarwal andYogeshSingh,SoftwareEngineering,NewAgeInternational Publishers.
4. PankajJalote,SoftwareEngineering,Wiley
5. DeepakJain,"SoftwareEngineering:PrinciplesandPractices",OxfordUniversityPress.
6. MuneshC.Trivedi,SoftwareEngineering,KhannaPublishingHouse
7. N.S.Gill,SoftwareEngineering,KhannaPublishingHouse

E24: Software Testing (MCA-513)

Course Outcomes

1. Apply various software testing methods.
2. Prepare test cases for different types and levels of testing.
3. Prepare test plan for an application.
4. Identify bugs to create defect report of given application.
5. Test software for performance measures using automated testing tools.

UNIT-I **(8)**

Review of Software Engineering: Overview of software evolution, SDLC, Testing Process, Terminologies inTesting: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, TestCases,TestingSuite,TestOracles,ImpracticalityofTestingAlldata;ImpracticalityoftestingAllPaths.Verification: Verification methods, SRS verification, Source code reviews, User documentation verification, andSoftware project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, andConfigurationAudits.

UNIT–II **(8)**

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, CauseEffect Graphing Technique. Structural Testing: Control flow testing, Path testing, Independent paths, Generationofgraphfromprogram,Identificationofindependentpaths,CyclomaticComplexity,DataFlowTesting,MutationTesting.

UNIT-III **(8)**

Regression Testing: What is Regression Testing? Regression Test cases selection, reducing the number of testcases,Codecoverageprioritization technique.Reducing thenumberoftest cases:Prioritizationguidelines,Prioritycategory, Scheme,RiskAnalysis.

UNIT-IV **(8)**

SoftwareTestingActivities: LevelsofTesting,Debugging,TestingtechniquesandtheirApplicability,Exploratory Testing Automated Test Data Generation: Test Data, Approaches to test data generation, test datagenerationusinggeneticalgorithm,Test DataGenerationTools,SoftwareTestingTools,andSoftwaretestPlan.

UNIT-V **98)**

Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing.Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing,PerformanceTesting, Databasetesting, Post DeploymentTesting.

REFRENCES:

1. YogeshSingh,"SoftwareTesting",CambridgeUniversityPress,NewYork,2012
2. K..K. Aggarwal &Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi,2003.
3. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-HillInternationalEdition, NewDelhi,2001.
4. MarcRoper,"SoftwareTesting",McGraw-Hill BookCo.,London,1994.
5. BorisBeizer,"SoftwareSystemTestingandQualityAssurance",VanNostrand Reinhold,NewYork,1984.

E-31: Cloud Computing (MCA-514)

Course Outcomes

1. Understand the concepts of Cloud Computing, key technologies, Strengths and limitations of cloud computing.
2. Develop the ability to understand and use the architecture to compute and storage cloud, service and models.
3. Understand the application in cloud computing.
4. Learn the key and enabling technologies that help in the development of cloud.
5. Explain the core issues of cloud computing such as resource management and security.

UNIT-I **(8)**

Introduction: Cloud-definition, benefits, usage scenarios, History of Cloud Computing - Cloud Architecture - Types ofClouds - Business models around Clouds – Major Players in Cloud Computing- issues in Clouds - Eucalyptus - Nimbus -OpenNebula, Cloud Sim.

UNIT-II **(8)**

Cloud Services: Types of Cloud services: Software as a Service-Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers-Google, Amazon,MicrosoftAzure,IBM, Salesforce.

UNIT-III **(8)**

CollaboratingUsingCloudServices:Email CommunicationovertheCloud-CRMManagement-ProjectManagement-Event Management - TaskManagement – Calendar - Schedules - Word Processing – Presentation –Spreadsheet-Databases– Desktop -SocialNetworksand Groupware.

UNIT-IV **(8)**

Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – SystemVim, Process VM,Virtual Machinemonitor–Virtualmachineproperties-Interpretationandbinarytranslation,HLLVM -supervisors–Xen,KVM,VMware,VirtualBox,Hyper-V.

