SCHEME OF EXAMINATION
AND
COURSE OF STUDY

for

MASTER OF COMPUTER APPLICATIONS (MCA)
(Full- Time Three Years Course)

Under

Choice Based Credit System

(*w.e.f. Session 2015- 16*)

DEPARTMENT OF COMPUTER SCIENCE
FACULTY OF TECHNOLOGY
GURUKULA KANGRI VISHWAVIDYALAYA HARIDWAR
(***Deemed to be university u/s 3 of UGC Act 1956***)

JULY 2015

Medium of Instruction:

The medium of Instruction will be **English**.

Modes of Assessment/Evaluation :

Modes of Evaluation for Theory Courses

Modes of assessment used for rating learners' performance in a theory course shall include Internal Assessment and End Semester Examination. The weightage for Internal Assessment will be typically 30 percent. This will consist of two tests out of which one is compulsory class test and another is either a class test or assignment on live problems or course project in a group/individually.

The end semester examination will be held as per the Vishwavidyalaya schedule and the weightage for this would be 70 percent. It is normally of 3 hours duration and will cover the full syllabus of the course. The end semester examination is mandatory.

Modes of Evaluation for Laboratory Courses

The assessment in a laboratory course will be based on regular supervision of the learner's work, her/his performance in viva-voce examinations, the quality of their work as prescribed through laboratory work and an end semester test that contains performing an experiment if practical examination is mentioned. Final submission/examination for laboratory courses will normally be held before the end semester examination (final theory examinations). The grade for laboratory courses can be awarded only after successfully completion of Term Work, Practical and/or Oral examination as per the curriculum manual of the programme.

Modes of Evaluation for Seminars

Seminars are evaluated based on a written report, and/ or an oral presentation before a panel of internal examiners appointed by Head of Department. The supervisor and/or co-supervisor, when involved, are part of the panel. The grade for Seminar can be awarded only after successfully completion of Term Work (if any) and Oral Presentation as per the curriculum manual of the programme. The evaluation of the seminars is completed before the commencement of the end semester examination.

Modes of Evaluation for Mini-Projects/ Dissertation - Work

Mini- Project - I, Mini- Project – II, Mini- Project - III and Mini- Project - IV are separately graded, at the end of the respective semesters. These mini- projects are supervised or guided, and need regular interaction (at least once a Exercise) with the supervisor/guide. Project group has to submit a project report and defend it in front of a panel of examiners. Panel of examiners for Mini- project - I, Mini- project - II Mini- project - III and Mini- project - IV evaluation will be appointed by Head of Department. Dissertation evaluation will be conducted by pair of Internal and External examiners appointed by Vishwavidyalaya. The guidelines for the same and details of mode of assessment are given in the curriculum manual of the programme. The grade for Mini-Projects/ Dissertation can be awarded only after successfully completion of Term Work and Oral Presentation as per the curriculum manual of the programme.

Assessment:

Maximum Marks for Theory (Core/ Elective) Paper	=	100
Maximum Marks for General Paper/ Mini- Project	=	100
Maximum Marks for Practical	=	100
Maximum Marks for Dissertation	=	500

15 Theory Lecture/ Tutorial Hours per Semester	=	1 Credit
30 Practical Hours per Semester	=	1 Credit

Credits per Core paper	=	4
Credits per Elective paper	=	4
Credit per General Paper	=	1
Credit per Mini- project	=	1
Credits per Practical(Core/Elective)	=	2
Credits per Dissertation	=	20

Sem.	Core Paper	Elective Paper	General Paper	Mini-project	Practical	Disser-tation	Credits	Marks
I	5	-	2	-	2	-	26	900
II	5	-	1	1	2	-	26	900
III	3	2	1	1	2	-	26	900
IV	3	2	1	1	2	-	26	900
V	2	3	1	1	2	-	26	900
VI	-	-	-	-	-	1	20	500
TOTAL	**18**	**7**	**6**	**4**	**10**	**1**	**150**	**5000**

Marks Breakup for Practical(ESE)

S. No.	Activity	Marks
1	Practical Record Book	20
2	Practical Hands-on	30
3	Viva-voce	20
TOTAL		**70**

Marks Breakup for Mini- Project

S. No.	Activity	Marks
1	Synopsis	20
2	Project Report	40
3	Final Presentation/ Viva	40
TOTAL		**100**

DEPARTMENT OF COMPUTER SCIENCE
SCHEME OF EXAMINATION

MASTER OF COMPUTER APPLICATIONS (MCA)

Paper Code	Paper Title	Periods Per Week				Evaluation Scheme		
		L	T	P	C	CIA	ESE	Total
SEMESTER - I								
MCA-C101	Introduction to Information Technology & UNIX	4	-	-	4	30	70	100
MCA-C102	Programming with C	4	-	-	4	30	70	100
MCA-C103	Computer System Architecture	3	1	-	4	30	70	100
MCA-C104	Discrete Mathematics	3	1	-	4	30	70	100
MCA-C105	Soft Skills	3	1	-	4	30	70	100
MCA-G106	Value Based Education	1	-	-	1	100	-	100
MCA-G107	Seminar on Current Topic/ Trend	-	1	-	1	100	-	100
MCA-C151	UNIX/ LINUX Lab	-	-	4	2	30	70	100
MCA-C152	C Programming Lab	-	-	4	2	30	70	100
TOTAL		**18**	**4**	**8**	**26**			**900**
SEMESTER - II								
MCA-C201	Data structures	4	-	-	4	30	70	100
MCA-C202	Object Oriented Programming Using C++	4	-	-	4	30	70	100
MCA-C203	Operating Systems	3	1	-	4	30	70	100
MCA-C204	Graph Theory	3	1	-	4	30	70	100
MCA-C205	Principles of Accounting	3	1	-	4	30	70	100
MCA-G206	Group Discussion	-	1	-	1	100	-	100
MCA-G207	Mini- Project - I *(Based on MCA-C102 and MCA-C201)*	-	-	2	1	100	-	100
MCA-C251	Data Structures Lab	-	-	4	2	30	70	100
MCA-C252	C++ Programming Lab	-	-	4	2	30	70	100
TOTAL		**17**	**4**	**10**	**26**			**900**
SEMESTER - III								
MCA-C301	Data Base Management System	4	-	-	4	30	70	100
MCA-C302	Programming with Java	4	-	-	4	30	70	100
MCA-C303	Theory of Computer Science	3	1	-	4	30	70	100
	ELECTIVE - I (*Choose any ONE*)	3	1	-	4	30	70	100
MCA-E304A	Probability and Statistics							
MCA-E304B	Optimization Techniques							
MCA-E304C	Numerical Analysis							
	ELECTIVE -II (*Choose any ONE*)	3	1	-	4	30	70	100
MCA-E305A	Management Information System and Business Intelligence							
MCA-E305B	Managerial Economics							
MCA-E305C	E-Commerce							
MCA-G306	Presentation *(Based on Technical Topic)*	-	1	-	1	100	-	100
MCA-G307	Mini- Project -II *(Based on MCA-C202)*	-	-	2	1	100	-	100
MCA-C351	Data Base Management System Lab	-	-	4	2	30	70	100
MCA-C352	Java Programming Lab	-	-	4	2	30	70	100
TOTAL		**17**	**4**	**10**	**26**			**900**

Paper Code	Paper Title	Periods Per Week				Evaluation Scheme		
		L	T	P	C	CIA	ESE	Total
MCA-C401	Software Engineering	4	-	-	4	30	70	100
MCA-C402	Analysis and Design of Algorithms	4	-	-	4	30	70	100
MCA-C403	Computer Communication Networks	3	1	-	4	30	70	100
	ELECTIVE - III (*Choose any ONE*)	3	1	-	4	30	70	100
MCA-E404A	Cryptography							
MCA-E404B	Fuzzy Sets and Logic							
MCA-E404C	Computer Graphics							
	ELECTIVE - IV (*Choose any ONE*)	3	1	-	4	30	70	100
MCA-E405A	Compiler Design							
MCA-E405B	Artificial Intelligence							
MCA-E405C	Data Warehousing and Data Mining							
MCA-G406	Aptitude - I	-	1	-	1	100	-	100
MCA-G407	Mini-project -III *(Based on MCA-C301 and MCA-C302)*	-	-	2	1	100	-	100
MCA-C451	Software Engineering Lab	-	-	4	2	30	70	100
MCA-C452	Analysis and Design of Algorithms Lab	-	-	4	2	30	70	100
TOTAL		**17**	**4**	**10**	**26**			**900**
SEMESTER - V								
MCA-C501	Internet Technologies	4	-	-	4	30	70	100
MCA-C502	Advanced Java Programming	4	-	-	4	30	70	100
	ELECTIVE - V (*Choose any ONE*)	3	1	-	4	30	70	100
MCA-E503A	Information Security							
MCA-E503B	Parallel Processing							
MCA-E503C	Ad-hoc and Sensor Networks							
MCA-E503D	Professional Ethics							
	ELECTIVE - VI (*Choose any ONE*)	3	1	-	4	30	70	100
MCA-E504A	Wireless Mobile Communication							
MCA-E504B	Cloud Computing Concepts							
MCA-E504C	Digital Image Processing							
MCA-E504D	Artificial Neural Networks							
	ELECTIVE - VII (*Choose any ONE*)	3	1	-	4	30	70	100
MCA-E505A	Enterprise Resource Planning							
MCA-E505B	Software Quality and Testing							
MCA-E505C	Software Reliability and Quality Control							
MCA-E505D	Research Methodology and Tools							
MCA-G506	Aptitude - II	-	1	-	1	100	-	100
MCA-G507	Mini- Project-IV *(Based on MCA-C401/ MCA-C501/ MCA-C502)*	-	-	2	1	100	-	100
MCA-C551	Internet Technologies Lab	-	-	4	2	30	70	100
MCA-C552	Advanced Java Programming Lab	-	-	4	2	30	70	100
TOTAL		**17**	**4**	**10**	**26**			**900**
SEMESTER - VI								
MCA-C651	Dissertation	**-**	**-**	**40**	**20**			**500**
GRAND TOTAL					**150**			**5000**

MCA-C101		INTRODUCTION TO INFORMATION TECHNOLOGY & UNIX	L	T	C	CIA	ESE	Time for ESE
			4	0	4	30	70	3Hrs.
Prerequisites	**:**	**NIL**						
Objectives	**:**	• This course will discuss the increasing role of technology in the information professions. • This course will also provide a basic understanding of UNIX operation system.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Introduction : Algorithms, A Simple Model of Computer, Characteristics of Computer, Representation of Characters, integers and fractions in Computers, Number systems and their arithmetic, Floating-point and Fixed- point binary data, Computer Generation and Classification, Computers Languages.
Input/ Output Units: Description of Computer Input Unit, Other Input Methods, Computer Output Units. Memory Hierarchy, Primary Memory(DRAM, SDRAM,DDR, RDRAM, ROM, PROM, EPROM, EEPROM), Secondary Memory.

Introduction to WWW : Internet Standards, Introduction to WWW, WWW Architecture, SMTP, POP3, File Transfer Protocol, Overview of HTTP, HTTP request and response, Generation of dynamic web pages.

Markup Language (HTML): Introduction to HTML and HTML , Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks, Lists, Tables, Frames, HTML Forms.

Cascading Style Sheet (CSS): The need for CSS, Introduction to CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds, Manipulating text, Margins and Padding, Positioning using CSS.

UNIX/LINUX : Login process, basic file manipulation, working directory, directory naming, listing a non- working directory, copying and moving files to a different directory, manipulating directories, file and directory security, file links, using pipes and filters, using expressions and patterns, using vi editors, modifying vi files.

Shell Programming : Creating a shell script, storing script files, executing a shell script, displaying messages, user variables, using command- line variables, using decision structures, loops and testing, bourne shell variables, nesting scripts, basic c programming tools.

BOOKS RECOMMENDED :

1. V. Rajaraman, "Fundamental of Computers", PHI, 2000.
2. V. K. Jain, "Internet and Web Page Design", BPB Publication, First Edition, 2000.
3. Sumitabh Das, "Unix Concepts and Applications", TMH
4. Mike Joy, Stephen Jarvis, Michael Luck, "Introducing Unix and Linux", Palgrave Macmillan.

MCA-C102		PROGRAMMING WITH C	L	T	C	CIA	ESE	Time for ESE
			4	0	4	30	70	3Hrs.
Prerequisites	:	Idea of any programming language and logical development.						
Objectives	:	The students will learn programming logic, use of programming instructions, syntax and program structure. This subject will also create foundation for students to learn other complex programming languages like C++, Java etc.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Brief history of C, the library and linking, compiling a C program, Data types, Constants, Variables, I/O functions, operators, Control structures of C, Switch Statements. Functions, Recursion, Arrays and strings

Pointers : Fundamentals, Pointer declaration, Pointers as arguments, Pointers as return values, Pointer arithmetic, Using Pointers for array processing, Operations on pointers, Arrays of pointers, Dynamic storage allocation, Dynamically allocated strings, dynamically allocated arrays, Deallocating storage, Pointers to pointers and Pointers to functions.

Defining and processing a structure, User- defined data types, Structures and pointers passing structures to a function, Nested arrays and structures, Self- referential structures, Unions, enumerations. Storage classes, automatic variable, external variable& static variable.

String handling, Streams, File Operations, Formatted I/O, Character I/ O, Line I/O, Block I/O, File positioning, String I/ O.

Preprocessor directives, *Macro definition :* simple macros, parameterized macros, parentheses in macro definitions, creating longer macros, predefined macros, *Conditional Compilation :* the #if and #endif directives, the defined operator, the #ifdef and #ifndef directives, the #elif and #else directives, Uses of conditional compilation. Low- level Programming : Bitwise operators, Bit- fields in Structures, Other low- level techniques : Defining machine- dependent types, Using unions to provide multiple views of data, using pointers as addresses.

BOOKS RECOMMENDED :

1. H. Schildt, "The Complete Reference C", 4th Ed., TMH, 2000.
2. Deitel & Deitel, "C How to Program", (Prentice Hall), 1996.
3. K. N. King, "C Programming : A Modern Approach", W W Norton & Company, Inc, 1996.

MCA-C103		COMPUTER SYSTEM ARCHITECTURE	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Basic Knowledge of Electronics						
Objectives	:	To give basic knowledge of digital electronics, CPU architecture, components, and their organization. in addition, this course will introduce to the memory management system of computer.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Digital Electronics : Boolean algebra and logic Gates, Simplification of Boolean Functions, Adders, subtractors, Binary parallel adder, Decimal adder, Magnitude comparator, Decoders, Multiplexers. Flip-flops(RS, D, JK, Master- slave & T flip- flops), Flip- flop Excitation table, analysis, Design of counters, Design with state equations, Registers, Shift register, Ripple Counter, Synchronous Counters, Timing sequences.

Central Processing Unit: Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Bus Interconnection design of basic computer, Register organization; Stack organization; Instruction Format and Addressing Modes.

Control Unit : Control memory, Address Sequencing, Micro program, Design of Control Unit.

Arithmetic Algorithms: Integer multiplication; Integer division, Floating point representations and Arithmetic algorithms.

I/O Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Data Transfer, Priority Interrupt, Direct Memory Access, Input Output Processor.

Memory Organization : Memory Hierarchy, RAM, ROM, Associative Memory, Cache Memory Organization and Virtual Memory Organization.

BOOKS RECOMMENDED :

1. M. M. Mano, "Digital Logic and Computer Design", PHI, 1998.
2. M. M. Mano, "Computer Architecture", PHI, 1998.
3. C. Hamacher.,et.al., "Computer Organization", McGraw Hill, 5th Edition.
4. W. Stallings, "Computer Organization & Architecture", PHI.

MCA-C104		DISCRETE MATHEMATICS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Basic knowledge of Sets and Algebra.						
Objectives	:	This is a mathematics related subject which revises the knowledge acquired previously by the student. Logic, Relations and Functions, Algebraic structures, combinotorics will be introduced in this course.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Sets, Relations and Functions: Definition of Sets and subsets, De Morgan's law, Cardinality, Mathematical induction; Propositions; Equivalence relations; Binary, Equivalence and partial ordering relations, chains and anti chains, Job sequencing problem, Pigeonhole principle.

Introduction to Algebra : Groups, Subgroups, Cosets, Lagrange's Theorem, Permutation Group, Isomorphism and Homomorphism, Normal Subgroups, Rings, Integral Domain, Fields.

Mathematical Logic : Notation; Connectives; Normal forms; Principal Normal Forms; Theory of Inference for Statement Calculus; Predicate calculus; Inference theory of the Predicate Calculus.

Permutation & Combinations : Introduction, Rules sum & products, Permutations, Combinations, Generation of permutation & combinations, Discrete probability, Conditional probability.

Discrete Numeric Functions and Generating Functions: Manipulation, Asymptotic behavior; Generating Functions. Recurrence Relations.

Boolean Algebra : Lattices and Algebra Systems; Principle of Duality; Basic Properties of Algebraic System defined by Lattice; Distributive and Complemented Lattices; Boolean Lattices and Boolean Algebra; Uniqueness of Finite Boolean algebra; Boolean Functions and Boolean Expressions; Propositional Calculus.

