

**SCHEME OF STUDIES & EXAMINATION**  
**FOR**  
**THE DEGREE**  
**OF**  
**MASTER OF COMPUTER APPLICATIONS**  
**(M.C.A.)**  
**(3-years Post Graduate Programme)**  
**(w.e.f. Session 2013-14)**



**Faculty of Computer Science & Information Technology**  
**Deenbandhu Chhotu Ram University of Science & Technology**  
**Murthal (Sonapat)-131039, Haryana, India**  
**April 2013**

**Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)**

**SCHEME OF STUDIES & EXAMINATIONS**

Master of Computer Application (MCA) 1<sup>ST</sup> Year 1<sup>st</sup> Semester

Credit Based Scheme w.e.f. 2013-14

Sr. No.	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
1.	MCA401	Problem Solving & Programming in C	3	1	-	25	75	-	100	4	3
2.	MCA403	Internet & Web Technologies	3	1	-	25	75	-	100	4	3
3.	HUM507B	Communication Skills	2	1	-	25	75	-	100	3	3
4.	MCA405	Discrete Mathematics	3	1	-	25	75	-	100	4	3
5.	MCA407	Digital Electronics	3	1	-	25	75	-	100	4	3
6.	MCA421	Software Lab-I (Based on MCA401)	-	-	3	20	-	30	50	1.5	3
7.	MCA423	Software Lab-II (Based on MCA403)	-	-	3	20	-	30	50	1.5	3
8.	HUM509B	Communication Skills Lab	-	-	2x2	25	-	50	75	2.0	2
<b>TOTAL</b>			<b>14</b>	<b>5</b>	<b>10</b>	<b>190</b>	<b>375</b>	<b>110</b>	<b>675</b>	<b>24</b>	

**Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)**

**SCHEME OF STUDIES & EXAMINATIONS**

Master of Computer Application (MCA) 1<sup>ST</sup> Year 2<sup>nd</sup> Semester

Credit Based Scheme w.e.f. 2013-14

Sr. No.	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
1.	MCA402	Data Structures using C	3	1	-	25	75	-	100	4	3
2.	MCA404	Visual Programming	3	1	-	25	75	-	100	4	3
3.	HUM506B	Interpersonal Skills and Personality Development	2	1	-	25	75	-	100	3	3
4.	MCA406	Computer Organization and Architecture	3	1	-	25	75	-	100	4	3
5.	MCA408	Information System Analysis & Design	3	1	-	25	75	-	100	4	3
6.	MCA422	Software Lab-III (Based on MCA402)	-	-	3	20	-	30	50	1.5	3
7.	MCA424	Software Lab-IV (Based on MCA404)	-	-	3	20	-	30	50	1.5	3
8.	HUM508B	Interpersonal Skills Lab	-	-	2x2	25	-	50	75	2	2
<b>TOTAL</b>			<b>14</b>	<b>5</b>	<b>10</b>	<b>190</b>	<b>375</b>	<b>110</b>	<b>675</b>	<b>24</b>	

**Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)**

**SCHEME OF STUDIES & EXAMINATIONS**

Master of Computer Application (MCA) 2<sup>nd</sup> Year 3<sup>rd</sup> Semester

Credit Based Scheme w.e.f. 2014-15

Sr. No.	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
1.	MCA501	Object Oriented Programming using C++	3	1	-	25	75	-	100	4	3
2.	MCA503	Database Management Systems	3	1	-	25	75	-	100	4	3
3.	MCA505	Operating System	3	1	-	25	75	-	100	4	3
4.	MCA507	Algorithm Analysis & Design	3	1	-	25	75	-	100	4	3
5.	MCA509	Software Engineering	3	1	-	25	75	-	100	4	3
6.	MCA521	Software Lab-V (Based on MCA501)	-	-	3	20	-	30	50	1.5	3
7.	MCA523	Software Lab-VI (Based on MCA503)	-	-	3	20	-	30	50	1.5	3
		<b>TOTAL</b>	<b>15</b>	<b>5</b>	<b>6</b>	<b>165</b>	<b>375</b>	<b>60</b>	<b>600</b>	<b>23</b>	

**Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)**

**SCHEME OF STUDIES & EXAMINATIONS**

Master of Computer Application (MCA) 2<sup>nd</sup> Year 4<sup>th</sup> Semester

Credit Based Scheme w.e.f. 2014-15

Sr. No.	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
1.	MCA502	Computer Graphics	3	1	-	25	75	-	100	4	3
2.	MCA504	Java Programming	3	1	-	25	75	-	100	4	3
3.	MCA506	Computer Networks	3	1	-	25	75	-	100	4	3
4.	MCA508	Artificial Intelligence	3	1	-	25	75	-	100	4	3
5.		Elective-I	3	1	-	25	75	-	100	4	3
6.	MCA522	Software Lab-VII (Based on MCA502)	-	-	3	20	-	30	50	1.5	3
7.	MCA524	Software Lab-VIII (Based on MCA504)	-	-	3	20	-	30	50	1.5	3
		<b>TOTAL</b>	<b>15</b>	<b>5</b>	<b>6</b>	<b>165</b>	<b>375</b>	<b>60</b>	<b>600</b>	<b>23</b>	

**Elective-I**

MCA552	Theory of Computation
MCA554	Optimization Techniques
MCA556	Network Security and Management
MCA558	Digital Image Processing

**Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)**

**SCHEME OF STUDIES & EXAMINATIONS**

Master of Computer Application (MCA) 3<sup>rd</sup> Year 5<sup>th</sup> Semester

Credit Based Scheme w.e.f. 2015-16

Sr. No.	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
1.	MCA601	Advanced Java	3	1	-	25	75	-	100	4	3
2.	MCA603	.Net Framework with C#	3	1	-	25	75	-	100	4	3
3.	MCA605	Software Project Management	3	1	-	25	75	-	100	4	3
4.		Elective – II	3	1	-	25	75	-	100	4	3
5.		Elective – III	3	1	-	25	75	-	100	4	3
6.	MCA621	Software Lab. - IX (Based on MCA601)	-	-	3	20	-	30	50	1.5	3
7.	MCA623	Software Lab. - X (Based on MCA603)	-	-	3	20	-	30	50	1.5	3
		<b>Total</b>	<b>15</b>	<b>5</b>	<b>6</b>	<b>165</b>	<b>375</b>	<b>60</b>	<b>600</b>	<b>23</b>	

**Elective-II**

MCA651 Linux & Shell Programming  
MCA653 Data Base Administration  
MCA655 Network Administration  
MCA657 J2EE and Applications

**Elective-III**

MCA661 Software Testing & Quality  
MCA663 Data Warehousing & Mining  
MCA665 Numerical and Statistical Method  
MCA667 Compiler Design

**Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)**

**SCHEME OF STUDIES & EXAMINATIONS**

Master of Computer Application (MCA) 3rd Year 6<sup>th</sup> Semester

Credit Based Scheme w.e.f. 2015-16

Sr. No.	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
1.	MCA602	PROJECT	-	-	-	50	-	100	150	20	3
TOTAL			-	-	-	50	-	100	150	20	3

**The Project work is to be carried out in an Industry/Research lab.**

- The Department/Training and Placement (T&P) officer will arrange training slots for the students, however, the student in consultation with the deptt./T&P cell can arrange for industrial training slot in reputed Industry/Research labs.
- At least one faculty member from the deptt. is to be associated with each student and designated as teacher-in-charge.
- The student is required to send his/her joining report, duly signed by the industry coordinator, to the deptt. through his/her teacher-in-charge within two weeks of joining.
- The teacher-in-charges will visit the industries at least twice in the semester. First visit is to be made within first two months of the commencement of Project work. The second visit is to be made in the last month of the Project duration.
- The University will appoint external examiner to conduct the viva-voce examination and the Practical marks will be awarded on the basis of project report, presentation and project execution carrying 30, 30 and 40 marks respectively during the conduct of Practical examination in the institute.

**Master of Computer Application (MCA) 1<sup>st</sup> Year 1<sup>st</sup> Semester  
w.e.f. 2013-14**

Sr. No.	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
1.	MCA401	Problem Solving & Programming in C	3	1	-	25	75	-	100	4	3
2.	MCA403	Internet & Web Technologies	3	1	-	25	75	-	100	4	3
3.	HUM507B	Communication Skills	2	1	-	25	75	-	100	3	3
4.	MCA405	Discrete Mathematics	3	1	-	25	75	-	100	4	3
5.	MCA407	Digital Electronics	3	1	-	25	75	-	100	4	3
6.	MCA421	Software Lab-I (Based on MCA401)	-	-	3	20	-	30	50	1.5	3
7.	MCA423	Software Lab-II (Based on MCA403)	-	-	3	20	-	30	50	1.5	3
8.	HUM509B	Communication Skills Lab	-	-	2x2	25	-	50	75	2.0	2
<b>TOTAL</b>			<b>14</b>	<b>5</b>	<b>10</b>	<b>190</b>	<b>375</b>	<b>110</b>	<b>675</b>	<b>24</b>	

## MCA401 - PROBLEM SOLVING AND PROGRAMMING IN C

### MCA Semester - I

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1-Computer Fundamentals:** Computer components, characteristics & classification of computers, hardware & software, peripheral devices, memory, types of memory, application software, compiler, interpreter, number system (binary, decimal, octal, hexa decimal), number system conversion. **Programming Languages:** Machine-, Assembly-, High Level- Language, Assembler, Compiler, Interpreter, debuggers, Programming fundamentals: problem definition, algorithms, flow charts and their symbols, introduction to compiler, interpreter, assembler, linker and loader and their inter relationship.