UNIT-V **(8)**

Security, Standards and Applications: Security in Clouds: Cloud security challenges – Software as a Service Security,Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for applicationDevelopers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internetdevicesand the cloud.

REFRENCES:

1. DavidE.Y.SarnaImplementingandDevelopingCloudApplication,CRCpress 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis andrecommendation,May2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing : A Practical Approach, Tata McGraw-Hill2010.
4. Haley Beard, Best Practices for Managing and Measuring Processes for On-demand Computing, Applications andDataCentersin the Cloudwith SLAs, Emereo PtyLimited,July2008.
5. G.J.Popek, R.P. Goldberg, Formal requirements for virtualizable third generation Architectures, Communicationsof the ACM, No.7Vol.17,July1974
6. JohnRittinghouse&JamesRansome,CloudComputing, Implementation,ManagementandStrategy,CRCPress,2010.
7. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and CollaborateQuePublishing, August2008.
8. JamesESmith,Ravi Nair,VirtualMachines,MorganKaufmannPublishers,2006.

E45: Big Data (MCA-515)

Course Outcomes

1. To Understand the Big Data challenges & opportunities and its applications area.
2. Understand data to big data generation, types and development.
3. Gain conceptual understanding of NOSQL Database.
4. Understanding of concepts of map and reduce and functional programming.
5. Gain conceptual understanding of Hadoop Distributed File System.

UNIT-I **(8)**

Understandingbigdata: Whatisbig data,whybig data, convergenceofkeytrends,unstructureddata, industryexamplesofbigdata,webanalytics,bigdataandmarketing, fraudandbigdata,riskandbigdata,creditriskmanagement,big data andalgorithmic trading, big data and HealthCare, big data in medicine, advertising and big data, big datatechnologies, Introduction to Hadoop, open source technologies, cloud and big data mobile business intelligence, CrowdsourcingAnalytics ,interand transfirewallanalytics

UNIT-II **(8)**

NoSQL data management: Introduction to NoSQL, aggregate data models, aggregates, key-value and document datamodels,relationships, graph databases, schema less databases ,materialized views, distribution models ,sharing , mastersslave replication , peer-peer replication , sharing and replication , consistency , relaxing consistency , version stamps ,mapreduce, partitioningand combining,composingmap-reduce calculations

UNIT-III **(8)**

Basics of Hadoop; Data format, analyzing data with Hadoop, scaling out , Hadoop streaming , Hadoop pipes , design ofHadoop distributed file system (HDFS) , HDFS concepts , Java interface , data flow ,Hadoop I/O , data integrity ,oppression,serialization ,Avro file-based data structures

UNIT-IV **(8)**

Map reduce applications; Map Reduce workflows, UNIT tests with MR UNIT, test data and local tests – anatomy ofMapReducejobrun,classic Map-reduce ,YARN,failures inclassicMap-reduceand YARN,jobscheduling,shuffleandsort,taskexecution ,MapReducetypes , inputformats , outputformats

UNIT-V **(8)**

Hadoop related tools; HBase, data model and implementations, Hbase clients, Hbase examples – praxis. Cassandra,cassandradatamodel,cassandraexamples,cassandraclients,Hadoopintegration.Pig,Grunt ,pigdatamodel,PigLatin,developing and testing PigLatin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL datamanipulation –HiveQLqueries

REFRENCES:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging BusinessIntelligenceand AnalyticTrendsforToday's Businesses",Wiley, 2013.
2. P.J.SadalageandM. Fowler,"NoSQLDistilled: ABrief Guidetothe EmergingWorldof
3. PolyglotPersistence",Addison-WesleyProfessional,2012.
4. TomWhite,"Hadoop:TheDefinitiveGuide",ThirdEdition,O'Reilley,2012.

7.V.K.Jain,BigData &Hadoop, Khanna PublishingHouse

5. EricSammer,"HadoopOperations",O'Reilley,2012.
6. E.Capriolo,D.Wampler,andJ.Rutherglen,"ProgrammingHive",O'Reilley,2012.
7. LarsGeorge,"HBase:TheDefinitiveGuide",O'Reilley,2011.
8. EbenHewitt,"Cassandra:TheDefinitiveGuide",O'Reilley,2010.
9. AlanGates,"ProgrammingPig",O'Reilley,2011.