BOOKS RECOMMENDED :

1. C. L. Liu, "Elements of Discrete Mathematics", McGraw Hill, 1985.
2. B. Colman and R.C.Busby, "Discrete Mathematical Structure for Computer Science", PHI, 1989.
3. P. Trembley and R. P. Manohar, "Discrete Mathematical Structures with Applications to Computer Science" McGraw Hill, 1988.

MCA-C105		SOFT SKILLS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Basic knowledge of English language.						
Objectives	:	To ensure the understanding of the basics of communication through English, application of the various models of verbal and non-verbal communication in the social and professional spheres. This course will also help in understanding the rules of phonology and its application, the basics of grammar to improve communication and speak a correct form of English.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Communication: Process of communication, Verbal and non- verbal communication, Language as a tool of communication, Levels of communication, Technical Communication, Differences between general and technical communication, Audio- Visual aids of communication.

Phonemes of English, Phonetic symbols, Accent, Intonation, Transcription of words, Words : Verbs, Finite, Nonfinite, Auxiliary, Model; Phrasal verbs : Antonyms, Synonyms; Sentence : Types (according to structure and meaning).

Business Letters: Sales and Credit letters; Letter of Enquiry; Letter of Quotation, Order, Claim and Adjustment Letters; **Official Letters**: D.O. Letters; Govt. Letters, Letters to Authorities etc.

Report Writing : Technical Proposal, Dissertation, Job Application, Resume.

Value- Based Text Readings

Following essays form the suggested text book with emphasis on Mechanics of writing,

a) The Aims of Science and the Humanities by M.E. Prior
b) The Language of Literature and Science by A. Huxley
c) Man and Nature by J. Bronowski
d) Man, Media and Society by G. Barry et.al.
e) Science and Survival by Barry Commoner

BOOKS RECOMMENDED :

1. V. N. Arora and Laxmi Chandra, "Improve Your Writing", Oxford Univ. Press, New Delhi.
2. Meenakshi Raman & Sangeeta Sharma, "Technical Communication – Principles and Practices", Oxford Univ. Press 2007, New Delhi.
3. R.C. Sharma & Krishna Mohan, "Business Correspondence and Report Writing", TMH, Delhi.
4. M. Rosen Blum, "How to Build Better Vocabulary", Bloomsbury Pub. London.
5. Norman Lewis , "Word Power Made Easy", W. R. Goyal Pub. & Distributors; Delhi.

MCA-G106		VALUE BASED EDUCATION	L	C	CIA
			1	1	100
Prerequisites	**:**	NIL			
Objectives	**:**	To provide guiding principles and tools for the development of a person recognizing that an individual is comprised of Physical, Intellectual, Emotional and Spiritual dimensions. This course will also enhance the knowledge of the principles of Arya Samaj and Gurukula education system.			

Understanding Value Education -Need, Basic Guidelines, Content, and Process, Self-exploration observing inside, Definition, Purpose, Content, Process, Acceptance, Present State, Things to done for future.

Basic Human Aspirations - Continuous happiness and prosperity, Exploring Happiness and Prosperity, Prevailing Nations of happiness and prosperity, Fulfilling Basic Aspirations, Basic Requirements, State today and reason, The need for Right understanding, Living in Harmony, Natural acceptance for Harmony, Human and Animal consciousness.

Understanding the Human Being -More than just the body, myself as co-existence, understanding needs for Body, Activities in self and Body, Self ("I") as the conscious Entity, Distinguishing the Needs for self and Body, Harmony in the self "I" - Activities in self "I", Problems Today, Effects of the Problem and its solution, Harmony with the Body - Understanding Sanyama and Suasthya.

Harmony in the family - Family a Basic Unit, Justice, Trust, Respect, Affection, Care, Guidance, Reverence, Glory, Gratitude, Love, From Family to world Family, Harmony in society- Family to society, Comprehensive Human goal (five Dimensions), Educations, Health, Justice Production, Exchange.

Harmony in Nature - Four orders (Things, Activity, Innateness, Natural Characteristic) Inter Connectedness, Recyclability, Conformance, Our state today and wayout, Harmony in Existence, Spare, Co-existence of Units, Limited and unlimited, Active and No-activity, Energized, Space is reflective and Transparent, Self-organized, Our actions today and future prospects.

Knowledge of the principles of Arya Samaj and Gurukula education system.

BOOKS RECOMMENDED :

1. R. R. Gaur, T. Sangal and G. P. Bagaria, "A Foundation Course in Human Values and Professional Ethics", Excel Books, First Edition, 2010, New Delhi.

MCA-G107		SEMINAR ON CURRENT TOPIC/ TREND	T	C	CIA
			1	1	100
Prerequisites	:	Awareness of current affairs and communication skills.			
Objectives	:	To prepare the students to give the presentations, face the audience and to develop the confidence which are very much needed for their professional life.			

This course enables students to present at least two seminars on current non- technical topics.

1. Oral Presentation is an important aspect of professional education. The Objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his/her interest.
2. Seminar topics can be chosen by the students with the advice from the faculty members
3. Students are to be exposed to following aspects of seminar presentations
    - Survey
    - Organization of Material
    - Preparation of OHP Slides/ PC Presentation
    - Report Writing

Each student is required to

4. Submit one page of synopsis of the seminar talk two days before for display on notice board.
5. Give 20 minutes presentation through OHP, PC and slide projector, followed by 10 minutes discussion.
6. Submit a report on the seminar topic with a list of references and slides used within a week.
7. Seminars are to be scheduled during the 5th week of the semester and any change in schedule should be discouraged.

MCA-C151	UNIX/ LINUX LAB	P	C	CIA	ESE	Time for ESE
		4	2	30	70	3Hrs.
Prerequisites	**:**	**NIL**				
Objectives	**:**	• To familiarize students with the Unix/ Linux environment • To learn the fundamentals of shell scripting/programming • To familiarize students with basic Unix/ Linux administration				

Excercise1

Study the following commands :

alias	cp	ftp	mail	tar
banner	date	gv	man	talk
bc	diff	gunzip	mkdir	telnet
bg	dir	head	more	unzip
cal	display	history	mv	vi
cat	df	id	passwd	vim
cc	du	indent	pine	vimtutor
cd	echo	dill	ps	wall
chgrp	exit	last	pwd	wait
chmod	fg	login	reboot	whereis
clear	file	logname	rm	who
chfn	finger	ln	rmdir	whoami
chown	find	logout	shutdown	write
cmp	gzip	ls	tail	zip
				ands

Excercise2

Session-1

a) Log into the system
b) Use vi editor to create a file called myfile.txt which contains some text.
c) correct typing errors during creation.
d) Save the file
e) logout of the system

Session-2

a) Log into the system
b) open the file created in session 1
c) Add some text
d) Change some text
e) Delete some text
f) Save the Changes
g) Logout of the system

Excercise3

a) Log into the system
b) Use the cat command to create a file containing the following data. Call it mytable use tabs to separate the fields.

1425	Ravi	15.65
4320	Ramu	26.27
6830	Sita	36.15
1450	Raju	21.86

c) Use the cat command to display the file, mytable.
d) Use the vi command to correct any errors in the file, mytable.
e) Use the sort command to sort the file mytable according to the first field. Call the sorted file my table (same name)
f) Print the file mytable
g) Use the cut and paste commands to swap fields 2 and 3 of mytable. Call it my table (same name)
h) Print the new file, mytable
i) Logout of the system.

Excercise4

Session-1

a) Login to the system
b) Use the appropriate command to determine your login shell
c) Use the /etc/passwd file to verify the result of step b.
d) Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.
e) Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.

Session-2

a) Write a sed command that deletes the first character in each line in a file.
b) Write a sed command that deletes the character before the last character in each line in a file.
c) Write a sed command that swaps the first and second words in each line in a file.

Excercise5

a) Pipe your /etc/passwd file to awk, and print out the home directory of each user.
b) Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word.
c) Repeat
d) Part using awk

Excercise6

Write a menu driven shell script which will print the following menu and execute the given task to display result on standard output.

MENU

1. Display calendar of current month
2. Display today's date and time
3. Display usernames those are currently logged in the system
4. Display your name at given x,y position
5. Display your terminal number
6. Exit

Excercise7

Shell programming using filters (including grep, egrep, fgrep)

Excercise8

Write a shell script to validate the entered date. (eg. Date format is: dd-mm-yyyy)

Excercise9

Write a shell script to check entered string is palindrome or not

Excercise10

a) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.
b) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
c) Write a shell script that determines the period for which a specified user is working on the system.

Excercise11

a) Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.
b) Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.

Excercise12

a) Write a shell script that computes the gross salary of a employee according to the following rules:
    i). If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.
    ii). If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic

   The basic salary is entered interactively through the key board.
b) Write a shell script that accepts two integers as its arguments and computers the value of first number raised to the power of the second number.

Excercise13

a) Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the user for the necessary information, such as the file name, new name and so on.
b) Write shell script that takes a login name as command – line argument and reports when that person logs in
c) Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.

Excercise14

a) Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
b) Develop an interactive script that asks for a word and a file name and then tells how many times that word occurred in the file.

c) Write a shell script to perform the following string operations:
   i). To extract a sub-string from a given string.
   ii). To find the length of a given string.

Excercise15

Write a C program that takes one or more file or directory names as command line input and reports the following information on the file:

- File type
- Number of links
- Read, write and execute permissions
- Time of last access

(Note : Use stat/fstat system calls)

Excercise16

Write C programs that simulate the following unix commands:

- mv
- cp

(Use system calls)

Excercise17

Write a C program that simulates ls Command
(Use system calls / directory API)

Excercise18

Write the awk program uncomment.awk which removes any comment from a C program. You can assume that the C source code contains only syntactically correct comments:

- starting with //, ending with a new line
- starting with /*, ending woth */ (can be multi-line)
- nesting of comments is not allowed
- Make sure that the number of lines of the C source code is not changed! When a line contains comments only, replace this line with an empty line.

Excercise19

Write an awk program using function, which capitalizes each word in a given string.

Excercise20

Write a program for process creation using C. (Use of gcc compiler)

Excercise21

Use of g++ compiler.

BOOKS RECOMMENDED :

1. M.G. Venkatesh Murthy , "Introduction to Unix & Shell Programming" , Pearson Education.
2. Sumitabha Das, "Unix Concepts and Applications", Fourth Edition, TMH.
3. Sumitabha Das, "Unix for Programmers andUusers", 3rd edition, Pearson Education.
4. B.A. Forouzan & R.F. Giberg , "Unix and Shell Programming –A Text Book", Thomson.

MCA-C152		C PROGRAMMING LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.
Prerequisites	**:**	**NIL**					
Objectives	**:**	• To gain experience about structured programming • To help students to understand the implementation of C language • To understand various features in C					

Lab Exercise List :

1. Find Area, Perimeter of Square & Rectangle.
2. Find max. Among 3 nos.
3. Check leap year
4. Factorial of Number
5. Calculate a^b
6. Prime Number.
7. Perfect Number.
8. Armstrong Number.
9. Floyd's Triangle
10. Fibonacci Series
11. Inter conversion of Decimal, Binary & Hexadecimal no.
12. LCM & GCD of numbers
13. Insert & Delete an element at given location in array.
14. Transpose of matrices
15. Multiplication of matrices
16. Display upper & lower diagonal of matrices
17. Array of Structure e.g. student result, Employee pay slip , Phone bill
18. Function with no parameter & no return values
19. Function with parameter & return values
20. Function with parameter & no return values
21. Function with call by reference
22. Recursion function e.g. sum of digit, reverse of digit
23. String manipulation function e.g. string copy, concatenation, compare, string length, reverse
24. Pointer Arithmetic
25. File handling e.g. Read / Write file, copy file, merging file
26. Random access of file
27. File handling with command line arguments
28. Drawing line, rectangle, circle, ellipse by using graph
29. Changing foreground/ background color
30. Changing color & font of text
31. Swapping of numbers by using bit wise operator.
32. Macro expansion
33. File Inclusion
34. IO interfacing & Device Driver using C.

MCA-C201		DATA STRUCTURES	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
Prerequisites	**:**	NIL					
Objectives	**:**	The basic algorithms related to handling data and organizing them. Various data structures like arrays, lists, stacks, queues, trees and graphs are introduced in this subject.					

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

*(Program implementations of algorithms are **NOT** to be asked.)*

Arrays, Stacks and Queues: Representation of Array (Single & Multi Dimensional Arrays), Address Calculation using Column & Row Major Ordering, Representation of Stacks & Queues Using Arrays and their Operations, Circular Queues, Conversion from Infix to Postfix and Evaluation of Postfix expressions using Stack.

Linked List: Singly linked list (operations on list), Linked stacks and queue, Polynomial representation and manipulation using linked list; Reading and Writing polynomials, Polynomial addition. Circular Linked list and doubly linked list.

Trees : Definition, BST traversal methods (Preorder, Postorder and Inorder), Recursive and non-recursive algorithms for traversal methods, Insertion into and deletion from a BST and their implementation. Height balanced AVL trees: Definition, Insertion of a node, height of an AVL tree. B-trees: Definition, Insertion and Deletion operations.

Searching and Sorting : Sequential & binary searches; Hashing schemes: hashing, Hash functions, Collision functions, Open addressing (Linear probing and modification), Chaining; Sorting methods : Insertion, selection, Bubble, Quick, Merge and Heap sorts.

Threaded binary tree : Introduction, Threads, in-order, preorder and post-order traversal, Insertion in Threaded tree.

Graph : Introduction. Representation: Adjacency Matrix and Adjacency List. ***Graph Traversals:*** Depth First Search, Breadth First Search. Applications of Graphs.

BOOKS RECOMMENDED :

1. Kruse, Leung and Tondo, "Data Structures and Program Design in C", PHI.
2. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Publ., 1994.

MCA-C202		OBJECT ORIENTED PROGRAMMING USING C++	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
Prerequisites	:	Programming with C.					
Objectives	:	• To learn how C++ supports Object Oriented principles • To understand and apply the principles hiding, localization and modularity in software development • To use the generic programming features of C++ including the STL					

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Input/ Output, Comments, Control Structures, Introducing Classes, Primitive Built-in Types, Literal Constants, Variables, const Qualifier, References, typedef Names, Enumerations, Class Types, Namespace using Declarations, Arrays, Pointers, Strings, Multi- dimensioned Arrays. Expressions and Operators, Type Conversions. Control Statements, Using the Preprocessor for Debugging. Local Objects, Inline Functions, Class Member Functions, Overloaded Functions, Pointers to Functions.

Classes : Class Definitions and Declarations, Implicit this Pointer, Class Scope, Constructors, Friends, static Class Members. Copy Control : Copy Constructor, Assignment Operator, Destructor, Managing Pointer Members. **Overloaded Operations and Conversions :** Defining an Overloaded Operator, Input and Output Operators, Arithmetic and Relational Operators, Assignment Operators, Subscript Operator, Member Access Operators, Increment and Decrement Operators, Call Operator and Function Objects, Conversions and Class Types.

Object-Oriented Programming: OOP : An Overview, Defining Base and Derived Classes, Conversions and Inheritance, Constructors and Copy Control, Class Scope under Inheritance, Pure Virtual Functions, Containers and Inheritance, Handle Classes and Inheritance.

Templates and Generic Programming : Template Definitions, Instantiation, Template Compilation Models, Class Template Members, Template Specializations, Overloading and Function Templates. Exception Handling, Namespaces, Multiple and Virtual Inheritance.

The IO Library : An Object-Oriented Library, Condition States, Managing the Output Buffer, File Input and Output, String Streams. **Sequential Containers :** Defining a Sequential Container, Iterators and Iterator Ranges, Sequence Container Operations, Deciding Which Container to Use, Container Adaptors. Associative Containers , The map Type, The set Type, The multimap and multiset Types.

BOOKS RECOMMENDED :

1. Lippman.S.B.., et al., "C++ Primer" Fourth Edition, Addition Wesley, 2005.
2. Herbert Scheldt, "Complete Reference", TMH.
3. Deitel H.M. & Deitel P.J. , "How to Program C+", PHI, 2003

MCA-C203		OPERATING SYSTEMS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	**:**	Data Structures, Computer Architecture, Assembly Language and Programming skills in C.						
Objectives	**:**	The course is an introduction to basic operating system principles. OS systems and structures, process management, process synchronization, memory management, peripheral device management and file systems are introduced.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Introduction: Operating system functions and characteristics, historical evolution of operating system. User-System interface. System call interface. Process Management :Process concept, process control block, process scheduling , operations on processes , inter-process communication. CPU scheduling: Scheduling concept, scheduling criteria, scheduling algorithms, multiple-processor scheduling.

Process Synchronization: Synchronization concept, synchronization requirement, Critical-Section Problem, Synchronization Hardware, semaphores; monitors.

Deadlocks: Deadlock Characterization, Deadlock prevention and avoidance, deadlock detection and recovery.

Memory Management : Introduction, logical and physical address space, dynamic loading, dynamic linking, swapping, Single Contiguous Memory Management, Fixed Partitioned Memory Management, Variable Partitions, Non- Contiguous Allocation, paging, segmentation, segmentation with paging.

Virtual memory management: Introduction, demand paging, performance of demand paging, page replacement algorithms, allocation of frames, thrashing, Other Consideration.

File management: File concept, file access and allocation methods, directory System, file protection mechanisms, free space management, recovery. Disk management : Disk structure, disk attachment, disk scheduling algorithms, disk management, swap space concept and management, RAID structure.