**UNIT 2-Operating system:** Definition and significance of OS, services and function of OS, OS architecture, Introduction to DOS, UNIX, Linux, GUI windows and their important commands.

**Internet basics:** Introduction to the basic concepts of Networks and Data Communications, LAN, MAN, WAN, OSI model, working of Internet, major features of internet, Emails, FTP, Using the internet

**UNIT 3-Elements of C:** C character set, identifiers and keywords, Data types: declaration and definition, storage classes in C, Type conversion, Types of error, 'C' macro, macros function.

**Operators:** Arithmetic, relational, logical, bitwise, unary, assignment and conditional operators and their hierarchy & associativity.

Data input/output.

**UNIT 4-Control statements:** Sequencing, Selection: if and switch statement; alternation, Repetition: for, while, and do-while loop; break, continue, goto. **Functions:** Definition, prototypes, passing parameters, recursion. **Data Structures:** arrays, struct, union, string, data files. **Pointers:** Declaration, operations on pointers, array of pointers, pointers to arrays.

#### **TEXT AND REFERENCE BOOKS:**

1. E. Balaguruswami, Programming in ANSI C, Tata Mcgraw Hill.
2. Yashwant Kanetker, Let us C, BPB Publications.
3. Gottfried, Programming with C, Tata McGraw Hill.
4. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language, 2nd Ed., Prentice Hall of India.
5. S.S. Bhatia and Vikram Gupta, Computer Fundamentals, Kalayani Publication.
6. Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, Information technology, TMH.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

## MCA403 – INTERNET AND WEB TECHNOLOGIES

### MCA Semester - I

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 – Introduction:** Introduction to the Internet, The world wide web: The idea of hypertext and hyper media; How the web works-HTTP, HTML and URLs; How the browser works-MIME types, plugins and helper applications; The standards-HTML, XML, XHTML and the W3C.

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

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

**UNIT 2 -** Separating style from structure with style sheets: Internal style specifications within HTML, External linked style specification using CSS, page and site design considerations.

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

**UNIT 3 - Server side programming:** Introduction to Server Side Technologies CGI/ASP/JSP., Programming languages for server Side Scripting, Configuring the server to support CGI, applications; Input/ output operations on the WWW, Forms processing, (using PERL/VBSCRIPT/JavaScript)

**UNIT 4 -** Other dynamic content technologies: introduction to ASP & JSP, Delivering multimedia over web pages, The VRML idea, The Java phenomenon-applets and servlets, issues and web development.

#### **TEXT BOOKS:**

1. Beginning XHTML by Frank Boumpery, Cassandra Greer, Dave Raggett, Jenny Raggett, Sebastian Schnitzenbaumer& ted Wugofski, 2000, WROX press (Indian Shroff Publ. SPD) 1st edition
2. HTML &XHTML:The Definitive Guide by Chuck Musciano, Bill Kennedy, 2000, 4th Edi.

#### **REFERENCE BOOKS:**

1. XHTML Black Book by Steven Holzner, 2000
2. CGI Programming on the World Wide Web. O'Reilly Associates.
3. Web Technologies By Achyut S Godbole , AtulKahate, 2003, T.M.H
4. Scott Guelich, ShishirGundararam, Gunther Birzniek; CGI Programing with Perl 2/e O'Reilly.



5. Doug Tidwell, James Snell, PavelKulchenko; Programming Web services, O'Reilly.
6. Intranets by James D.Cimino, 1997, Jaico Publ.
7. Internet and Web Technologies – Raj Kamal, 2002, T.M.H

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**HUM507B – COMMUNICATION SKILLS**  
**MCA Semester - I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>2</b>	<b>1</b>	<b>-</b>	<b>3</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**OBJECTIVE**

To provide students an opportunity to learn how to communicate fluently and accurately in English in professional contexts.