Computer Graphics and Animation Lab (MCA-551)

Course Outcomes

1. Programming User-interface issues
2. Concepts of 2D & 3D object representation
3. Implementation of various scan & clipping algorithms 2D modeling
4. Implementation of illumination model for rendering 3D objects Visibility detection & 3D viewing
5. Implementation of a project based on learned concepts

LISTOFEXPERINETNS

(1) DigitaldifferentialAnalyzer
(2) LineDrawingAlgorithms
(3) Mid-pointCircleGenerationAlgorithm
(4) Creatingtwo-DimensionalObjects
(5) Two-dimensionalTransformation
(6) PictureColoring
(7) Three-Dimensionaltransformation
(8) SimpleAnimationusingTransformation
(9) Key-FrameAnimation
(10) DesignAnimationusingFLASH

Note: Labcanbeconductedin"C"language/ VirtualLabs/OpenGL.

Project Based on Software Engineering (MCA-552)

Course Outcomes

1. To prepare SRS document, design document, test, UML, DFD, ER diagrams
2. cases and software configuration management and risk management related document.
3. Develop function oriented and object oriented software design using tools like rational rose.
4. Able to perform unit testing and integration testing.
5. Apply various white box and black box testing techniques

Students are expected to analyse the problem Statement/ case study and design a solution applying software engineeringprinciples.

Note: Labcan beconducted usingVirtual Labs provided byIITKhargpur/ Bombay.

Colloquium (MCA-611)

Course Outcomes

1. Carry out a substantial research-based project
2. Demonstrate capacity to improve student achievement, engagement and retention
3. Demonstrate capacity to lead and manage change through collaboration with others
4. Demonstrate an understanding of the ethical issues associated with practitioner research
5. Analyze data and synthesize research findings
6. Report research findings in written and verbal forms
7. Use research findings to advance education theory and practice.
8. Learn how to create unique, plagiarism free content and how to Publish work.

Industrial Project (MCA-612)

Course Outcomes

1. Learn to work in real practical software and industrial development environment where outer world find and access software services for their particular domain in various technologies.
2. Brush-up their knowledge complete in interested areas and software and web technologies.
3. Demonstrate a sound technical knowledge of their selected project topic.
4. Undertake problem identification, formulation and solution.
5. Design engineering solutions to complex problems utilising a systems approach.
6. Conduct an engineering project.
7. Communicate with engineers and the community at large in written an oral forms.
8. Demonstrate the knowledge, skills and attitudes of a professional engineer.
9. Learn to work in a team to accomplish the desired task in time bound and quality frame form.
10. Learn how to create report of project and presentation with professional required skill set.
11. Student learn Presentation Skills, Discussion Skills, Listening Skills, Argumentative Skills, Critical Thinking, Questioning, Interdisciplinary Inquiry, Engaging with Big Questions, Studying Major Works

E21: (MCA-513) Cryptography and Network Security

UNIT-I **(8)**

Introduction:tosecurityattacks,servicesandmechanism,introductiontocryptography.ConventionalEncryption:Conventionalencryptionmodel,classicalencryptiontechniques-substitutionciphersandtranspositionciphers,cryptanalysis,stereography,streamandblockciphers.ModernBlockCiphers: Blockciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES),strength of DES, differential and linear crypt analysis of DES, blockcipher modes of operations, triple DES,IDEAencryptionanddecryption,strengthofIDEA,confidentialityusingconventionalencryption,trafficconfidentiality,keydistribution,randomnumbergeneration.

UNIT-II **(8)**

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler'stheorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals ofpublic key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchangealgorithm,introductoryidea of Ellipticcurve cryptography,Elganelencryption.

UNIT-III **(8)**

Message Authentication and Hash Function: Authentication requirements, authentication functions, messageauthentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digestalgorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digitalsignaturestandards (DSS),proofofdigitalsignature algorithm.