BOOKS RECOMMENDED :

1. Silberschatz, A. and Galvin, P. B., "Operating System Concepts", 7th Ed., Addison Wesley, 2006.
2. Tanenbaum, A.., "Modern Operating Systems", PHI , 2004.
3. Godbole, A.S., "Operating Systems", 2nd Ed., TMH, 2005.
4. Nutt, G., "Operating Systems", Addison-Wesley, 2004

MCA-C204		GRAPH THEORY	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	NIL						
Objectives	:	To familiarize the students with the concepts of graph theory and related algorithms.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

(*Theorems and Problems referring some research paper for detailed proof are **NOT** to be set in the question paper.*)

Introduction: Applications of Graphs; Finite and Infinite Graphs; Incidence and Degree; Isolated and Pendant Vertex; Isomorphism; Sub Graph, Walks, Paths and Circuits; Connected and Disconnected Graphs; Components of A Graph; Euler Graphs; Hamiltonian Paths and Circuits; The Traveling Salesman Problem.

Trees, Circuits and Cut-sets: Properties of Trees; Pendant Vertices in A Tree; Center of A Tree; Rooted and Binary Trees; Spanning Tree, Spanning Trees in A Weighted Graph, Algorithm For Shortest Spanning Tree, Fundamental Circuits, Cut-sets and Cut Vertices; Fundamental Cut-sets, Connectivity and Separability.

Planar Graphs : Combinatorial Vs Geometric Graphs; Planar Graph; Kuratowski's Graphs; Detection of Planarity; Geometric Dual; Thickness and Crossings.

Matrix representation and coloring : Path Matrix, Cut- Set Matrix, Circuit Matrix, Incidence Matrix, Adjacency Matrix and Their Properties.

Chromatic Number, Chromatic Polynomial, Chromatic Partitioning, Matchings, Covering and Four Colour Problem; Directed Graphs; Digraphs and Binary Relations; Directed Path and Connectedness; Adjacency Matrix of Digraph; Directed Tree: Arborescence; Paired Comparison and Tournaments; Counting Labeled and Unlabeled Trees.

Algorithms : Shortest path, minimal spanning tree, Connectedness and components, Fundamental circuits, Cut- vertices and separability, Isomorphism.

BOOKS RECOMMENDED :

1. N. Deo, "Graph Theory with Applications to Engineering and Computer Science", PHI, 1993.
2. M. N. S. Swamy and K. Thulasiraman, "Graphs, Networks and Algorithms", Wiley Inter-Science

MCA-C205		PRINCIPLES OF ACCOUNTING	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	**:**	NIL						
Objectives	**:**	The financial aspect of business and management will be taught to students through this subject. This will benefit students in understanding and analyzing financial statements of a business.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Accounting Process and Principles, Financial, Cost and Management Accounting.

Elements of Book Keeping, Journal, Cash and Handbook, Book Reconciliation Statement, Ledger, Trial Balance, Profit and Loss Accounts, Final Accounts of Proprietary and Partnership Concern and Balance Sheet.

Cost Accounting : Objectives, Elements of Cost, Understanding of The Different Methods of Costing.

Financial Management : Meaning, Scope and Role, A Brief Study of Functional Areas of Financial Management. Introduction To Various FM Tools, *Ration Analysis :* Meaning, Basis of Comparison, Types of Ratios

Working Capital Management : *Theory of Working Capital Management:* Introduction, Nature of Working Capital, Concepts and Definitions of Working Capital, Need For Working Capital, Permanent and Temporary Working Capital, Changes in Working Capital, Determinants of Working Capital.

Budgeting : Budgets, Purpose, Budgetary Control, Preparation of Budgets, Master Budget, Fixed and Flexible Budgeting.

BOOKS RECOMMENDED :

1. T. S. Grawal, "Introduction to Accounting", Sultan Chand & Co., 2000.
2. R. L. Gupta, "Principles of Accounting", Sultan Chand & Co., 2000.
3. I.M. Pandey, "Financial Management", TMH.
4. Jain & Kher, "Financial Management", TMH, 1999.

MCA-G206		GROUP DISCUSSION (On current non- technical topics)	T 1	C 1	CIA 100
Prerequisites	:	General knowledge, current affair awareness and communication skills.			
Objectives	:	To enable the students to present their ideas / perception / views with confidence and discuss the matter in group discussions.			

MCA-G207		MINI- PROJECT- I (Based on MCA-C102 and MCA-C201)	P 2	C 1	CIA 100
Prerequisites	**:**	Knowledge of programming language C.			
Objectives	**:**	The objective is to provide the students the in depth knowledge of C by implementing the concepts of data structure for a particular application.			

MCA-C251		DATA STRUCTURES LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.
Prerequisites	:	Data structures and C (mainly structures, functions and pointers).					
Objectives	:	This laboratory course gives a thorough understanding of the concepts of various Data Structures and their applications. It also provides a comprehensive understanding of the various algorithms for problem solving.					

1. Addition and Multiplication of Two Polynomials.
2. Addition and Transpose of Sparse Matrices.
3. Singly Linked List: Create, Display, Insertion, Deletion, Search, Reverse
4. Singly Circular Linked List: Create, Display, Insertion, Deletion, Search,
5. Doubly Linked List: Create, Display, Insertion, Deletion, Search, Reverse
6. Stack Implementation
7. Stack Application: Inter conversion of Infix, Prefix & Postfix
8. Stack Application: Palindrome & Matching Parenthesis.
9. Queue Implementation
10. Queue Application: Job Scheduling.
11. Sequential & binary searches
12. Hashing schemes
13. Sorting methods : Insertion, selection, Bubble, Quick, Merge and Heap sorts.
14. Binary Search Tree Implementation: Creation, Insertion, Deletion, Copy, Mirror, Traversal (Preorder, Post order, in order).
15. Graph Application: Depth First Search, Breadth First Search, Shortest Path Algorithm.

MCA-C252		C++ PROGRAMMING LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.
Prerequisites	:	Knowledge of C++					
Objectives	:	This lab work provides hands-on practical knowledge of C++ language.					

C++ Programming assignments based on class, inheritance, abstraction, encapsulation, dynamic binding, polymorphism, I/IO systems, exception handling should be covered.

Exercise 1 : Write a program to find the maximum of three using conditional operator.
Exercise 2 : Write a program to find the largest, second largest and third largest in a given array.
Exercise 3 : Write a program to find the factorial of a given number.
Exercise 4 : Write a program to generate the Fibonacci series.
Exercise 5 : Write a program to find the GCD and LCM of two no's.
Exercise 6 : Write a program to print the diagonal elements of matrix.
Exercise 7 : Write a Program to demonstrate use of array of objects.
Exercise 8 : Write a program to illustrate the use of scope resolution operator.
Exercise 9 : Write a program to find the square root using inline function.
Exercise 10 : Write a program to illustrate the use of friend function.
Exercise 11 : Write C++ program to create five object of book, get information of book using getdata() function including name, price, publication and author.
Exercise 12 : Write a program to take name, address as character array, age as int , salary as float and contains inline functions to set the values and display it.
Exercise 13 : Using the concept of function overloading Write function for calculating the area of triangle, circle and rectangle.
Exercise 14 : Write a function power to raise a number m to power n. The function takes a double value for m and int value for n. Use default value for n to make the function to calculate squares when this argument is omitted.
Exercise 15 : Create a class TIME with members hours, minutes, seconds. Take input, add two time objects passing objects to function and display result.
Exercise 16 : Write a program for multiplication of two matrices using OOP.
Exercise 17 : Create a class Student which has data members as name, branch, roll no, age ,sex ,marks in five subjects. Display the name of the student and his percentage who has more than 70%.Use array of objects.
Exercise 18 : Write a program access members of a student class using pointer to object members (or using indirection operator).
Exercise 19 : Write a program to generate a magic square using OOP.
Exercise 20 : Write a program to enter any number and find its factorial using constructor.
Exercise 21 : Write a program to perform addition of two complex numbers using constructor overloading. The first constructor which takes no argument is used to create objects which are not initialized, second which takes one argument is used to initialize real and imag parts to equal values and third which takes two argument is used to initialized real and imag to two different values.
Exercise 22 : Write a program to generate a Fibonacci series using copy constructor.
Exercise 23 : Create a class which keep track of number of its instances. Use static data member, constructors and destructors to maintain updated information about active objects.
Exercise 24 : Write a program to demonstrate the use of "this" pointer.

Exercise 25 : Write a program to find the biggest of three numbers using friend function.

Exercise 26 : Write a program to demonstrate the use of friend function with Inline assignment.

Exercise 27 : Write a program to find the greatest of two given numbers in two different classes using friend function.

Exercise 28 : Write a program to find the sum of two numbers declared in a class and display the numbers and sum using friend class.

Exercise 29 : Write a program to overload binary + operator.

Exercise 30 : Write a program to overload ++ operator to increment age of person by one month.

Exercise 31 : Write a program to overload less than (<) operator.

Exercise 32 : Write a program to overload assignment (=) operator.

Exercise 33 : Implement a class string containing the following functions:

- Overload + operator to carry out the concatenation of strings.
- Overload = operator to carry out string copy.
- Overload <= operator to carry out the comparison of strings.
- Function to display the length of a string.
- Function tolower( ) to convert upper case letters to lower case.
- Function toupper( ) to convert lower case letters to upper case.

Exercise 34 : Write a program to overload new and delete operators.

Exercise 35 : Write a program to overload unary minus (-) operator using friend function.

Exercise 36 : Create a base class basic_info with data members name ,roll no, sex and two member functions getdata and display. Derive a class physical_fit from basic_info which has data members height and weight and member functions getdata and display. Display all the information using object of derived class.

Exercise 37 : Create class first with data members book no, book name and member function getdata and putdata. Create a class second with data members author name ,publisher and members getdata and showdata. Derive a class third from first and second with data member no of pages and year of publication. Display all these information using array of objects of third class.

Exercise 38 : Design three classes STUDENT ,EXAM and RESULT. The STUDENT class has datamembers such as rollno, name. create a class EXAM by inheriting the STUDENT class. The EXAM class adds datamembers representing the marks scored in six subjects. Derive the RESULT from the EXAM class and has its own datamembers such as totalmarks.Write a program to model this relationship.

Exercise 39 : Create an abstract base class called FIGURE and derive two classes CLOSE and OPEN from that. Declare two more classes called POLYGON and ELLIPSE using CLOSE class. Create derived classes LINE and POLYLINE from the OPEN class .All classes must have appropriate member functions including constructors and destructors.

Exercise 40 : Create a base class called SHAPE. Use this class to store two double type values. Derive two specific classes called TRIANGLE and RECTANGLE from the base class. Add to the base class, a member function getdata to initialize base class datamembers and another member function display to compute and display the area of figures. Make display a virtual function and redefine this function in the derived classes to suit their requirements. Using these three classes design a program that will accept driven of a TRINGLE or RECTANGLE interactively and display the area.

Exercise 41 : Create a class called LIST with two pure virtual function store() and retrieve().To store a value call store and to retrieve call retrieve function. Derive two classes stack and queue from it and override store and retrieve.

Exercise 42 : Write a program to define the function template for swapping two items of the various data types such as integer, float and characters.

Exercise 43 : Write a program to define the function template for calculating the square of given numbers with different data types.

Exercise 44 : Write a program to illustrate how template functions can be overloaded.

Exercise 45 : Write a program to illustrate how to define and declare a class template for reading two data items from the keyboard and to find their sum.

Exercise 46 : Write a program to illustrate the use of a vector class template for performing the scalar product of int type vectors as well as float type vectors.

Exercise 47 : Write a program to demonstrate the use of special functions, constructor and destructor in the class template. The program is used to find the biggest of two entered numbers.

Exercise 48 : Write a program to read a set of lines from the keyboard and to store it on a specified file.

Exercise 49 : Write a program to read a text file and display its contents on the screen.

Exercise 50 : Write a program to copy the contents of a file into another.

Exercise 51 : Write a program to perform the deletion of white spaces such as horizontal tab ,vertical tab, space, line feed, new line and carriage return from a text file and store the contents of the file without the white spaces on another file.

Exercise 52 : Write a program to convert lower case character to an upper case character of a text file.

Exercise 53 : Write a program to read the class object of student_info such as name, age, sex, height and weight from the keyboard and to store them on a specified file using read() and write() functions. Again the same file is opened for reading and displaying the contents of the file on the screen.

Exercise 54 : Write a program to read two numbers and then divide first no by second no and raise an exception if second number is zero.

Exercise 55 : Write a program to raise an exception if any attempt is made to refer to an element whose index is beyond the array size.

MCA-C301		DATA BASE MANAGEMENT SYSTEM	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
Prerequisites	:	• Elementary Maths (sets and Relations) • Basic Data Structure Concepts					
Objectives	:	The goal of this course is to teach the fundamentals of the database systems. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of databases.					

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Introduction: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Object-Based and Semi structured Databases, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators.

Relational Model: Structure of Relational Databases, Fundamental Relational-Algebra Operations, Additional Relational-Algebra Operations, Extended Relational-Algebra Operations, Null Values, Modification of the Database.

SQL: Background , Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Complex Queries, Views, Modification of the Database, Joined Relations.

Advanced SQL: SQL Data Types and Schemas, Integrity Constraints, Authorization, Embedded SQL, Dynamic SQL.

Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity-Relationship Diagrams, Weak Entity Sets, and Extended E-R Features, Reduction to Relational Schemas.

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Decomposition Using Functional Dependencies, Database-Design Process.

Storage and File Structure: Overview of Physical Storage Media, Magnetic Disks, File Organization, Organization of Records in Files, Data-Dictionary Storage.

Transactions: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability.

Concurrency Control: ***Lock-Based Protocols:*** locks, granting of locks, Two-Phase locking protocol, implementation of locking. ***Timestamp-Based Protocols:*** timestamps, Timestamp-ordering protocol, Thomas' write rule. ***Deadlock Handling:*** deadlock prevention, deadlock detection, recovery from

deadlock. Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage.

BOOKS RECOMMENDED :

1. Silberschatz, H F Korth and S. Sudarshan, "Database System Concepts", 5th Ed, McGraw Hill, 2006.
2. Elmasari and Navathe, "Fundamentals of Database Systems", 4th edition, Addison Wesley Publishing Company.

MCA-C302		PROGRAMMING WITH JAVA	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
Prerequisites	:	Programming using C++ and Object Oriented Paradigm.					
Objectives	:	The aim of the course is to provide a thorough grounding in object-oriented techniques for Java as well as to examine the major uses of Java - internet programming, design pattern, user interfaces and networking.					

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Java Programming Fundamentals: History of Java, Java's Key Features, Java Virtual Machine, Identifiers, Comments, Keywords, Eight Primitives, Using Objects. Introduction, Overview of Java, Data types, Variables and Arrays, Operators, Control Statements, ***Classpath & JARs:*** 'Classpath' in Java, Java Archives.

Classes: Classes & Packages, 'import' Statement, Importance of Encapsulation, Java Constructors, Access Modifiers, Method Overloading. ***Polymorphism and Inheritance:*** 'Protected' Modifier, Using 'this' and 'super', 'final' keyword, Static Members & Methods. Interfaces & Abstract Classes, Complete Construction Process, Class 'Object', Nested Classes, Enums in Java.

Basic Design Patterns : Basic Concepts of Design Patterns, Iterators, Pattern Concept, The OBSERVER Pattern, Layout Managers and the STRATEGY Pattern, components, Containers, and the COMPOSITE Pattern, Scroll Bars and the DECORATOR Pattern. ***Java Object Model:*** The Java Type System, Type Inquiry, the Object Class, Shallow and Deep Copy, Serialization, Reflection

Exception, Collections and IO : ***Exceptions & Assertions:*** Types of Program Errors, The Exception Model, Checked and Unchecked Exceptions, Defining Custom Exceptions, Assertions. ***Working with Common Classes:*** java.lang.String, java.lang.System, java.util.Calendar. ***Java Collection Framework & Generics:*** List Basics, Using Lists Wisely, Other Collection Classes. ***Java IO:*** Input Stream/Output Stream, Java Serialization, Readers & Writers, Working with Files.

Thread and Applet : Java Thread Model, Thread Priorities, Synchronization, Messaging, Thread Class, Runnable Interface. Applet Architecture, Skeleton, Applet Display Methods, HTML APPLET tag, Passing Parameters to the Applet, udioClip and AppletStub Interface, Delegation Event Model, Event Classes.

Networking: Overview, TCP/IP Sockets, Writing Your Own Web Server.

BOOKS RECOMMENDED :

1. Schildt, H.. "JAVA The Complete Reference", Seventh Edition, TMH, 2007.
2. Arnold, K., "The Java Programming Language", Third Edition, Pearson Education.
3. Balagurswamy E., "Programming with Java", TMH, 2nd Edition, 2000.

MCA-C303		THEORY OF COMPUTER SCIENCE	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Fundamentals of discrete mathematics.						
Objectives	:	The course introduces some fundamental concepts in automata theory and formal languages. The students will be familiarized with regular expression, finite automaton, formal language, grammar, pushdown automaton and Turing machine.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

(*Proof of theorems to be done by the method of constructive algorithms*)

Introduction to Languages; Recursive Definitions; Regular Expressions; Finite Automata; Transition Graphs; Kleene's Theorem;

Non- Deterministic Finite Automata, Finite Automata with Output - Moore and Mealy machines, Equivalence of Moore and Mealy machines; Regular Languages; Non-regular Languages; Decidability.