UNIT-IV **(8)**

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-prettygood privacy(PGP),S/MIME.

UNIT-V **(8)**

IPSecurity:Architecture,Authenticationheader,Encapsulatingsecuritypayloads,combiningsecurityassociations, key management. Web Security: Secure socket layer and transport layer security, secure electronictransaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trustedsystems.

REFRENCES

1. WilliamStallings,"CryptographyandNetworkSecurity:PrincipalsandPractice",PearsonEducation.
2. BehrouzA.Frouzan: CryptographyandNetworkSecurity,TataMcGrawHill
3. CK Shyamala,NHarini,Dr.T.R.PadmnabhanCryptographyandSecurity,Wiley
4. BruceSchiener,"AppliedCryptography".JohnWiley&Sons
5. V.K.Jain,CryptographyandNetworkSecurity,KhannaPublishingHouse
6. BernardMenezes,"NetworkSecurityandCryptography",CengageLearning.
7. AtulKahate,"CryptographyandNetworkSecurity",Tata McGraw Hill

E22: (MCA-513) Natural Language Processing

UNIT-I **(8)**

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, EvaluatingLanguage Understanding Systems, Different levels of Language Analysis, Representations and Understanding,OrganizationofNaturallanguageUnderstandingSystems,LinguisticBackground:An outlineof Englishsyntax.

UNIT-II **(8)**

Introduction to semantics and knowledge representation, some applications like machine translation, databaseinterface.

UNIT-III **(8)**

GrammarsandParsing:GrammarsandsentenceStructure,Top-DownandBottom-UpParsers,TransitionNetwork Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars:Basic Featuresystem for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented TransitionNetworks.

UNIT-IV **(8)**

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language,HandlingquestionsinContext-FreeGrammars.HumanpreferencesinParsing,Encodinguncertainty,DeterministicParser.

UNIT-V **(8)**

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speechtagging,ObtainingLexicalProbabilities,ProbabilisticContext-FreeGrammars,BestFirstParsing.SemanticsandLogicalForm,Word sensesand Ambiguity,EncodingAmbiguityin Logical Form.

REFRENCES:

1. AksharBharti,VineetChaitanyaandRajeevSangal,NLP:APaninianPerspective,PrenticeHall,NewDelhi
2. JamesAllen,Natural LanguageUnderstanding,PearsonEducation
3. D.Jurafsky,J.H.Martin,SpeechandLanguageProcessing,PearsonEducation
4. L.M.Ivansca,S.C.Shapiro,NaturalLanguageProcessingandLanguageRepresentation
5. T.Winograd,LanguageasaCognitiveProcess,Addison-Wesley

E23: (MCA-513) Human Computer Interaction

UNIT-1 **(8)**

Introduction: Importance of user Interface – definition, importance of 8 good designs. Benefits of good design. Abrief history ofScreendesign. The graphicaluser interface– popularity of graphics, the concept of directmanipulation, graphical system, Characteristics, Web user– Interface popularity, characteristics- Principles ofuserinterface

UNIT-II **(8)**

Designprocess–Humaninteractionwithcomputers,importanceof8humancharacteristicshumanconsideration,Human interaction speeds, understandingbusinessjunctions.

UNIT-III **(8)**

Screen Designing :Design goals–Screen planning andpurpose, 8 organizing screen elements,ordering ofscreen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focusandemphasis–presentationinformationsimplyandmeaningfully–informationretrievalonweb–statistical graphics– Technological considerationin interface design.

UNIT-IV **(8)**

Windows: New and Navigation schemes selection of window, 8 selection of devices based and screen basedcontrols. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosingcolors.

UNIT-V **(8)**

Softwaretools:Specificationmethods,interface–BuildingTools.8InteractionDevices–Keyboardandfunction keys – pointing devices – speech recognition digitization and generation – image and video displays –drivers.

REFRENCES;

1. AlanDix,JanetFinlay,GregoryAbowd,RussellBealeHumanComputerInteraction,3rdEditionPrentice Hall, 2004.

2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in Human Computer Interaction, Wiley, 2010.

3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-WesleyPublishingCo.

E25: (MCA-513) Modern Application Development

UNIT-I **(8)**

Introduction: Introduction to mobile applications – Embedded systems - Market and business drivers for mobileapplications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobileapplications

UNIT-II **(8)**

Basic design: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobileapplications, both hardware and software related – Architecting mobile applications – User interfaces for mobileapplications – touch events and gestures – Achieving quality constraints– performance,usability, security,availabilityand modifiability.

UNIT-III **98)**

Advanced design: Designing applications with multimedia and web access capabilities – Integration with GPSand social media networking applications – Accessing applications hosted in a cloud computing environment – Designpatternsfor mobileapplications.

UNIT-IV **(8)**

Technology in android: Introduction – Establishing the development environment – Android architecture – Activitiesandviews–InteractingwithUI–PersistingdatausingSQLite–Packaginganddeployment–Interaction with server side applications – Using Google Maps, GPS and Wi-fi – Integration with social mediaapplications.

UNIT-V **(8)**

TECHNOLOGY II–IOS: IntroductiontoObjectiveC –iOSfeatures –UIimplementation–Touchframeworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift:Introductionto Swiftfeatures ofswift.

REFRENCES:

1. CharlieCollins,MichaelGalpinandMatthiasKappler,“AndroidinPractice”,DreamTech,2012
2. AnubhavPradhan,AnilV DespandeComposingMobileApps,Learn,explore,apply
3. JamesDoveyandAshFurrow,“BeginningObjectiveC”, Apress,2012
4. JeffMcWherterandScottGowell,"ProfessionalMobileApplicationDevelopment",Wrox,2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS6Development:ExploringtheiOSSDK”, Apress, 2013.

E32: (MCA-514) Soft Computing

UNIT-I **(8)**

Artificialneuralnetworks:Basicconcepts-Singlelayerperception-MultilayerPerception-SupervisedandUnsupervisedlearning–Backpropagationnetworks-Kohnen'sselforganizingnetworks-Hopfield network.

UNIT-II **(8)**

Fuzzy systems: Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition – Fuzzyautomataand languages-Fuzzycontrolmethods-Fuzzydecision making.

UNIT-III **(8)**

Neuro - fuzzy modeling: Adaptive networks based Fuzzy interface systems - Classification and Regression Trees – Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing – Evolutionarycomputation.

UNIT-IV **(8)**

Genetic algorithms: Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction – Rankmethod -Rankspace method.

UNIT-V **(8)**

Application of soft computing: Optimization of traveling salesman problem using Genetic Algorithm, Geneticalgorithm-based Internet Search Techniques, Soft computing-based hybrid fuzzy controller, Introduction to MATLABEnvironment for SoftcomputingTechniques.

REFRENCES:

1. Sivanandam,Deepa,“PrinciplesofSoftComputing”,Wiley
2. JangJ.S.R,SunC.T.andMizutaniE,"Neuro-Fuzzyand Softcomputing",PrenticeHall
3. TimothyJ.Ross,"FuzzyLogicwithEngineeringApplications",McGrawHill
4. LaureneFausett,"FundamentalsofNeuralNetworks",PrenticeHall
5. D.E.Goldberg,"GeneticAlgorithms:Search,OptimizationandMachineLearning",AddisonWesley
6. Wang,“FuzzyLogic”,Springer

E33:(MCA-514) Information Storage Management

UNIT-I **(8)**

IntroductiontoStorageTechnology: Dataproliferationandthevaryingvalueofdatawithtime&usage,Sourcesofdata and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basicstorage management skills and activities, The five pillars of technology, Overview of storage infrastructure components,Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage andRegulations.

UNIT-II **(8)**

StorageSystemsArchitecture;Intelligentdisksubsystemsoverview,Contrastofintegratedvs.modulararrays,Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, andspecifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization,protection, and back end management, Array caching properties and algorithms, Front end connectivity and
queuingproperties,Frontendtohoststorageprovisioning,mapping,andoperation,Interactionoffilesystemswithstorage,Storagesystemconnectivityprotocols.