Context-Free Grammars.

Trees; Regular Grammars; Chomsky's Normal Form; Pushdown Automata; Context- Free Languages; Non- Context- Free Languages;

Parsing; Decidability for CFG - Emptiness, Finiteness and Membership questions about CFG.

Turing Machines (TM); Post Machines (PM), Simulating a PM on TM.

Recursively Enumerable Languages; Encoding of Turing Machines; Phrase Structure Grammar; Context Sensitive Grammar; Defining the Computer and Computable Functions; Church's Thesis; Halting Problem for Turing Machines.

BOOKS RECOMMENDED :

1. Cohen, Daniel I.A., "Introduction to Computer Theory", John Wiley & Sons
2. Hopcroft, J.E. & Ullman, J.D, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House
3. Lewis, H.R., Papadilypriou, C.H., "Elements of the Theory of Computation", PHI, 1981.

MCA-E304A		PROBABILITY AND STATISTICS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	NIL						
Objectives	:	This course provides an introduction to some concepts of probability and statistics with applications for students who would like to have careers in information intensive fields.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Basic Statistics : Measures of central tendency - mean, median, mode; Measures of dispersion-Range, Mean deviation, Quartile deviation and Standard deviation; Moments, Skewness and Kurtosis, Linear correlation, Karl Pearson's coefficient of Correlation, Rank correlation and linear regression.

Probability Theory : Sample space, Events, Different approaches to probability, Addition and multiplication theorems on probability, Independent events, Conditional probability, Bayes Theorem

Random variables and Distribution : Random variables, Probability density functions and distribution functions, Marginal density functions, Joint density functions, mathematical expectations, moments and moment generating functions. Discrete probability distributions -Binomial, Poisson distribution, Continuous probability distributions- uniform distribution and normal distribution.

Sampling and Estimation : *Theory of Sampling*: Population and sample, Types of sampling, *Theory of Estimation:* Introduction, point estimation, methods of point estimation-Maximum Likelihood estimation and method of moments, Central Limit Theorem (Statement only) .

Testing of Hypothesis : Null and alternative hypothesis, types of errors, level of significance, critical region, Large sample tests – Testing of hypothesis concerning mean of a population and equality of means of two populations Small sample tests – t Test-for single mean, difference of means. Paired t-test, Chi-square test (Concept of test statistic ns2/2) , F test - test for equality of two population variances.

BOOKS RECOMMENDED :

1. S. C. Gupta, "Fundamentals of Statistics", 6th Edition, Himalaya Publications.
2. Medenhall, "Introduction to Probability and Statistics", Thomson Learning, 12 Edn.
3. S. C. Gupta ,V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand Publications.
4. Robert V. Hogg &Allen T. Craig, "Introduction to Mathematical Statistics", Pearson education.

MCA-E304B		OPTIMIZATION TECHNIQUES	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Fundamental knowledge of calculus and linear algebra.						
Objectives	:	• To provide the concept and an understanding of basic concepts in Operations Research Techniques for Analysis and Modeling in Computer Applications. • To understand, develop and solve mathematical model of linear programming problems • To understand, develop and solve mathematical model of Transport and assignment problems						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Introduction to Operations Research : Origin and Development of Operations Research, Nature and Characteristic Features of OR, Models in OR, OR and Decision Making, Phases of Operations Research.

Linear Programming : Introduction, Construction of LP Model, Graphical LP Solution.

Simplex Method: Introduction, Standard LP Form and its basic Solutions, Simplex Algorithm, Artificial Starting Solution, Special cases in Simplex Method, Applications.

Duality: Introduction, Definition of Dual Problems, Relationship between the Optimal Primal and Dual Solutions, Economic Interpretation of Duality, Dual Simplex Method, Primal Dual Computation.

Integer Programming : Methods of Integer Programming, Cutting-Plane Method: Fractional (Pure Integer) Method, Mixed-Cut method.

Branch and Bound Technique.

Transportation and Assignment Model: Definition of Transportation Model, Non Traditional Transportation Model, Transportation Algorithms, Assignments Model.

Deterministic Dynamic Programming: Introduction, Recursive Nature of Computing, Forward and Backward Recursion, Applications of Dynamic Programming in Optimal Sub- division Problem, Shortest Route Problem, Cargo Loading Problem, Reliability Problem.

Game Theory*: Minimax- Maximin pure strategies, Mixed strategies and Expected Payoff, Concept of Dominance, Graphical Solution of m x 2 and 2 x n Games.

PERT/CPM: Arrow (Network) Diagram Representation, Time Estimates for Activities, Earliest Expected Completion Time of Events (ET), Latest Allowable Event Completion Time(TL), Critical Path and Critical Path Calculations, PERT: Probability Consideration in Project Scheduling, PERT calculations.

Queuing Theory: Definition of Queuing System, Characteristics of Queuing Models, Notation, Transient and Steady State of Queuing System, Birth-Death process, Pure birth & Pure Death processes, (M/M/1):(FIFO/∞/∞); (M/M/s):(FIFO/∞/∞) (M/M/1):(FIFO/N/∞) Models, Their Characteristics and State Transition Sate Diagrams.

BOOKS RECOMMENDED :

1. Taha, Hamdy A.,"Operations Research : An Introduction", 7th Ed. Pearson Education
2. *Kanti Swarup, P.K. Gupta, Man Mohan, "Operations Research", Sultan Chand & Sons.
3. Hiller, F.S. & Liberman, G.J., "Introduction to Operations Research", 2nd Ed., Holden Day Inc. London.

MCA-E304C		NUMERICAL ANALYSIS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	**:**	Basic of Mathematics						
Objectives	**:**	The objective of this course is to enable students to obtain an intuitive and working understanding of numerical methods for the basic problems of numerical analysis and gain experience in the implementation of numerical methods using a computer. They would also gain an appreciation of the concept of error in these methods and the need to analyze and predict it.						
NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.									

Introduction: Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation, Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation

Solution of Algebraic and Transcendental Equation: Bisection Method, Iteration method, Method of false position, Newton-Raphson method, Methods of finding complex roots, Muller's method, Rate of convergence of Iterative methods, Polynomial Equations.

Interpolation: Finite Differences, Difference tables. ***Polynomial Interpolation:*** Newton's forward and backward formula. ***Central Difference Formulae:*** Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. ***Interpolation with unequal intervals:*** Langrange's Interpolation, Newton Divided difference formula, Hermite's Interpolation

Numerical Integration and Differentiation: ***Numerical Integration:*** Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule, Waddle's rule. ***Solution of differential Equations:*** Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta Methods, Predictor Corrector Methods, Automatic Error Monitoring and Stability of solution

Statistical Computation: Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves etc, Data fitting with Cubic splines, Regression Analysis, Linear and Non linear Regression, Multiple regression, Statistical Quality Control methods.

BOOKS RECOMMENDED :

1. Rajaraman V, "Computer Oriented Numerical Methods", Pearson Education
2. Gerald & Whealey, "Applied Numerical Analyses", Addison Wesley Publishing Company.
3. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engg. Computations", New Age Int.
4. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi
5. Sastry S. S, "Introductory Methods of Numerical Analysis", Pearson Education.

MCA-E305A		MANAGEMENT INFORMATION SYSTEM AND BUSINESS INTELLIGENCE	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	NIL						
Objectives	:	This subject will teach the student foundations of Management Information System along with exposure to modern business information systems.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

System and Information Concepts : General Model, Types of systems, Subsystems, Feedback control, Systems approach to organization, Law of requisite variety, Control by exception, Information Concepts, Types of Information, Quality of Information, Value of Information, Mini cases related to Feedback Control.

Management Information System : Definitions, Role of MIS, MIS in Academics, Structure of MIS based on management activity and functions, System and Information concepts to MIS.

Decision Making Systems, Modeling and Analysis : Decision Making Definition and Concept, Phases of Decision Making Process, Modeling Process, Static and Dynamic Models, Sensitivity Analysis, Heuristic programming, Simulation

Decision Support System : DSS Definition, Characteristics & Capabilities of DSS, DSS Application, Case Study.

Expert System : Basic concepts of Expert System, Structure of Expert System, How Expert System works, Expert System Application, Comparison of Conventional & Expert System, Case Study.

Executive Information and Support Systems: Enterprise & Executive Information System Concept and Definition, Enterprise & Executive Support System Concept and Definition, Information needs of Executives, Characteristics and benefits of EIS, Comparing and Integrating EIS and DSS.

Business Intelligence : Definition of Problem (Corporate problems & Issues), Concept of data mart, data warehousing and data mining , data visualization and presentation, Designing physical database, Deploying and supporting DW/BI system, BI Architecture – spread sheets, concept of dashboard, OLAP, decision engineering, LIS, BI Tools – concept of dashboard, BI Application in various domains, BI Analytics (discriminate analysis and logistic regression, cluster analysis, principle component analysis).

BOOKS RECOMMENDED :

1. Gordan Devis, Margrethe H. Oison, "Management Information System", TMH, 3rd Ed.
2. Robert Murdick, Joel e. Ross, "Information Systems for Modern Management", PHI, 3rd Ed.
3. Efraim Turban, "Decision Support & Intelligent System", Pearson, 8th Ed.
4. Waman S..Jawadekar, "Management Information System", TMH, 4th Ed.
5. V.Rajaraman, "Analysis and Design of Information System", PHI, 2nd Ed.

MCA-E305B	MANAGERIAL ECONOMICS	L	T	C	CIA	ESE	Time for ESE
		3	1	4	30	70	3Hrs.
Prerequisites	:	NIL					
Objectives	:	This subject will teach the student foundations of Management Information System along with exposure to modern business information systems.					

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

The Fundamentals of Managerial Economics : Goals and Constraints, The Nature and Importance of Profits, Understanding Incentives, Economic rationality, Scarcity and opportunity cost, Marginal and Incremental Analysis, Basic Calculus: The Calculus of Optimization.

Theory of Demand : Demand and Supply, Market Equilibrium, Price Ceilings and Price Floors, Comparative Statics: Changes in Demand and Supply. Price Elasticity of Demand, Price Elasticity, Total Revenue, and Marginal Revenue, Factors Affecting Price Elasticity, Cross Price Elasticity. Income Elasticity of Demand, Other Elasticities, Elasticities for Nonlinear Demand Functions. Elasticity of Supply, Demand Forecasting, Choice and Utility Theory, Law of Diminishing marginal utility, Consumer Equilibrium, Indifference curve Analysis, Consumer Surplus, Price effect, Substitution Effect and Income Effect.

Theory of Production and Cost : The Production Function, Profit-Maximizing Input Usage. Isoquants and Isocosts, Cost Minimization and Optimal Input Substitution. The Cost Function, Breakeven analysis, Contribution analysis, Long-run Costs and Economies of Scale, Multiple Cost Functions and Economies of Scope. Learning curve

Theory of Market and pricing : The Nature of Industry, Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly, Game theory, Product pricing.

BOOKS RECOMMENDED :

1. Tomas and Maurice, "Managerial Economics: Concept and Applications", 8th Ed. McGraw-Hill.
2. Barry Keating, J. Holton Wilson, "Managerial Economics", Biztantra, Second Edition, 2003.
3. Dominick Salvatore, "Managerial Economics", Thomson, Fourth Edition, 2001.
4. P.L. Mehta, "Managerial Economics – Analysis, Problems and Cases", Sultan Chand Sons, Delhi.
5. Varshney and Maheswari, "Managerial Economics", Sultan Chand and Sons, New Delhi.
6. G.S. Gupta, "Managerial Economics", T M H, New Delhi

MCA-E305C		E-COMMERCE	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	**:**	NIL						
Objectives	**:**	• To understand the nature of e-Commerce2 • To recognize the business impact and potential of e-Commerce • To explain the technologies required to make e-Commerce viable • To apply the concepts of Internet security in e-business applications • To assess the suitability of various design principles for websites and applications • To explain the economic consequences of e-Commerce • To discuss the trends in e-Commerce and the use of the Internet						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

An introduction to Electronic commerce: What is E-Commerce (Introduction and Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E- Commerce, Electronic Commerce Applications, Electronic Commerce and Electronic Business(C2C)(C2G,G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C)

The Internet and WWW: Evolution of Internet, Domain Names and Internet Organization (.edu, .com, .mil, .gov, .net etc.), Types of Network, Internet Service Provider, World Wide Web, Internet & Extranet, Role of Internet in B2B Application, building own website, Cost, Time, Reach, Registering a Domain Name, Web promotion, Target email, Baner, Exchange, Shopping Bots

Internet Security: Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate Email privacy, Computer Crime (Laws, Types of Crimes), Threats, Attack on Computer System, Software Packages for privacy, Hacking, Computer Virus (How it spreads, Virus problem, virus protection, Encryption and Decryption, Secret key Cryptography, DES, Public Key Encryption, RSA, Authorisation and Authentication, Firewall, Digital Signature(How it Works)

Electronic Data Exchange: Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model. **Electronic Payment System:** Introduction, Types of Electronic Payment System, Payment Types, Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment Cash, Electronic Cash

Planning for Electronic Commerce: Planning Electronic Commerce initiates, Linking objectives to business strategies, Measuring cost objectives, Comparing benefits to Costs, Strategies for developing electronic commerce web sites

Internet Marketing: The PROS and CONS of online shopping, The cons of online shopping, Justify an Internet business, Internet marketing techniques, The E-cycle of Internet marketing, Personalization e-commerce.

RECOMMENDED BOOKS :

1. G.S.V.Murthy , "E-Commerce Concepts, Models, Strategies", Himalaya Publishing House
2. Kamlesh K Bajaj and Debjani Nag , "E- Commerce ", TMH
3. Gray P. Schneider, "Electronic commerce",

MCA-G306		PRESENTATION (Based on Technical Topic)	T	C	CIA
			1	1	100
Prerequisites	**:**	NIL			
Objectives	**:**	This course enables students to present a power point presentation based on any technical topic.			

1. The Objective of the presentation is to prepare the student for systematic independent study of state of the art topics in broad area of his/her specialization.
2. Seminar topics can be chosen by the students with the advice from the faculty members
3. Students are to be exposed to following aspects of seminar presentations
    - Literature Survey
    - Organization of Material
    - Preparation of PC Presentation
    - Technical Writing

   Each student is required to
4. Submit one page of synopsis of the seminar talk two days before for display on notice board.
5. Give 20 minutes presentation through PC followed by 10 minutes discussion.
6. Submit a report on the seminar topic with a list of references and slides used within a week.
7. Seminars are to be scheduled during the 5th week of the semester and any change in schedule should be discouraged.

MCA-G307		**MINI- PROJECT- II (Based on MCA-C202)**	**P**	**C**	**CIA**
			2	**1**	**100**
Prerequisites	**:**	Knowledge of C++ Programming Language			
Objectives	**:**	The main objective to work on a mini- project is to develop an application using the concepts of C++ programming language.			

MCA-C351		DATA BASE MANAGEMENT SYSTEM LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.
Prerequisites	:	Knowledge of DBMS.					
Objectives	:	This laboratory course gives a thorough understanding of the concepts of various DBMS and their applications. It also provides a comprehensive understanding of various database design and SQL queries.					

Group - I. SQL/PL-SQL :

Exercise 1:

i). Create table Salespeople with fields snum, sname, city, commission
ii). Orders table with field's onum, odate, snum, amt
iii). Customers table with field's cnum, cname, city, rating, snum.

Exercise 2:

i). Add at least 10 records
ii). Display all the records with all sales peoples information.
iii). Display the details of fields sname, commission
iv). Display the odate, snum, onum, amt from orders table.
v). Display snum from orders table without duplications.
vi). Display name & city of salesman where city is "Pune
vii). Display all details of customer where rating is 100.
viii). Display all details from customer table where salespersons number is 1001.
ix). Display the numbers of sales persons, with orders currently in the orders table without any repeats.
x). Display all customers where rating is more than 200
xi). Display all customers where city is 'Mumbai' rating is more than 100.
xii). Display all customers where city is either 'Pune' or 'Mumbai'
xiii). List all customers not having city 'Pune' or rating more than 100
xiv). List all orders between order dates 10/03/05 to 30/3/05
xv). Display all orders more that 1000 amt.
xvi). Display names & cities of all salespeople in 'Pune' with a commission above 10.
xvii). Display all customers excluding those, with rating less than equal to 100, unless they are located in 'Nagar'
xviii). Display all sales persons names starting with character 'G'.
xix). Display all sales persons names starting with character 'G', the 4th character is 'A' & the rest of characters will be any.
xx). Find all records from customers table where city is not known i.e. NULL.
xxi). Display all the customer's names begins with a letter A to G.
xxii). Assume each salesperson has a 12% commission on order amt. Display orderno, snum, commission for that order.

Exercise 3:

i). Display all the customers' records, arranged on name.
ii). Display all customers records arranged on rating in desc. Order.
iii). Display all sales persons records arranged on snum

iv). Display the count for total number of customers in customers table.
v). Display the count of snum in order table without duplication of snum.
vi). Display the counts of all orders for Feb05
vii). Display the count of different non-NULL city values in the customer's table.
viii). Display the maximum outstanding amount as blnc+amt
ix). Display the minimum rating within customers table.
x). Display average of amt.
xi). Display sales persons number wise maximum amt from order table.
xii). Display the largest order taken by each salesperson on each date.
xiii). Display the details of maximum orders above 3000.
xiv). Display details of orders order number & date wise
xv). Display customer's highest ratings in each city.
xvi). Write a query that totals the orders for each day & places the results in descending order.

Exercise 4:

i). Add a column curr_bal in orders table for current balance
ii). Increase commission of all sales persons by 200.
iii). Delete all orders where odate is less than 5-2-05

Exercise 5:

i). Display names of all customers matched with the salespeople serving them.
ii). Find all orders by customers not located in same cities as their Salespersons.
iii). Display each order number followed by the name of customer who made it.
iv). Calculate the amount of salespersons commissions on each order by a customer with a rating above 100.
v). Display the pairs of salespeople who are living in the same city. Exclude combinations of sales people with themselves as well as duplicate rows with the order reversed.
vi). Display the names & cities of all customers with same rating as Hoffman.

Exercise 6:

i). Write a query that uses a sub-query to obtain all orders for the customer named 'Gopal'. Assume you do not know the customer number.
ii). Write a query that produces the names & ratings of all customers who have above-average orders.
iii). Write a query that selects the total amt in orders for each salesperson for whom this total is greater than the amount of the largest order in table.

Exercise 7:

i). Create a union of two queries that shows the names, cities 7 ratings of all customers. Those with a rating of 200 or greater will also have ratings "high rating", while the others will have the words "low rating".
ii). Write a command that produces the name & number of each salesperson & each customer with more than one current order. Put results in alphabetical order.

Exercise 8:

i). Create an index that would permit each salesperson to retrieve his or her orders grouped by date quickly.

ii). Create a view that shows all of the customers who have highest ratings.

iii). Create a view that shows number of salespeople in each city.

Group II. Forms/Reports:

1. Creation of forms for the case study assigned.
2. Creation of Reports based on different queries.
3. Creating password and security features for applications.
4. Usage of file locking table locking, facilities in applications
5. Creation of Small fully fledged database application spreading over to 3 sessions.

MCA-C352		JAVA PROGRAMMING LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.
Prerequisites	:	Knowledge of Java.					
Objectives	:	This laboratory course gives a thorough understanding of the concepts of core Java.					

Exercise 1 :

a) Write a Java program that prints all real solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a, b, c and use the quadratic formula. If the discriminate b2 -4ac is negative, display a message stating that there are no real solutions.

b) The Fibonacci sequence is defined by the following rule:
The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.

Exercise 2 :

a) Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.

b) Write a Java program to multiply two given matrices.

c) Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util)

Exercise 3 :

a) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.

b) Write a Java program for sorting a given list of names in ascending order.

c) Write a Java program to make frequency count of words in a given text.

Exercise 4 :

a) Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

c) Write a Java program that displays the number of characters, lines and words in a text file.

Exercise 5 :

a) Write a Java program that:

i) Implements stack ADT.
ii) Converts infix expression into Postfix form
iii) Evaluates the postfix expression

Exercise 6 :

a) Develop an applet that displays a simple message.

b) Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.

Exercise 7 :

Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.

Exercise 8 :

Write a Java program for handling mouse events.

Exercise 9 :

a) Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.

b) Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

Exercise 10 :

Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException Display the exception in a message dialog box.

Exercise 11 :

Write a Java program that implements a simple client/server application. The client sends data to a server. The server receives the data, uses it to produce a result, and then sends the result back to the client. The client displays the result on the console. For ex: The data sent from the client is the radius of a circle, and the result produced by the server is the area of the circle. (Use java.net)

Exercise 12 :

a) Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.

b) Write a Java program that allows the user to draw lines, rectangles and ovals.

Exercise 13 :

a) Write a java program to create an abstract class named Shape that contains an empty method named numberOfSides ( ). Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method numberOfSides ( ) that shows the number of sides in the given geometrical figures.

b) Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using JTable component.

MCA-C401		SOFTWARE ENGINEERING	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
Prerequisites	:	• Program Development • Basic Concepts of DBMS					
Objectives	:	To introduce fundamental concepts, principles and emerging methods, tools, and techniques for the cost-effective engineering of high-quality software systems.					

Introduction to Software Engineering: Software Engineering Challenges, Software Engineering approach

Software Process: Software Process, Characteristics, software development process models - Waterfall, Iterative, Prototype, Incremental, Spiral, win-win Spiral, Comparison. Project Management Process.

Software Requirement Analysis and specification: Software Requirements, Need for SRS, Problem analysis, Requirements specification, IEEE format of SRS, Requirements Engineering, Requirements Validation, Object-oriented Analysis Case Studies - Course Scheduling, Personal Investment Management System

Software Architecture: Role of Software Architecture, Architecture views, Component and Connector view. Architectural styles of C&C view. Evaluating Architectures.

Function Oriented Design: Design Principles, Module-level concepts. Design notations and specifications, structured design methodology. Object-oriented design

Detailed Design: Detailed design and PDL, Verification, Metrics

User Interface Design: Golden rules, User Interface Design, Interface Design Activities, Implementation tools, Risk Engineering – Risk Analysis and Management,

Modeling : Concepts, Modeling with UML

Testing Techniques & Strategies: Fundamentals, Test case design, white box, black box, basis path, control structure testing, Strategic approach to software testing, Unit testing, Integration testing, Validation testing & System Testing.

Software Maintenance: Definition, Maintenance activities, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering.

Effort & Schedule Estimation: Software Project Estimation, Decomposition techniques, Empirical Estimation Models (COCOMO, Function Point Analysis, Delphi Approach), The Make/Buy decision. Automated Estimation tools.

Software Configuration Management: Software Configuration Management, SCM Process.Version control, Change Control, Configuration Audit, Status reporting, SCM standards.

Case Tools: Overview.

BOOKS RECOMMENDED :

1. Agarwal, KK, et. al., "Software Engineering", New Age International Publication, 2005.
2. Pressmann, R.S., "Software Engineering – A Practitioner's Approach", McGraw- Hill International Editions.
3. Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java",2nd Edition, Pearson Education Asia
4. Jalote Pankaj, "An Integrated Approach to Software Engineering", Naros Publishing House, New Delhi, 1995

MCA-C402		ANALYSIS & DESIGN OF ALGORITHMS	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
Prerequisites	:	Discrete mathematical structures, Data Structures and proficiency of programming Language.					
Objectives	:	• To learn how to analyze the complexity of algorithms • To compare and evaluate algorithms in terms of time and space complexity • To program brute force, divide and conquer, decrease and conquer, transform and conquer, greedy, and dynamic techniques					

Introduction. What is an algorithm ? Time and space complexity of an algorithm. Comparing the performance of different algorithms for the same problem. Different orders of growth. Asymptotic notation. Polynomial vs. Exponential running time.

Basic Algorithm Design Techniques. Divide-and-conquer, greedy, randomization, and dynamic programming. Example problems and algorithms illustrating the use of these techniques.

Graph Algorithms. Graph traversal: breadth-first search (BFS) and depth-first search (DFS). Applications of BFS and DFS. Topological sort. Shortest paths in graphs: Dijkstra and Bellman-Ford. Minimum spanning trees.

Sorting and Searching. Binary search in an ordered array. Sorting algorithms such as Merge sort, Quick sort, Heap sort, Radix Sort, and Bubble sort with analysis of their running times. Lower bound on sorting. Median and order statistics.

NP-completeness. Definition of class NP. NP-hard and NP-complete problems. 3SAT is NP-complete. Proving a problem to be NP-complete using polynomial-time reductions. Examples of NP-complete problems.

Coping with NP-completeness. Approximation algorithms for various NP-complete problems.

Advanced topics. Pattern matching algorithms : Knuth-Morris-Pratt algorithm. Algorithms in Computational Geometry : Convex hulls. Fast Fourier Transform (FFT) and its applications. Integer and polynomial arithmetic. Matrix multiplication : Strassen's algorithm.

BOOKS RECOMMENDED :

1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithm", PHI.
2. Parag Dave & Himanshu Dave, "Design and Analysis of Algorithms", Pearson Education.
3. Michel Goodrich, Roberto Tamassia, “Algorithm design-foundation, analysis & internet examples”, Wiley.
4. A V Aho, J E Hopcroft, J D Ullman, "Design and Analysis of Algorithms", Addison-Wesley Publishing.
5. Brassard G. amd Bratley P., Allgorithms, Theory and Practices, PHI.
6. Anany V. Levitin "Introduction to the Design and Analysis of Algorithms” Pearson Education publication.

MCA-C403		COMPUTER COMMUNICATION NETWORKS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	• Basic Networking • Operating System Concepts • Basics of Physics						
Objectives	:	• To provide insight about networks, topologies, and the key concepts • To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities • To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP • To know the basic concepts of network security and its various security issues related with each layer						

Data communication : components, data representation and data flow.

Networks: distributed processing, physical structures, categories of networks, interconnection of networks, protocols, standards.

Data and Signals : analog and digital, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. Digital Transmission: Analog to digital conversion, Transmission modes. Analog Transmission: Digital to analog conversion, analog to analog conversion. Bandwidth utilization: Multiplexing and spreading. Transmission media: Guided and unguided. Dial-up modems, and ADSL.

Error detection and correction: types of error, redundancy, forward error correction and retransmission, hamming distance, CRC, polynomials, checksum. Data link control: framing, flow and error control, simplest protocol, stop-and-wait protocol, stop-and-wait ARQ, go-back-n ARQ, selective repeat ARQ, piggybacking. Multiple access: CSMA, CSMA/CD, CSMA/CA.

Wired LAN: Standard Ethernet. Bridges: requirement, transparent bridge, and source routing bridge. **Wireless LAN:** IEEE 802.11. Switching: circuit-switched networks, datagram networks, virtual-circuit networks. Internet protocol version 4, address mapping, delivery , forwarding and routing of IP packets. Unicast routing protocols: distance routing protocol, link state routing.

Process-to-process Delivery: UDP and TCP. Data traffic, congestion and congestion control. Congestion control in TCP. Quality of Service and techniques to improve it. Domain Name System (DNS).

Telnet, FTP, WWW and HTTP. Introduction to Cryptography. Network Security: message confidentiality, message integrity, message authentication, message non-repudiation and entity authentication.

BOOKS RECOMMENDED :

1. Forouzan, B. A.: Data communication and Networking, 4th edition, TMH, 2006
2. Tanenbaum, A.S.: Computer Networks, (PHI), 1990.
3. Stallings, W. : Data and Computer Communication, PHI, 1995.

MCA-E404A		CRYPTOGRAPHY	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Knowledge of Mathematics						
Objectives	:	• To gain knowledge about the mathematics of the cryptographic algorithms. • To get an insight into the working of different existing cryptographic algorithms. • To learn how to use cryptographic algorithms in security.						

Origins of Cryptography, Issues, Codes and ciphers, Preliminary ideas of factoring and testing, gcd and its complexity.

Symmetric Key Cryptosystems, Block ciphers, Substitution ciphers, DES and Feistel ciphers and the problem of breaking them, The field Z/pZ, Euler's φ function.

Stream Ciphers, Linear feedback shift registers and associated results, Geffe generator, Diffe-Hellman key exchange, Bit commitment using symmetric key.

Public-key Cryptosystems, Discrete logarithm, RSA and Miller-Rabin, Authentication, Digital signatures, Merkle-Hellman Knapsack public key cipher.

Factoring and other topics, Pollard ρ-heuristic, Pollard p-1 algorithm, Quadratic sieve algorithm, Zero-knowledge proof idea, Recent developments.

BOOKS RECOMMENDED :

1. J. Menezes, P. Van Oorschot , and S. Vanstone, "Handbook of Applied Cryptography", CRC Press
2. William Stallings, "Cryptography and Network Security", Pearson Education, 3rd Edition, Reprint 2003

MCA-E404B		FUZZY SETS AND LOGIC	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	NIL						
Objectives	:	• To understand the concepts of Crisp & Fuzzy sets, Fuzzy Relation • To understand the principles of Uncertainty and its measures • To study Fuzzy Logic in Database Systems						

Classical and Fuzzy sets: Overview of classical sets, membership functions, α-cut, properties of α-cuts, decomposition theorems, extension principle.

Operations on Fuzzy Sets: Complement, Intersections, Unions, and Combinations of operations.

Fuzzy Arithmetic: fuzzy numbers, linguistic variables, arithmetic operations on intervals & numbers, lattice of fuzzy numbers, fuzzy equations.

Fuzzy Relations: crisp and fuzzy relations, projections and cylindric extensions. Binary fuzzy relations. Binary relations on a single set. Fuzzy equivalence relations. Fuzzy compatibility relations & Fuzzy ordering relations.

Possibility: Possibility distribution, possibility theory, possibility versus probability theory.

Fuzzy Rules: Structure of fuzzy rules, fuzzy rule-based inference, designing antecedent membership functions, fuzzy mapping rules, fuzzy implication rules. Fuzzy rule-based models for approximations. Types of fuzzy rule-based models.

Fuzzy Implications and Approximate Reasoning: Propositional Logic, first-order predicate calculus. Fuzzy Logic- fuzzy implication, approximate reasoning, criteria of fuzzy implications, families of fuzzy implications, major fuzzy implication functions.

Fuzzy Logic in Database Systems: Fuzzy information, imprecise information, imprecise queries, redundancy and functional dependency, similarity-based fuzzy relations, possibility-based fuzzy relations, fuzzy relational algebra, fuzzy SQL, functional dependency i fuzzy relations.

Uncertainty-based Information: Information and uncertainty, non-specificity of crisp sets, non-specificity of fuzzy sets, fuzziness of fuzzy sets.

Constructing Fuzzy Sets and Operations: General discussion, an overview, direct method with one expert, direct method with multiple experts, indirect methods with one expert, indirect methods with multiple experts, constructions from sample data.

Application to pattern recognition and decision-making.

BOOKS RECOMMENDED :

1. G.J.Klir & Bo Yuan, "Fuzzy Sets and Fuzzy Logic", PHI , 1995
2. Yen & R. Langari, "Fuzzy Logic", Pearson Education , 1999.

MCA-E404C		COMPUTER GRAPHICS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	• Knowledge of Data Structures • Mathematical Concepts						
Objectives	:	• To understand basic algorithms for computer graphics • To understand 2-D and 3- D transformations • To study visible surface detection methods • To understand basics of animation						

Introduction to Computer graphics: Video display devices, Raster- scan systems, Random- scan systems, Graphics monitors and workstations, Input devices, hardcopy devices, Computer graphics software. Point plotting techniques**: Points and lines, line- drawing algorithm, Circle generating algorithms, Ellipse- generating algorithms.

Two-Dimensional Transformations: Transformations of Points, Transformations of Straight Lines, Mid Point Transformations, Transformations of Parallel Lines, Transformations of Intersecting Lines, Rotation, Reflection, Scaling, Projection, Combined Transformation, Transformation of the unit square.

Three-Dimensional Transformation: Introduction to Three- Dimensional Transformation, 3-D Scaling, Shearing, Rotation, Reflection, Projection and Translation, Multiple Transformation, Rotation about an Axis parallel to a Coordinate Axis, rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane.

Two Dimensional Viewing: viewing pipeline, Viewing coordinate reference frame, window- to-viewport coordinate transformation, Clipping operations, Point clipping, Cohen- Sutherland line clipping, Sutherland- Hodgeman polygon clipping, Curve clipping, Text clipping, Exterior clipping. Plane curves^^: Introduction to Plane Curves, Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of Circle, Ellipse, Parabola.

Visible Surface Detection Methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP tree methods, area sub-division and octree methods.

Computer Animation: Design of animation sequences, General computer- animation functions, Raster animations, Computer- animation languages, Key- frame systems morphing simulating accelerations, Motion specifications.

BOOKS RECOMMENDED :

1. Hearn D., Baker P.M., "Computer Graphics", Prentice-Hall of India.
2. Rogers and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill Book Co.
3. Newman, W., Sproul, R.F., "Principles of Interactive Computer Graphics", McGraw- Hill, 1980.

MCA-E405A		COMPILER DESIGN	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Knowledge of Data Structures and System Programming						
Objectives	:	• To understand the various stages involved in the design of a compiler • To have a grasp on the syntactic and semantic structure in the compiler design						

Introduction to Compilers : Compilers and Translators; Need of Translators; Structure of Compiler; Lexical Analysis; Syntax Analysis; Intermediate Code Generation; Optimization; Code Generation; Book Keeping; Error Handling; Compiler Writing Tools.

Finite Automata (FA) and Lexical Analyzer(LA) : Role of LA, design of LA, Regular Expression, FA, Regular Expression to FA, Minimizing the number of states in a DFA.

Syntactic Specification of Programming Languages : Context Free grammars, Derivation and Parse Trees, Capabilities of context free grammars.

Basic Parsing Techniques : Parsers, Shift-reduce Parsing, Operator-Precedence Parsing, Top Down Parsing, Predictive Parser.

Automatic Construction of Efficient Parsers : LR Parsers, Canonical Collection of LR(0) items, Constructing SLR Parsing Tables, Constructing Canonical LR Parsing Tables, Constructing LALR Parsing Tables.

Syntax-Directed Translation: Syntax-Directed Translation Schemes, Implementation of Syntax Directed Translators, Intermediate Code, Postfix Notation, Parse Trees & Syntax Trees, Three-address code, quadruples and triples.

Symbol Tables(ST): Contents of ST, Data Structures for STs.

Error Detection and Recovery: Errors, Lexical Phase Errors, Syntactic Phase Errors, Semantic Errors. **Introduction to Code Optimization :** Sources of Optimization, Loop optimization.