UNIT-III **(8);**

Introduction to Networked Storage: JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS)environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity,
FibreChannelprinciples,standards,&networkmanagementprinciples,SANmanagementprinciples,NetworkAttachedStorage(NAS):elements,connectivityoptions,
connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (SCSI, FCIP, FCP),connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivityoptions,standards,andmanagementprinciples,HybridStoragesolutionsoverviewincludingtechnologieslikevirtualization&appliances.

UNIT-IV **(8)**

Introduction to Information Availability: Business Continuity and Disaster Recovery Basics, Local business continuitytechniques,Remote businesscontinuitytechniques,Disaster Recoveryprinciples&techniques.

UNIT-V **(8)**

Managing & Monitoring: Management philosophies (holistic vs. system & component), Industry managementstandards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability,capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active managementbest practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques,Management tools overview.

REFRENCES:

1. Information Storage and Management Storing, Managing, and Protecting Digital Information, by EMC,Hopkintonand Massachusetts,Wiley,**ISBN:**97881265214
2. Information storage and management: storing, managing, and protecting digital information by Wiley Pub GSomasundaram,AlokShrivastava
3. MeetaGupta,StorageAreaNetworkFundamentals,PearsonEducationLimited,2002
4. RobertSpalding,"StorageNetworks:TheCompleteReference",TataMcGrawHill,Osborne,2003.
5. MarcFarley,"BuildingStorageNetworks",TataMcGrawHill,Osborne.2001.

E34:(MCA-514) Digital Image Processing

UNIT-I **(8)**

Introduction and Fundamentals: Motivation and Perspective, Applications, Components of Image Processing System,Element ofVisualPerception, ASimple Image Model, SamplingandQuantization.

Image Enhancement in Frequency Domain: Fourier Transform and the Frequency Domain, Basis of Filtering inFrequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain;Smoothing Frequency Domain Filters – Gaussian Low pass Filters; Sharpening Frequency Domain Filters – GaussianHighpassFilters;Homomorphic Filtering.

UNIT-II **(8)**

Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear TransformationFunctions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancementusing Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Meanfilter,Ordered Statistic Filter;Sharpening– TheLaplacian.

UNIT-III **(8)**

Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise Only-SpatialFiltering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max andMin filters; Periodic Noise Reduction by Frequency Domain Filtering – Band pass Filters; Minimum Mean-square ErrorRestoration.

UNIT-IV **(8)**

Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion,OpeningandClosing,MorphologicalAlgorithms–
BoundaryExtraction,RegionFilling,ExtractionofConnectedComponents,Convex Hull,Thinning, Thickening

UNIT-V **(8)**

Registration:

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms toEstablishCorrespondence,Algorithms to RecoverDepth

Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level thareholding, Local thresholding,Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, EdgeLinking and Edge Following, Edge Elements Extraction by thareholding, Edge Detector Performance, Line Detection,CornerDetection.

REFRENCES:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: PearsonEducation.
2. DigitalImageProcessingandComputerVision,R.J.Schalkoff.Publishedby:JohnWileyandSons,NY.
3. Fundamentals ofDigital ImageProcessing,A.K.Jain.PublishedbyPrenticeHall,Upper Saddle River,NJ.
4. DigitalImage Processing,MuneshC.Trivedi, SanjayM.Shah,KhannaPublishingHouse

E35:(MCA-514) Distributed Systems

UNIT–I **(8)**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the WebChallenges.Architecturalmodels, FundamentalModels.

TheoreticalFoundationforDistributedSystem:LimitationofDistributedsystem,absenceofglobalclock,sharedmemory,Logicalclocks;Lamport's&vectorslogicalclocks.

ConceptsinMessagePassingSystems:causalorder,totalorder,totalcausalorder,TechniquesforMessageOrdering,Causalorderingof messages, globalstate, terminationdetection.

UNIT-II **(8)**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem,Tokenbasedand non-token-basedalgorithms,performancemetricfordistributedmutual exclusionalgorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance,detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edgechasingalgorithms.