Code Generation: Object Programs, Problems in Code Generation.

BOOKS RECOMMENDED :

1. A.V.Aho, R.Sethi & J.D. Ullman, "Principles of Compiler Design", Narosa Publishing House, 1986.
2. A.V. Aho, R. Sethi & J.D. Ullman, "Compilers - Principles, Techniques & Tools", Addison Wesley.
3. J. Tremblay & P.G. Sorenson, "The Theory & Practice of Compiler Writing", McGraw Hill, 1981.

MCA-E405B		ARTIFICIAL INTELLIGENCE	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	• Discrete Mathematics • Analysis of Algorithm						
Objectives	:	• To study the concepts of Artificial Intelligence and Methods of solving problems using Artificial Intelligence • To understand the basic techniques of knowledge representation and their use and components of an intelligent agent • To be able to implement basic decision making algorithms, including search-based and problem solving techniques, and first-order logic.						

Introduction : Definition and scope of Artificial Intelligence (A.I.), A.I. Techniques and its characteristics.

Problem Solving : Problems and problem spaces, Problems as state space search, Production systems, Control Strategies, Heuristic search, Problem characteristics, Production system characteristics.

Problem Solving Methods : Forward versus backward reasoning, Problem Trees versus Problem graphs, Knowledge representation and the frame problem, Generate-and-test, Hill Climbing, Breadth-First-Search, Problem Reduction, Constraint satisfaction, Means-End analysis.

Game Playing : Minimax search, Alpha-beta pruning, Secondary search.

Knowledge Representation using Predicate Logic: Representing simple facts using logic, Resolution, Conversion to clause form, Resolution in clause form, Unification algorithm.

Structured Knowledge Representation : Introduction, Semantic Nets, Frames. Introduction to Expert Systems and Programming in Prolog (Standard Prolog).

BOOKS RECOMMENDED :

1. Elaine R., "Artificial Intelligence", McGraw Hill.
2. Winston, P.H., "Artificial Intelligence", Addison Wesley.
3. Clockskin, W.F. and Mellish, C.S., "Programming in Prolog", Narosa Publishing House, 1981.

MCA-E405C		DATA WAREHOUSING AND DATA MINING	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	• Knowledge of DBMS • Information System Concepts						
Objectives	:	• To learn the fundamentals of designing large-scale data warehouses using relational technology. • To study the design aspects, planning and development.						

Need for Data Warehousing : Escalating need for strategic information, failures of past decision-support systems, operational versus decision-support systems, data warehousing-the only viable solution, data warehouse defined.

Data Warehouse: Defining features, data warehouses and data marts, overview of the components, and metadata in the data warehouse.

Defining the Business Requirement: Dimensional analysis, information packages, requirement-gathering methods, and requirements definition: scope and content. Architecture and Infrastructure: Understanding data warehousing architecture, distinguishing characteristics, architectural framework, technical architecture, collection of tools, infrastructure supporting architecture, the significant role of metadata.

Principles of Dimensional Modeling: Objectives, from requirements to data design, the STAR schema, STAR schema keys, advantage of the STAR schema. Dimensional Modeling: updates to the dimension tables, miscellaneous dimensions, the snowflake schema, aggregate fact tables, families of STARS. Data extraction, transformation and loading.

Matching Information to the Classes of Users : Information from the data warehouse, users of the information, information delivery, and information delivery tools. OLAP: Demand for online analytical processing, major features and functions, OLAP models, OLAP implementation considerations.

Data Mining : What is data mining, data mining defined, the knowledge discovery process, OLAP versus data mining, data mining and the data warehouse. Major data mining techniques, cluster detection, decision trees, memory-based reasoning, link analysis, neural networks, genetic algorithms, moving into data mining, data mining applications. Data mining primitives, languages, and system architectures.

BOOKS RECOMMENDED :

1. Paul Raj Pooniah, “Fundamentals of Data Warehousing”, John Wiley & Sons, 2001.
2. Jiawei Han and Micheline Kamber, “Data Mining”, Morgan Kaufmann Publishers, 2001.

MCA-G406		**APTITUDE- I**	**T**	**C**	**CIA**
			1	**1**	**100**
Prerequisites	**:**	NIL			
Objectives	**:**	This course enables students to : • present seminar • participate quiz program at class level on reasoning/ aptitude/technical • visit any industry/ organization			

The quiz programs are based on the following topics and some technical questions are to be asked.

General Mathematics-I : Numbers Property, Simplification, Divisibility, HCF and LCM, Decimal Fractions, Square roots and Cube Roots, Logarithms, Antilogrithms, Surds and indices, Permutation and Combination, Probability, Odd man out series, Number series, letter series, codes, Relationships, classification. Calendar, Clock, Pipes and Cistern, Time and Distance, Problems of Train, Boats and Streams. Area, Volume and surface Areas, Heights and Distances.

Reasoning- I: Logical Reasoning, Analytical Reasoning, Understanding the structure of arguments; Evaluating and distinguishing deductive and inductive reasoning;

BOOKS RECOMMANDED :

1. Agarwal. R. S., "Quantitative Aptitude for Competitive Examinations", S. Chand Limited, 2011
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", Tata McGraw Hill, 3rd Edition, 2011
3. Edgar Thrope, "Test of Reasoning for Competitive Examinations," Tata McGraw Hill, 4th Edition, 2012

MCA-G407		MINI- PROJECT- III (Based on MAC-C301 AND MCA-C302)	P	C	CIA
			2	1	100
Prerequisites	:	Knowledge of JAVA Programming Language and SQL			
Objectives	:	The main objective to work on a minor project is to develop an application using the concepts of JAVA and DBMS.			

MCA-C451		SOFTWARE ENGINEERING LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.
Prerequisites	:	Knowledge of software engineering					
Objectives	:	The purposes of this lab are : • To understand the software engineering methodologies for project development. • To gain knowledge about open source tools for Computer Aided Software Engineering. • To develop an efficient software using case tools.					
Software Required		Open source Tools: StarUML / UMLGraph / Topcased					

Prepare the following documents for each experiment and develop the software using software engineering methodology

1. Problem Analysis and Project Planning -Thorough study of the problem – Identify Project scope, Objectives and Infrastructure.
2. Software Requirement Analysis – Describe the individual Phases/modules of the project and Identify deliverables.
3. Data Modelling – Use work products – data dictionary, use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.Software Development and Debugging – implement the design by coding
4. Software Testing – Prepare test plan, perform validation testing, coverage analysis, memory leaks, develop test case hierarchy, Site check and site monitor.

Sample Experiments:

Academic domain

1. Course Registration System
2. Student marks analysing system

Railway domain

3. Online ticket reservation system
4. Platform assignment system for the trains in a railway station

Medicine domain

5. Expert system to prescribe the medicines for the given symptoms
6. Remote computer monitoring

FINANCE domain

7. ATM system
8. Stock maintenance

Human Resource management

9. Quiz System
10. E-mail Client system.

MCA-C452		ANALYSIS AND DESIGN OF ALGORITHMS LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.
Prerequisites	:	Knowledge of data structures and programming language					
Objectives	:	The purposes of this lab are : • To understand the different algorithm methods • To get a first-hand experience of implementing well-known algorithms in a high-level language. • To be able to compare the practical performance of different algorithms for the same problem.					

Write Programs in C/C++/Java Language:

1. Implement and analyze to compute the greatest common divisor (GCD) of two numbers.
2. Implement and analyze to find the median element in an array of integers.
3. Implement and analyze to find the majority element in an array of integers.
4. Implement and analyze to sort an array of integers using Heap sort.
5. Implement and analyze to sort an array of integers using Merge sort.
6. Implement and analyze to sort an array of integers using Quick sort.
7. Implement and analyze to find the edit distance between two character strings using dynamic programming.
8. Implement and analyze to find an optimal solution to weighted interval scheduling using dynamic programming.
9. Implement and analyze to find an optimal solution to matrix chain multiplication using dynamic programming.
10. Implement and analyze to do a depth-first search (DFS) on an undirected graph. Implementing an application of DFS such as (i) to find the topological sort of a directed acyclic graph, OR (ii) to find a path from source to goal in a maze.
11. Implement and analyze to do a breadth-first search (BFS) on an undirected graph. Implementing an application of BFS such as (i) to find connected components of an undirected graph, OR (ii) to check whether a given graph is bipartite.
12. Implement and analyze to find shortest paths in a graph with positive edge weights using Dijkstra's algorithm.
13. Implement and analyze to find shortest paths in a graph with arbitrary edge weights using Bellman-Ford algorithm.
14. Implement and analyze to find the minimum spanning tree in a weighted, undirected graph.
15. Implement and analyze to find all occurrences of a pattern P in a given string S.
16. Implement and analyze to multiply two large integers using Karatsuba algorithm.
17. Implement and analyze to compute the convex hull of a set of points in the plane.
18. (Mini-project Topic) Program to multiply two polynomials using Fast Fourier Transform (FFT).

MCA-C501		INTERNET TECHNOLOGIES	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
Prerequisites	:	Knowledge about networks					
Objectives	:	• To learn the basic web concepts and Internet protocols. • To understand CGI Concepts & CGI Programming. • To familiarize with Apache Tomcat Server. • To study SERVELETS, JSP and PHP .					

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Internet Basics, PERL & CGI : HTTP request and response, cookies basics, HTTP 1.1, CGI architecture, Intro PERL with Features, Working with Strings and Arrays, File Handling, Pattern matching & formatting, Creating and using subroutines, Using PERL for CGI scripting
Note: Apache Http server is used at server side

Apache Tomcat Server : Obtaining and Installing Apache Tomcat, Tomcat Directory Structure - bin, conf, logs, server, work, temp, webapps, Web Application Directory Structure, Deploying HTML and JSP Pages, Configuring Tomcat - Editing server.xml, Deploying Web Applications - Deployment Descriptors, web.xml configuration file Tomcat Manager - Deploying and Managing, Web Application using the Tomcat Manager, Creating a WAR File, Configuring Tomcat to Connect to a Database, Configuring Security on Tomcat, Granting Permissions to Java Apps

Servlets : Introduction, Servlet vs CGI, Servlet API Overview, Servlet Life Cycle, Coding: Writing & running simple servlet, Generic servlet, HTTPServlet, ServletConfig, ServletContest, Writing servlet to handle Get & Post methods, reading use request data, Session tracking in servlets, Servlets & JDBC. Writing threadsafe servlet
Note: Apache Tomcat server is used at server side.

JSP : Why JSP?, Directives, Writing simple JSP page, Scripting Elements, Default Objects in JSP, JSP Actions, Managing Sessions using JSP, JSP with beans, JSP & Databases, Error Handling in JSP, Introduction to custom tag
Note: Apache Tomcat server is used at server side.

PHP : Obtaining, Installing and Configuring PHP, Introduction PHP and the Web Server Architecture Model, Overview of PHP Capabilities, CGI vs. Shared Object Model, PHP HTML Embedding Tags and Syntax, Simple PHP Script Example, PHP and HTTP Environment Variables, PHP Language Core, Variables, Constants and Data Types, and Operators. Decision Making , Flow Control and Loops, Working with Arrays, Working with Strings and functions Outputting Data,, Include and Require Statements, File and Directory Access Operations, Error Handling and Reporting Considerations, Processing HTML Form Input from the User, Creating a Dynamic HTML

Form with PHP, Login and Authenticating Users, Using GET, POST, SESSION, and COOKIE variables, Session Management and Variables, Working with Cookies, Sending Email

Introduction to Object-oriented PHP: Classes and Constructors, Database Operations with PHP, Built-in Database Functions, Connecting to a MySQL(or Any Other Database), Creating Database, Dropping Database, Selecting a Database, Building and Sending the Query to Database Engine, Retrieving , Updating and Inserting Data.
Note: Apache Http server is used at server side

BOOKS RECOMMENDED :

1. Teach Yourself PERL in 21 days Pearson Education.
2. Programming the World Wide Web Robert W. Sebesta
3. Developing Java Servlets James Goodwill
4. Professional JSP Wrox press
5. Complete reference JSP
6. Java Server Programming Vol-I Wrox press
7. Professional Apache Tomcat – Wrox Press
8. Agile Java Development with Spring, Hibernate and Eclipse by Anil Hemrajani
9. Professional Java Development with the Spring Framework - Wrox Press
10. Beginning PHP, Apache, MySql web development

MCA-C502		ADVANCED JAVA PROGRAMMING	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
Prerequisites	:	Core Java Programming					
Objectives	:	• To learn to design GUI java applications with Applet. • To learn java component technologies such as Java Beans. • To learn Networking concepts and advance java network programming. • To study the distributed computing capability of Java Platform. • To learn JDBC and to perform SQL operations from java application.					

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Introduction to Advanced Java : Java Streaming, Components and events handling, Threading concepts, Networking features, Byte code interpretation, Media Techniques.

Java Applets and Beans : Applets and HTML, Bean Concepts, Events in Bean Box, Bean customization and persistence, JavaScript, Combining scripts and Applets, Applets over web, Animation techniques, Animating images.

Advanced Networking : Java Socket and URLs, Socket and Interprocess Communication, Client/Server Methodology, Content and Protocols handlers, Developing distributed applications, CORBA and IIOP, Interfaces, RMI, Remote objects, Object serialization.

Java Database Programming : Inside JDBC, Connecting to Databases, Basic steps of JDBC, Databases and SQL, Retrieving Information, Storing Information, Accessing Multimedia databases, Working with database metadata, Database support in Web applications. Web Servers, Server-Side Java, and More.

Inside an HTTP Server, Web Server Architecture, The HTTP Protocol, Using a Web Server, Advanced Web Server Features, HTTP Server Overview, Common Gateway Interface and CGI Scripts, Servlets, Dynamic Documents, Creating the Servlet. A Servlet Version of the Featured App. doGet( ). getAppointments( ). newAppointmentForm( ). insertNewAppointment( ). JSP, Setting up the JSP environment, Generating dynamic content.

BOOKS RECOMMENDED :

1. Deitel and Deitel, "Advanced Java(TM) 2 Platform How to Program", Pearson Edu., 2002.
2. Dick Steflik, PrashantSridharan, "Advanced Java Networking", 2/E, Pearson Education.
3. Hans Bergsten, "Java Server Pages", 3/E, O'Reilly Media, 2004.
4. George Reese, "Database Programming with JDBC and Java", 2/E, O'Reilly Media, 2000.

MCA-E503A		INFORMATION SECURITY	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Knowledge of Network Security						
Objectives	:	• To understand the threat models and the basic types of authentication mechanisms • To analyze cryptographic techniques, protocols, formats, and standards • To analyze different log files and understand Cyber laws to recover and secure the data						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Introduction to Information Security : History and evaluation of Information security CIA triangle, Components of IS, Control in IT environment, Information Security Management system, components of ISMS and conceptual framework, Steps for developing ISMS.

Need of Information security : Threats to information security, Risk to Information systems, Information security in organization, Introduction to cyber crimes and attacks, Information security policy, policy definition and security life cycle.

Information Security Policy and Standards: Security principles, Types of Information security policies- Administrative and Technical, A structure and framework of compressive security policy, policy infrastructure, policy design life cycle and design processes, PDCA model, Security policy standards and practices - BS7799, ISO/IEC 17799, ISO 27001. Auditing tools such as ISO 27001 ISMS TOOL KIT, NGS AUDITOR, Windows password auditor, ISO IES 27002 2005 IS AUDIT TOOL

Domains of IT security : user/accepted usage/ access, data access, physical access, Internet access, e-mail, digital signature, outsourcing, software development and acquisition, hardware acquisition, Network and telecom, BCP and DRP, security organization structure, Domains related security based case studies.

IT Governance : What is IT Governance, good governance, objectives and dimensions, foundation, structure, processes; IT governance framework- COBIT, ITIL, ISO 17799, IT governance maturity model.

Auditing concepts ISA need, concept, standards, performance, steps, Techniques, methodologies, around and through computer, Controls – Concept objectives, types, risk.

Controls : Input, process, validation, output, logical access, physical access, Database, network, environment, BCP, Evidence collection, evaluation and Reporting methodologies.

Ethical Hacking

BOOKS RECOMMENDED :

1. Mark Stamp, "Information security Principles and Practice" Wiley, Second Edition, 2011.
2. Matt Bishop, "Computer Security: Art and Science", Second Edition, Pearson Education, 2012.
3. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2011.
4. Mark Merkow, James Breithaupt "Information Security: Principles and Practices" First Edition, Pearson Education, 2007.
5. William Stallings, "Cryptography and Network Security: Principles and Practices", Third Edition, Pearson Education, 2011.
6. Charles P.Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", 3rd Edition, 2007.
7. Micki Krause, Harold F. Tipton, "Information Security Management Handbook", 6th Ed., 2012.

MCA-E503B		PARALLEL PROCESSING	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Knowledge of computer architecture and data structure						
Objectives	:	• To learn about Modern Processors and concepts • To understand the concepts of Optimizations • To learn about Parallel Computers and Programming						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Introduction : Computational demands of modern science, Advent of practical parallel processing.

PRAM Algorithms : A model of serial computation, The PRAM model of parallel computation, PRAM Algorithms, Reducing the number of processors,.