UNIT–III **(8)**

AgreementProtocols:Introduction,Systemmodels,classificationofAgreementProblem,Byzantineagreementproblem,Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application ofAgreement problem, Atomic CommitinDistributedDatabasesystem.

DistributedResourceManagement: IssuesindistributedFileSystems,Mechanismforbuildingdistributedfilesystems,DesignissuesinDistributedSharedMemory,AlgorithmforImplementationofDistributedSharedMemory**.**

UNIT–IV **(8)**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrentsystems,Obtainingconsistent Checkpoints, RecoveryinDistributed DatabaseSystems.

FaultTolerance: IssuesinFaultTolerance,Commit Protocols,Votingprotocols,Dynamicvotingprotocols.

UNIT–V **(8)**

TransactionsandConcurrencyControl:Transactions,Nestedtransactions,Locks,OptimisticConcurrencycontrol,Timestampordering, Comparison of methodsforconcurrencycontrol.

DistributedTransactions:Flatandnesteddistributedtransactions,AtomicCommitprotocols,Concurrencycontrolindistributedtransactions, Distributed deadlocks,Transactionrecovery.

Replication: Systemmodelandgroupcommunication,Fault-tolerantservices,highlyavailableservices,Transactionswithreplicated data.

REFRENCES:

1. Singhal&Shivaratri,"AdvancedConceptinOperatingSystems",McGrawHill
2. Ramakrishna,Gehrke,"DatabaseManagementSystems",McGrawhill
3. Coulouris,Dollimore,Kindberg,"DistributedSystem:ConceptsandDesign",PearsonEducation
4. DistributedSystem,MuneshC.Trivedi,KhannaPublishingHouse
5. Tenanuanbaum,Steen,"DistributedSystems",PHI
6. GeraldTel,"DistributedAlgorithms",CambridgeUniversityPress

E41:(MCA-515) Distributed Database System

UNIT-I **(8)**

Transactionandschedules,ConcurrentExecutionoftransaction,ConflictandViewSerializability,TestingforSerializability, Concepts inRecoverable and Cascade less schedules.

UNIT–II **(8)**

Lockbasedprotocols,timestamp-basedprotocols,MultipleGranularityandMultiversionTechniques,enforcingserializabilitybyLocks, Lockingsystemwith multiplelockmodes,architecturefor Lockingscheduler

UNIT-III **(8)**

DistributedTransactionsManagement,DataDistribution,FragmentationandReplicationTechniques,DistributedCommit, Distributed Lockingschemes, Longdurationtransactions,Moss Concurrencyprotocol.

UNIT–IV **(8)**

IssuesofRecoveryandatomicityinDistributedDatabases,Traditionalrecoverytechniques,Logbasedrecovery,Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recoveryline,Concepts in Orphanand InconsistentMessages.

UNIT-V **(8)**

DistributedQueryProcessing,MultidayJoins,Semijoins,Costbasedqueryoptimizationfordistributeddatabase,Updatingreplicated data, protocolsfor Distributed DeadlockDetection, EagerandLazyReplicationTechniques

REFRENCES:

1. Silberschatz,KorthandSudershan,DatabaseSystemConcept',McGrawHill
2. RamakrishnaandGehrke,'DatabaseManagementSystem,McGrawHill
3. Garcia-Molina,Ullman,Widom,'DatabaseSystemImplementation'Pearson Education
4. CeeiandPelagatti,'DistributedDatabase',TMH
5. DistributedSystem,MuneshC.Trivedi,KhannaPublishingHouse
6. SinghalandShivratri,'AdvanceConceptsinOperatingSystems'MCGrawHill

E42:(MCA-515) Simulation and Modelling

UNIT-1 **(8)**

System definition and components, stochastic activities, continuous and discrete systems, system modeling, types ofmodels, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types ofsystemstudy.

UNIT-II **(8)**

System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analyticalmethods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuingsystemandaninventoryproblem,Monte-Carlosimulation,DistributedLag models,Cobwebmodel.

UNIT-III **(8)**

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of aservosystem,simulationofanautopilot,Discretesystemsimulation,fixedtime-stepvs.eventoevenmodel,generationofrandomnumbers, testforrandomness,Monte-Carlocomputation vs. stochasticsimulation.

UNIT-IV **(8)**

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logisticcurves,generalizationof growthmodels,system dynamicdiagrams,IntroductiontoSIMSCRIPT:Program,systemconcepts,origination,and statements, definingthetelephone systemmodel.

UNIT-V **(8)**

Simulation of PERT Networks, critical path computation, uncertainties in activity duration, resource allocation andconsideration.Simulationlanguagesandsoftware,continuousanddiscretesimulationlanguages,expression-basedlanguages,object-orientedsimulation,generalpurposevs.application-orientedsimulationpackages,CSMP-III,MODSIM-III.

REFRENCES:

1. GeoftreyGordon,"SystemSimulation",PHI
2. JerryBanks,JohnS.CBarryL.NelsonDavidM.Nicol,"DiscreteEventSystemSimulation",PearsonEducation
3. VPSingh,"SystemModelingandsimulation",NewAgeInternational.
4. AverillM.Law,W.DavidKelton,"SystemModelingandsimulationandAnalysis",TMH

E43:(MCA-515) Real Time Systems

UNIT-I **(8)**

Introduction: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc.,Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, ReferenceModels for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic TaskModel,precedenceconstraints and Data Dependency.

UNIT-II **(8)**

RealTimeScheduling: Common Approaches to Real TimeScheduling:Clock DrivenApproach, WeightedRoundRobin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimalityof Effective-Deadline-First(EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling,SchedulingAperiodic andSporadicjobsin PriorityDrivenand ClockDriven Systems.

UNIT-III **(8)**

ResourcesSharing: Effectof ResourceContentionandResourceAccess Control(RAC),Non-preemptiveCriticalSections,BasicPriority-InheritanceandPriority-CeilingProtocols,StackBasedPriority-CeilingProtocol,UseofPriority-Ceiling Protocol in Dynamic Priority Systems, Pre-emption Ceiling Protocol, Access Control in Multiple-UNITResources, ControllingConcurrentAccessesto Data Objects.

UNIT-IV **(8)**

Real Time Communication: Basic Concepts in Real time Communication, Soft and Hard RT Communication systems,ModelofRealTimeCommunication,Priority-BasedServiceandWeightedRound-RobinServiceDisciplinesforSwitched Networks, Medium Access Control Protocols for BroadcastNetworks, Internet and Resource ReservationProtocols

UNIT-V **(8)**

Real Time Operating Systems and Databases: Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues,Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Timedatabases

REFRENCES:

1. RealTimeSystemsbyJaneW.S. Liu,PearsonEducation Publication.
2. MallRajib,"RealTimeSystems",PearsonEducation
3. AlbertM.K.Cheng,"Real-TimeSystems:Scheduling,Analysis,andVerification",Wiley.

E44: (MCA-515) Pattern Recognition

UNIT-1 **(8)**

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation,Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean andcovariance,Normaldistribution,multivariate normaldensities,Chisquaredtest.

UNIT-II **(8)**

StatisticalPattenRecognition: BayesianDecisionTheory,Classifiers,Normaldensityand discriminantfunctions,

UNIT-III: **(8)**

Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reductionmethods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM),HiddenMarkovModels(HMM), Gaussian mixturemodels.

UNIT-IV: **(8)**

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest NeighborRule, Fuzzyclassification.

UNIT-V: **(8)**

UnsupervisedLearning&Clustering: Criterionfunctionsforclustering,ClusteringTechniques:Iterativesquare-errorpartitioned clustering–Kmeans, agglomerativehierarchicalclustering, Clustervalidation.

REFRENCES:

1. RichardO.Duda,PeterE.HartandDavidG.Stork,"PatternClassification",2ndEdition,JohnWiley,2006.
2. C.M.Bishop,"PatternRecognitionandMachineLearning",Springer,2009.
3. S.TheodoridisandK.Koutroumbas,"PatternRecognition",4thEdition,AcademicPres