Parallel Programming Languages : Programming parallel processes, Fortran- 90, Sequent C. Mapping and Scheduling : Mapping Data to processors on processor arrays and Multi-computers, Dynamic Load Balancing on Multi-computers, Static scheduling on UMA multiprocessors, Deadlock.

Elementary Parallel Algorithms : Classifying MIMD algorithms, Reduction, Broadcast, Prefix sums. Matrix Multiplication : Sequential matrix multiplication, Algorithms for processor arrays, algorithms for multiprocessors, Algorithms for Multi- computers.

Sorting : Enumeration sort, Lower bounds on parallel sorting, Odd- Even transposition sort, Bitonic Merge, Quick sort- based algorithms, Random real and random write.

Graph Algorithms : Searching a graph, Connected components, All- paired shortest path, Single-source shortest path, Minimum- cost spanning tree. Combination Search : Introduction, Divide and Conquer, Branch and bound, Parallel branch and Bound algorithms.

BOOKS RECOMMENDED :

1. Quinn, Michael J. ,"Parallel Computing: Theory and Practice", McGraw Hill, 1994.
2. Crichlow, Joel M. , "An Introduction to Distributed and Parallel Computing", PHI, 1988.
3. Hwang, Kai & Briggs, F.A., "Computer Architecture and Parallel Processing", McGraw Hill, 1985.

MCA-E503C		AD-HOC AND SENSOR NETWORKS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Knowledge about networks						
Objectives	:	• To understand the basics of Ad-hoc & Sensor Networks • To learn various fundamental and emerging protocols of all layers in ad-hoc network • To study about the issues pertaining to major obstacles in establishment and efficient management of ad-hoc and sensor networks • To understand the nature and applications of ad-hoc and sensor networks • To understand various security practices and protocols of Ad-hoc and Sensor Networks						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Ad-Hoc Networks Fundamentals and MAC Protocols : Fundamentals of WLans, IEEE 802.11 Architecture, Self Configuration and Auto Configuration- Issues in Ad-Hoc Wireless Networks, MAC Protocols For Ad-Hoc Wireless Networks, Contention Based Protocols, TCP Over Ad-Hoc Networks- TCP Protocol Overview, TCP and MANETs, Solutions For TCP Over Ad-Hoc Networks

Ad-Hoc Network Routing and Management : Routing in Ad-Hoc Networks- Introduction - Topology based versus Position based Approaches, Proactive, Reactive, Hybrid Routing Approach, Principles and issues, Location services, DREAM, Quorums based Location Service, Grid, Forwarding Strategies, Greedy Packet Forwarding, Restricted Directional Flooding- Hierarchical Routing- Other Routing Protocols.

Sensor Network Communication Protocols : Introduction, Architecture, Single Node Architecture, Sensor Network Design Considerations, Energy Efficient Design Principles for WSN's, Protocols for WSN, Physical Layer, Transceiver Design Considerations, MAC Layer Protocols, IEEE 802.15.4 Zigbee, Link Layer and Error Control Issues, Routing Protocols, Mobile Nodes and Mobile Robots, Data Centric & Contention Based Networking, Transport Protocols & QoS, Congestion Control Issues, Application Layer Support.

Sensor Network Management and Programming : Sensor Management, Topology Control Protocols and Sensing Mode Selection Protocols, Time Synchronization, Localization and Positioning, Operating Systems and Sensor Network Programming, Sensor Network Simulators.

Ad-Hoc and Sensor Network Security : Security in Ad-Hoc and Sensor Networks, Key Distribution and Management, Software based Antitamper Techniques, Water Marking techniques, Defense against Routing Attacks, Secure Ad-Hoc Routing Protocols, Broadcast Authentication WSN Protocols, TESLA, Biba, Sensor Network Security Protocols, SPINS

BOOKS RECOMMENDED :

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", Second Edition,World Scientific Publishing, 2011.
2. Holger Karl, Andreas willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Inc .2005.
3. C.Siva Ram Murthy and B.S.Manoj, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2004.
4. C.K.Toh, "Ad Hoc MobileWireless Networks", Pearson Education, 2002.
5. Erdal Çayırcı , Chunming Rong, "Security in Wireless Ad Hoc and Sensor Networks", John Wiley and Sons, 2009
6. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks Theory and Practice", JohnWiley and Sons, 2010
7. Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: in Wired and Wireless Networks", Springer, 2006
8. Kazem Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks: Technology, Protocols and Applications", Wiley Interscience A John Wiley & sons, Inc., Publication.
9. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks : An information processing Approach", Elsevier 2004 .
10. Amiya Nayak, Ivan Stojmenovic, "Wireless Sensor and Actuator Networks : Algorithm and Protocols for Scalable Coordination and Data communication", John Wiley & Sons 2010 .
11. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman Publishers, 2004.

MCA-E503D	PROFESSIONAL ETHICS	L	T	C	CIA	ESE	Time for ESE
		3	1	4	30	70	3Hrs.

Prerequisites	:	**NIL**
Objectives	:	• To understand the concepts of computer ethics in work environment. • To understand the threats in computing environment • To understand the intricacies of accessibility issues • To ensure safe exits when designing the software projects

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Computer Ethics Introduction and Computer Hacking : A general Introduction, Computer ethics: an overview, Identifying an ethical issue, Ethics and law, Ethical theories, Professional Code of conduct, An ethical dilemma, A framework for ethical decision making, Computer hacking, Introduction, definition of hacking, Destructive programs –hacker ethics, Professional constraints, BCS code of conduct, To hack or not to hack?, Ethical positions on hacking

Aspects of Computer Crime and Intellectual Property Rights : Aspects of computer crime, Introduction, What is computer crime, computer security measures, Professional duties and obligations, Intellectual Property Rights, The nature of Intellectual property, Intellectual Property, Patents, Trademarks, Trade Secrets, Software Issues, Copyright, The extent and nature of software piracy, Ethical and professional issues, free software and open source code

Regulating Internet Content, Technology and Safety : Introduction, in defense of freedom expression, censorship, laws upholding free speech, Free speech and the Internet, Ethical and professional issues, Internet technologies and privacy, Safety and risk, assessment of safety and risk, risk benefit analysis, reducing risk

Computer Technologies Accessibility Issues : Introduction, Principle of equal access, Obstacles to access for individuals, professional responsibility, Empowering computers in the workplace, Introduction, computers and employment, computers and the quality of work, computerized monitoring in the work place, telecommuting, social, legal and professional issues, Use of Software, Computers and Internet-based Tools, Liability for Software errors, Documentation Authentication and Control, Software engineering code of ethics and practices, IEEE-CS, ACM Joint task force

Software Development and Social Networking : Software Development, strategies for engineering quality standards, Quality management standards, Social Networking, Company owned social network web site, the use of social networks in the hiring process, Social Networking ethical issues, Cyber bullying, cyber stalking, Online virtual world, Crime in virtual world, digital rights management, Online defamation, Piracy, Fraud

BOOKS RECOMMENDED :

1. Penny Duquenoy, Simon Jones and Barry G Blundell, "Ethical , legal and professional issues in computing", Middlesex Vishwavidyalya Press, 2008
2. George Reynolds, "Ethics in Information Technology", Cengage Learning, 2011
3. Caroline Whitback," Ethics in Engineering Practice and Research ", Cambridge Vishwavidyalya Press 2011
4. Richard Spinello, "Case Studies in Information and Computer Ethics", Prentice Hall, 1997.
5. John Weckert and Douglas Adeney, Computer and Information Ethics, Greenwood Press, 1997.
6. Sara Baase, "A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet",3rd Edition, Prentice Hall, 2008
7. http://www.infosectoday.com/Articles/Intro_Computer_Ethics.htm

MCA-E504A		WIRELESS MOBILE COMMUNICATION	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Knowledge about networks						
Objectives	:	• Wireless transmission basics and Protocols. • Wireless LAN and ATM. • Mobile Application Architecture, Messaging and security.						
NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.									

Introduction : History and evolution of mobile radio systems. Types of mobile wireless services/systems-Cellular, WLL, Paging, Satellite systems, Standards, Future trends in personal wireless systems- Cellular concept and frequency reuse, Multiple Access Schemes, channel assignment and handoff.

Wireless Media : Wireless Media access control protocols, SDMA, FDMA, TDMA, CDMA, comparison. Telecommunication systems, GSM, DECT, TETRA, UMTS and IMT, 2000, satellite systems, GEO 139, LEO 139, MEO 140. Routing, localization, handover, broadcast systems, overview. Cyclic repetition of data, digital audio broadcasting, digital video broadcasting.

Wireless LAN and ATM : Wireless LAN, IEEE 802.11 standards, HIPERLAN, Blue tooth technology and protocols. Wireless Local Loop technologies. Wireless ATM, motivation, working group, services, reference model, functions, radio access layer, handover, location management, addressing, mobile QoS issues, delays, error and packet loss, error control schemes, Access point control protocol.

Mobile Architecture : Choosing the right architecture, Application Architecture, Smart Client, Messaging Types, Messaging Value Chain.

Mobile and Wireless Security : Security Primer, Creating a Secure environment, Threads, Technologies, Other Security Measures, WAP Security, Smart Client Security, Overview of Smart Client Architecture, Mobile Operating Systems.

BOOKS RECOMMANDED :

1. Jochen Schiller, "Mobile Communications", Addison Wesley, 2nd Edition, 2011.
2. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley Dreamtech India Pvt. Ltd., 2004.
3. Uyless Black, "Mobile and Wireless Networks", Prentice Hall, 1996.
4. Willian C.Y. Lee, "Mobile Communication Design Fundamentals", John Wiley, 1993.

MCA-E504B		CLOUD COMPUTING CONCEPTS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Knowledge of operating systems						
Objectives	:	• To introduce the broad perceptive of cloud architecture and model • To understand the concept of Virtualization and design of cloud Services • To be familiar with the lead players in cloud. • To understand the features of cloud simulator • To apply different cloud programming model as per need.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Cloud Architecture and Model : Technologies for Network-Based System, System Models for Distributed and Cloud Computing, NIST Cloud Computing Reference Architecture.

Cloud Models : Characteristics, Cloud Services, Cloud models (IaaS, PaaS, SaaS), Public vs Private Cloud –Cloud Solutions - Cloud ecosystem, Service management, Computing on demand.

Virtualization : Basics of Virtualization - Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data-center Automation.

Cloud Infrastructure : Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources.

Programming Model : Parallel and Distributed Programming Paradigms, MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache, Mapping Applications, Programming Support, Google App Engine, Amazon AWS, Cloud Software Environments, Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

Security in the Cloud : Security Overview, Cloud Security Challenges and Risks, Software-as-a-Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security.

BOOKS RECOMMENDED :

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

2. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.
4. Kumar Saurabh, “Cloud Computing – insights into New-Era Infrastructure”,Wiley India,2011.
5. George Reese, “Cloud Application Arch.: Building Appli. and Infrastructure in the Cloud”, O'Reilly
6. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
7. Katarina Stano+evska-Slabeva, Thomas Wozniak, Santi Ristol, “Grid and Cloud Computing – A Business Perspective on Technology and Applications”, Springer.
8. Ronald L. Krutz, Russell Dean Vines, “Cloud Security – A comprehensive Guide to Secure Cloud Computing”, Wiley – India, 2010.
9. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing”, TMGH,2013.
10. Gautam Shroff, "Enterprise Cloud Computing", Cambridge Vishwavidyalaya Press, 2011
11. Michael Miller, "Cloud Computing", Que Publishing, 2008
12. Nick Antonopoulos, "Cloud computing", Springer Publications, 2010

MCA-E504C		DIGITAL IMAGE PROCESSING	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Knowledge of MATLAB and basics of calculus						
Objectives	:	• To understand Digital Image Processing fundamentals. • To learn Image Transformation, Enhancement, Restoration and Compression Techniques. • To implement various techniques for Segmentation of Images. • To learn the Image Reconstruction operations.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Introduction : Background, Digital Image Representation, Steps in Image Processing, Elements of Digital Image Processing Systems; Digital Image Fundamentals: Elements of Visual perception, A simple Image model, Sampling and Quantization, Basic Relationships between pixels, Imaging Geometry, Photographic film.

Image Transforms : Introduction to Fourier Transform, Discrete Fourier Transform, Properties of the Two- Dimensional Fourier Transform, The Fast Fourier Transform, Separable Image Transform, The Hotelling Transform.

Image Enhancement : Background, Enhancement by Point Processing, Spatial Filtering, Enhancement in the Frequency Domain, Generation of Spatial Masks from Frequency Domain Specifications, Color Image Processing.

Image Restoration: Degradation Model, diagonalisation of Circulate and Block Circulate Matrices, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square (Wiener) Filter, Constrained Least Squares Restoration, Interactive Restoration; Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory, Error-Free Compression, Lossy Compression, Image Compression Standards.

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Oriented Segmentation, Use of Motion in Segmentation; Representation and Description: Representation Schemes, Boundary Descriptors, Regional Descriptors, Morphology, Relational Description.

BOOKS RECOMMENDED :

1. Rafael C. Gonzalez and Richard E. Wooks, "Digital Image Processing", Addison- Wesley, 1992.
2. A. K. Jain, "Fundamentals of Digital Image Processing", PHI, 1993.

MCA-E504D		ARTIFICIAL NEURAL NETWORKS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	**:**	**NIL**						
Objectives	**:**	• To understand the basics of ANN and comparison with Human brain • To study about various methods of representing information in ANN • To learn various architectures of building an ANN and its applications • To understand the Pattern classification and Pattern Association techniques						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Neural Networks : History of Neural Networks Development. Introduction to Expert Systems. Expert System vs Neural Networks. Biological Neurons. Artificial Neurons – Activation Functions. Neural Networks Concepts and Architecture. Knowledge Representation in Neural Networks. Artificial Intelligence and Neural Networks.

Learning Methods : Categories of Learning – Supervised/Unsupervised and Reinforcement Learning Memory based Learning. Hebbian Learning. Competitive Learning. Boltzman Learning. Statistical Learning.

Neural Networks Models : Single Layer Perception Least Mean Square Algorithm Perception Convergence Theorem.

Multi Layers Perception: Introduction, Back Propagation Algorithm. Stopping Criteria Complexity of Learning Generalization.

Hopfield Model : The Hopfield Learning Algorithm and its Limitations.

Self Organizing Network: Introduction, The Kohonen Algorithm, Neural Networks Applications.

BOOKS RECOMMENDED :

1. J. M . Zurada, “Introduction to Artificial Neural Systems”, Jaico Publishing House,1997.
2. K. Gurney, “An Introduction to Neural Networks”, UCL Press,1997.
3. Simon Hayking: Neural Networks, "A Comprehensive Foundation, Pearson Education", Second Edition, 2001.
4. Limin Fu, "Neural Networks in Computer Intelligence", Mc-Graw Hill Publications.

MCA-E505A		ENTERPRISE RESOURCE PLANNING	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Knowledge of DBMS and Software Engineering						
Objectives	:	To learn ERP systems its structure, modules, benefits, implementation and post implementation issues thru real-life cases.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Enterprise Resource Planning : Introduction, What Is ERP?, Need of ERP, Advantage of ERP, Growth of ERP, ERP vs Traditional Information Systems.

ERP and Related Technologies : Business Process Re-Engineering (BPR), Management Information System (MIS), Decision Support System (DSS), Executive Support System (ESS),Data Warehousing, Data Mining, On-Line Analytical Processing (OLAP),Supply Chain Management, Customer Relationship Management

ERP Modules and Vendors : Finance, Production Planning, Control and Management, Sales and Distribution, Human Resource Management, Inventory Control System, Quality Management, ERP market, Comparison of Current ERP Packages and Vendors, like; SAP, Oracle, PeopleSoft, BAAN etc., Disadvantages of non-ERP system. Importance of ERP vise versa in-house applications, Benefits of integration, Standardization of data code

ERP Implementation Life Cycle : Evaluation and selection of ERP package, Project planning, Implementation, Team Training and Testing, End User Training and Going Live, Post Evaluation and Maintenance, Role of organization management & vendor

ERP Case Studies : Post Implementation review of ERP packages, in manufacturing, Services and Others Organizations, Customization of ERP for different types of Industries.

BOOKS RECOMMANDED :

1. Bret Wagner, Ellen Monk, “Concepts in Enterprise Resource Planning”, 2012.
2. Bret Wagner, Ellen Monk, “Enterprise Resource Planning”, Third Edition Cengage Learning, 2008.
3. Ashu Gupta, Rajesh Verma, Jatindar Kumar, “Enterprise Resource Planning: Concepts and Applications”, 2012.
4. Alexis Leon, "Enterprise Resource Planning", TMH,2nd Ed.
5. V.K. Garg & N.K. Venkita Krishnan, "ERP Ware: ERP Implementation Framework", PHI.
6. V.K. Garg & N.K. Venkita Krishnan, "ERP Concepts & Planning", PHI, 2nd Ed.

MCA-E505B		SOFTWARE QUALITY AND TESTING	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	:	Knowledge of Software Engineering						
Objectives	:	• To Gain Knowledge in the Test Environment • Ability to plan tests • Ability to execute tests, design test cases, use test tools, etc • Ability to develop testing status reports • Ability to develop good software quality matrices						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Software Quality, Software quality Metrics, Applying Seven Basic Tools in Software Management, Defect Removal Effectiveness, The Rayleigh Model, Exponential Distribution and Reliability Growth Models.

Quality Management Tools, Complexity Metrics and Models, Metrics for Object Oriented Projects, Availability Metrics, Measuring and Analyzing Customers Satisfaction.

Conducting in process Quality Assessments, Conducting Software Projects Assessments, Software Process Improvement, Using Function Point Metrics to Measure Software Process Improvement.

White Box Testing, Black Box Testing, Integration Testing, System and Acceptance Testing, Performance Testing, Regression Testing, Internationalization Testing, Ad-hoc Testing, Testing of Object-Oriented Systems, Usability and Accessibility Testing.

Test Management and Automation: Test Planning, Management, Execution and Reporting, Software Test Automation, Test Metrics and Measurements,

BOOKS RECOMMANDED :

1. Paul Ammann, Jeff Offutt, "Introduction to Software Testing", Cambridge Vishwavidyalya Press, 2008.
2. Srinivasan D., Gopalaswamy R., "Software Testing: Principles and Practices", Pearson, 2012.
3. William Perry, "Effective Methods of Software Testing", Third Edition,Wiley Publishing 2007
4. Naresh Chauhan , "Software Testing Principles and Practices", Oxford Universit Press, 2010.
5. Dale H. Besterfiled et al., "Total Quality Management", Pearson Education Asia, 3/e, 2006.
6. Stephen Kan, "Metrics and Models in Software Quality", Addison – Wesley, 2/e, 2004.
7. Llene Burnstein, "Practical Software Testing", Springer International Edition, Chennai, 2003
8. Adithya P. Mathur, "Foundations of Software Testing – Fundamentals Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

MCA-E505C		SOFTWARE RELIABILITY AND QUALITY CONTROL	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	**:**	Knowledge in Software Engineering						
Objectives	**:**	• To appreciate and understand scientific concepts of Software and Hardware Reliability • To apply Software Reliability Growth Models in Software Development • To emphasize the Application of Software Reliability Models						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Reliability and Availability of Computer System : Series, Parallel and Network Systems, Fault Rates and Failure Probabilities.

Software System Performance Modeling : Modeling of Programs, Networks Models of Computer Program, Software Monitoring System.

Software Reliability, Reliability Models : Estimation, Measurement and Prediction Model, Software Reliability Specification, Statistical Testing, Reliability Growth Modeling

Programming for Reliability : Fault Avoidance, Fault Tolerance, Exception Handling, Defensive Programming.

Quality Management : Process Quality Management, Quality Reviews, Software Standard, Documentation Standards, Software Metrics, Product Quality Metrics.

BOOKS RECOMMENDED :

1. Musa, J.D. et al, "Software Reliability-Measurements, Prediction and Application", McGraw Hill,1987
2. Ian Sommerville, "Software Engineering", Addison-Wesley, 1998.
3. Ferrari, D. "Computer Systems Performance Evaluation", PHI, 1978.

MCA-E505D		RESEARCH METHODOLOGY AND TOOLS	L	T	C	CIA	ESE	Time for ESE
			3	1	4	30	70	3Hrs.
Prerequisites	**:**	**NIL**						
Objectives	**:**	Research is a tool which helps the manager to identify, understand and solvemanagement problems. Research improves the decision making ability of the manager. The objective of the subject is to create scientific attitude towards solving a management problem and impart knowledge about tools available for carrying out research.						

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Introduction and overview

The nature of Computer Science(CS)research; what is research?

Literature searches, informationgathering

Reading and understanding researchpapers

Technical writing, referencing,bibliographies

Presentation skills, written and oral

Choosing or proposing a project

Project planning, tools and techniquesfor planning

Project conduct, time management,risk management, team working

Commercial and economic considerations in IT research and ITindustry

Review of legal, ethical, social and professional (LSEP) issues includingdata protection and standards

Research Methods in ComputerScience (introduction)

Research Methods (for SoftwareEngineering)

Measured-based research methods in Computer Science

BOOKS RECOMMENDED :

1. Christian W. Dawson, "Projects in Computing and Information Systems (A Student's Guide)", Addison Wesley, 2005.
2. Justin Zobel, "Writing for Computer Science", Springer, 2004
3. C.R. Kothari, "Research Methodology Methods and Techniques", New Age International Pub,2nd Ed
4. Deepak Chawla, Neena Sondhi, "Research Methodology Concepts and Cases", Vikas Pub.

MCA-G506		APTITUDE - II	T	C	CIA
			1	1	100
Prerequisites	:	NIL			
Objectives	:	This course enables students to : • To improve verbal aptitude and reasoning ability of the student. • To collectively solve problems in teams & group. • participate quiz program at class level on reasoning/ aptitude/technical			

The quiz programs are based on the following topics and some technical questions are to be asked.

General Mathematics-II : Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs. Data Interpretation - Sources, acquisition and interpretation of data; Quantitative and qualitative data; Graphical representation and mapping of data. Mixtures & Solutions, Time, Speed & Distance, Time & Work, Simple Interest, Compound Interest, Stocks and Shares, True Discount, Banker's discount. Averages, Percentage, Profit and Loss, Ratio and Proposition, Partnership, Allegation and mixture, Chain rule. Problems on ages, Quadratic Equations, Linear equations & inequalities, Sets & Functions, Sequences & Series.

Reasoning- II: Verbal analogies: Word analogy-Applied analogy; Verbal classification; Reasoning Logical Diagrams: Simple diagrammatic relationship, multi-diagrammatic relationship; Venn diagram.

BOOKS RECOMMENDED :

1 Agarwal. R. S, "Quantitative Aptitude for Competitive Examinations", S. Chand Limited 2011
2 Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", Tata McGraw Hill, 3rd Edition, 2011
3 Edgar Thrope, "Test of Reasoning for Competitive Examinations", Tata McGraw Hill, 4th Edition, 2012

MCA-G507		**MINI- PROJECT- IV** *(Based on MCA-C401/ MCA-C501/ MCA-C502)*	**P**	**C**	**CIA**
			2	**1**	**100**
Prerequisites	**:**	Knowledge of Software Engineering/ Internet Technologies/ Java Programming			
Objectives	**:**	The main objective to work on a mini- project is to develop an application by implementing the concepts of Software Engineering using Internet Technologies/ Java Programming.			

MCA-C551		INTERNET TECHNOLOGIES LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.
Prerequisites	:	Knowledge of Perl/ JSP/ Servlet(Java)/PHP/ SQL .					
Objectives	:	This laboratory course gives a thorough understanding of the concepts of various latest Internet technologies and their implementation to develop the applications.					

1. Verify installation and setting of Web container/Web Server/Tomcat and prepare an installation report, which contains setting of class path, server port, starting and shutting down of server etc.
2. Write a servlet program which overrides doPost( ) method and write "Welcome to Servlet Programming". Also create an HTML table with five rows and two columns in this program.
3. Write a servlet program that takes your name and address from an HTML Form and displays it.
4. Write a servlet program that displays current date and time. Your servlet should also indicate the number of times it has been assessed since it has been loaded.
5. Write a program to show inter servlet communication between two servlets.
6. Write a Servlet Program that displays server information (server name, port etc.).
7. Write a program, using servlet and JDBC which takes students roll number and provides student information, which includes the name of the student, the address, email-id, program of study, and year of admission. You have to use a database to store student's information.
8. Write program of 7 with login and password protection. Display a message if login and password are not correctly given.
9. Write a program using servlet and JDBC for developing an online application for the shopping of computer science books. (Hint: use concept of session tracking) You have to create a database for book title, author(s) of book, publisher, year of publication, price. Make necessary assumptions for book shopping.
10. Write a JSP program to output, "Welcome to JSP world. The time now is: system current time. Use a scriptlet for the complete string, including the HTML tags.
11. write a JSP page that display a randomly generated number in first visit to this page and repeat displaying this same number in subsequent visits.
12. Write a JSP page to output the values returned by System.getProperty for various system properties such as java.version, java.home, os.name, user.name, user.home, user.dir etc. Each property should be displayed in a separate row.
13. Write a JSP page to use either <jsp:include> or <jsp:forward> depending upon the value of a Boolean variable.
14. Write a JSP page using <jsp:forward> to go to a servlet program which display your name, date of birth and address.

15. Create an HTML form to take customer information (Name, Address, Mobile No.). Write a JSP program to validate this information of customers.
16. Write a JSP program using <jsp:include> to include the program written in 9.
17. Write a JSP program which display a web page containing your personal information such as: Name, Date of Birth, Sex, Area of Interest, Specialisation and a paragraph explaining what you want to be in the next five years.
18. Develop an application that collects/maintains the product information of an electronics goods production company, in a database. Write a JSP page to retrieve (to display) selective this information in database on demand. Make necessary assumptions to develop this application.
19. Make an HTML form that name of a table, number of rows and number of columns in this table, using JSP page display the table of given specification.
20. Using Servlet, JSP, JDBC, and XML, create a Web application for a recruitment agency to providing assistance in searching the candidates from its databases as per requirements of its various clients. Make necessary assumptions while developing this application.

Lab Exercises Based on PHP:

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
3. Write a program to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. Write a program to sort an array.
7. Write a PHP script that removes the whitespaces from a string. Sample string : 'The quick " " brown fox' Expected Output : Thequick""brownfox
8. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.
9. Write a PHP script that checks if a string contains another string.
10. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.
11. Write a simple PHP program to check that emails are valid.
12. Using switch case and dropdown list display a —Hello message depending on the language selected in drop down list.
13. Write a PHP program to print Fibonacci series using recursion.
14. Write a PHP script to replace the first 'the' of the following string with 'That'.

MCA-C552		ADVANCED JAVA PROGRAMMING LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.
Prerequisites	**:**	Knowledge of JAVA .					
Objectives	**:**	This laboratory course gives a thorough understanding of the advanced concepts of JAVA programming and their implementation to develop the applications.					

1. Create a distributed name server (like DNS) RMI.
2. Create a Java Bean to draw various graphical shapes and display it using or without using BDK
3. Develop an Enterprise Java Bean for Student Information System
4. Develop an Enterprise Java Bean for Library Operations
5. HTML to Servlet Applications
6. Applet to Servlet Communication
7. Designing online applications with JSP
8. Creating JSP program using Java Beans
9. Working with Enterprise Java Beans
10. Performing Java Database Connectivity.
11. Creating Web services with RMI.
12. Creating and Sending Email with Java
13. Building web applications

MCA-C651	DISSERTATION	C*	MM*
		20	500

***I - Evaluation Rules :**

1) A candidate should work on the Dissertation for 4 months and 6-8 hours on each working day.

2) First synopsis (containing mainly literature survey corresponding to the problem taken up for the project work and line of attack to solve the problem) within one month of joining the training is to be submitted and will be evaluated for **4 credits** (Max. Marks - 100).

3) Second synopsis (containing essentially the progress of work in comparative details) within three months of joining the training is to be evaluated will be evaluated for **6 credits** (Max. Marks - 150).

4) Credits for Final Dissertation Report & Viva Voce: **10** (Max. Marks - 250).

II - General Rules for Dissertation :

1) Dissertation work may be done individually or in groups in case of bigger projects. However if dissertation is done in groups, each student must be given a responsibility for a distinct module and care should be taken to see the progress of individual modules is independent of others.

2) Students should take guidance from an internal guide and prepare a Dissertation Report on "Dissertation Work" in 3 copies to be submitted to the department in the month of April/. May. Whenever possible, a separate file containing source-code listings should also be submitted. Every student should also submit at least 4 typed copies of their dissertation synopsis.

3) The Dissertation Synopsis should contain an Introduction to Dissertation, which should clearly explain the dissertation scope in detail. Also, Data Dictionary, DFDs, ERDs, File designs and a list of output reports should be included.

4) The dissertation Work should be of such a nature that it could prove useful or be relevant from the commercial/technical angle.

5) The dissertation- report will be duly accessed by the internal guide of the subject .

6) The dissertation- report should be prepared preferably in the prescribed format.

7) The student will have to explain his work in power- point presentation in front of the panel consisting of departmental faculty and external examiner(s).

III- General Guidelines Regarding Preparation of Dissertation Report

The purpose of this note is to describe how to organize the written Dissertation submitted as partial fulfillment of your MCA. Degree.

Typing

a) The typing shall be standard 12 pts in double spaced using black ink only
b) Margins must be Left 2 inches Right 1.5 inches
Top 2 inches Bottom 1.5 inches
c) Paper A4 size Bond Paper

Copies

Three hard-bound copies.

FORMAT FOR TITLE PAGE AND FOR EMBOSSING

TITLE OF DISSERTATION
<Font Size 18><1.5 line spacing>

A DISSERATION REPORT
<Font Size 14>

Submitted by
<Font Size 14><Italic>
NAME OF THE CANDIDATE
<Font Size 16>

in partial fulfillment for the award of the degree of
<Font Size 14><1.5 line spacing><Italic>

MASTER OF COMPUTER APPLICATIONS
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DEPARTMENT OF COMPUTER SCIENCE
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FACULTY OF TECHNOLOGY
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GURUKUL KANGRI VISHWAVIDYALAYA,
HARDWAR – 249 404
<Font Size 16><1.15 line spacing>

MONTH & YEAR <Font Size 14>

SPECIMEN

SECURITY CONTROL ON NET BANKING

A DISSERATION REPORT

Submitted by

RAJEEV SHARMA

in partial fulfillment for the award of the degree of

MASTER OF COMPUTER APPLICATIONS

< Emblem>

DEPARTMENT OF COMPUTER SCIENCE
FACULTY OF TECHNOLOGY
GURUKUL KANGRI VISHWAVIDYALAYA,
HARDWAR – 249 404

MAY 2018

The **guidelines** regarding the documentation and scope of project are mentioned here below :

MCA – III SEM – VI (COMMERCIAL SYSTEM PROJECTS)

Project Report should be submitted in following format for Commercial Application Projects viz. Payroll, Sales, Purchase, Inventory, Book Shop, Examination system etc. Where VB, Access, Oracle, ASP and Java is used.

2 Blank Pages at beginning
Title Page
Certificate form Company
Certificate form Guide
Acknowledgement
Index with printed page Numbers

CHAPTER 1 : INTRODUCTION

1. Company Profile
2. Existing System and Need for System
3. Scope of work
4. Operating Environment – Hardware and Software

CHAPTER 2 : PROPOSED SYSTEM

1. Proposed System
2. Objectives of System
3. User Requirements

CHAPTER 3 : ANALYSIS & DESIGN

1. Data Flow Diagram (DFD)
2. Functional Decomposition Diagram (FDD)
3. Entity Relationship Diagram (ERD)
4. Data Dictionary
5. Table Design
6. Code Design
7. Menu Tree
8. Menu Screens
9. Input Screens
10. Report Formats
11. Test Procedures and Implementation

CHAPTER 4 : USER MANUAL

1. User Manual
2. Operations Manual/ Menu Explanation

3. Forms and Report Specifications

Drawbacks and Limitations
Proposed Enhancements
Conclusion
Bibliography
ANNEXURE :
ANNEXURE 1 : INPUT FORMS WITH DATA
Project report should be submitted in following format for project using OOAD, Embedded System, WAP and other technologies and Web Deployed Systems where C, C++, J2EE, .NET, OOAD and Java, SDK's, API's are used.

ANNEXURE 2 : OUTPUT REPORTS WITH DATA
ANNEXURE 3 : SAMPLE CODE
2 Blank Pages at the end.

MCA – III SEM VI (TECHNICAL PROJECTS)

2 Blank Pages at beginning
Title Page
Certificate from Company
Certificate form Guide
Acknowledgement
Index with printed Page Numbers

CHAPTER 1 : INTRODUCTION

1. Company Profile
2. Existing System and Need for System
3. Scope of Work
4. Operating Environment – Hardware and Software
5. Detail Description of Technology Used

CHAPTER 2 : PROPOSED SYSTEM

1. Proposed System
2. Objectives of System
3. User Requirements

CHAPTER 3 : ANALYSIS & DESIGN

1. Object Diagram
2. Class Diagram
3. Use Case Diagrams
4. Module Hierarchy Diagram
5. Component Diagram
6. Deployment Diagram (in case of Web Deployment)

7. Module Specifications
8. Interface Diagram (in case of WAP and Embedded Systems)
9. Web Site Map Diagram (in case of Web site)
10. User Interface Design (Screens etc.)
11. Table specifications (in case back end is a database)
12. Test Procedures and Implementation

CHAPTER 4 : USER MANUAL

1. User Manual
2. Operations Manual/ Menu Explanation
3. Program Specification/ Flow Charts

Drawbacks and Limitations
Proposed Enhancements
Conclusion
Bibliography
ANNEXURE :
ANNEXURE 1 : USER INTERFACE SCREENS
ANNEXURE 2 : OUTPUT REPORTS WITH DATA (if any)
ANNEXURE 3 : SAMPLE PROGRAM CODE (which will prove sufficient development is done by the student)
2 Blank Pages at the end.

CERTIFICATE FROM ORGANIZATION/ INDUSTRY

The certificate from the organization/ industry should be submitted in the following format in the prescribed letter pad of the organization/ industry.

Date:

To
The Head
Department of Computer Science
Gurukula Kangri Vishwavidyalaya
Haridwar - 249404

CERTIFICATE OF PROJECT COMPLETION

This is to certify that _____ has completed the project in our organization as per the particulars given below.

PERIOD :

PROJECT TITLE :

SOFTWARE TOOLS USED :

SIGNATURE AND STAMP

INDUSTRY / ORGANISATION
OFFICE SEAL