**COURSE CONTENT**

**UNIT 1** **20 Marks**

Business letter and memo writing, emails, E-commerce and business vocabulary

**UNIT 2** **20 Marks**

Curriculum Vitae, Resume, Statement of purpose

**UNIT 3** **20 Marks**

Technical Report Writing, technical jargon and persuasive writing skills

**UNIT 4** **15 Marks**

Oral presentations: tele- communication, negotiation skills, presentation in meetings and public gatherings

**RECOMMENDED READING**

1. Raman, Meenakshi&Sangeeta Sharma. *Technical communication: English Skills for Engineers*. Delhi: OUP, 2009.

**SUGGESTED READING**

1. Lesikar, Raymond V. and Marie E.Flatley. *Basic Business Communication*. Delhi: Tata Mcgraw Hill, 2005
2. Kumar, Sanjay and PushpLata. *Communication Skills*. Delhi: OUP, 2011
3. Anderson, Paul V. *Technical Communication*. New Delhi: Cengage Learning, 2007.

## **SCHEME OF END SEMESTER EXAMINATION (MAJOR TEST) AND INSTRUCTIONS FOR THE EXAMINER**

### **Theory**

1. The duration of the exam will be 3 hours.
2. The Question Paper for this course shall have four questions in all. The questions may be divided into parts. The marks of each question can be distributed into/among its parts as per its nature and requirement.
3. Question no. 1 on Unit I will be of 20 marks. The question may have two parts with internal choice. Students will be asked to write a letter, memo or e-mail on a business subject/ issue. The contents of the unit may also be assessed by asking theoretical question while the stress would be on testing the actual letter writing on a given business/technical situation.
4. Question no. 2 will be of 20 marks. The question may have two parts with internal choice, asking students to prepare CV/Resume/SOP, different components of the Unit II.
5. Question no 3 will be of 20 marks. The question may have two parts divided into theoretical and practical aspects of the unit. The theoretical part will be of 10 marks and practical part (report writing on a given subject) will be of 10 marks.
6. Question no. 4 covering various components of the Unit III will be of 15 marks.

**MCA405 – DISCRETE MATHEMATICS**  
**MCA Semester - I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - Set Theory:** Introduction to set theory, Set operations, Algebra of sets, Duality, Finite and Infinite sets, Cartesian Product, Relations, Representation of relations, Types of relation, Equivalence relations and partitions, Partial ordering relations and lattices, Function and its types, Composition of function and relations

**UNIT 2 - Graphs And Trees:** Introduction to graphs, Directed and Undirected graphs, Homomorphic and Isomorphic graphs, Subgraphs, Cut points and Bridges, Multigraph and Weighted graph, Paths and circuits, Shortest path in weighted graphs, Eulerian path and circuits, Hamilton paths and circuits, Planar graphs, Euler's formula, Graph Coloring, Trees, Spanning trees, Binary trees and its traversals.

**UNIT 3 - Propositional logic:** Basic operations: AND( $\wedge$ ), OR( $\vee$ ), NOT( $\sim$ ), Truth value of a compound statement, propositions, tautologies, contradictions, Validity of Arguments, Boolean Algebra

**Group theory:** Definition and examples of a monoid, Semigroup, Groups and rings, Homomorphism, Isomorphism and Automorphism, Subgroups and Normal subgroups, Cyclic groups, Cosets, Lagrange's theorem.

**UNIT 4 - Recursion And Recurrence Relation :** linear recurrence relation with constant coefficients, Homogeneous solutions, Particular solutions, Total solution of a recurrence relation using generating functions.

**Techniques Of Counting:** Permutations with and without repetition, Combination.

**TEXT BOOK:**

- Elements of Discrete Mathematics C.L Liu, 1985, McGraw Hill

**REFERENCE BOOKS:**

1. Discrete Mathematics by Johnson Bough R., 5th Edition, PEA, 2001..
2. Concrete Mathematics: A Foundation for Computer Science, Ronald Graham, Donald Knuth and Oren Patashik, 1989, Addison-Wesley.
3. Mathematical Structures for Computer Science, Judith L. Gersting, 1993, Computer Science Press.
4. Applied Discrete Structures for Computer Science, Doerr and Lefvasseur, (Chicago: 1985,SRA
5. Discrete Mathematics by A. Chtewynd and P. Diggle (Modular Mathematics series), 1995, Edward Arnold, London.

6. Schaums Outline series: Theory and problems of Probability by S. Lipshutz, 1982, McGraw-Hill Singapore
7. Discrete Mathematical Structures, B. Kolman and R.C. Busby, 1996, PHI
8. Discrete Mathematical Structures with Applications to Computers by Tembley&Manohar, 1995, McGraw Hill.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA407 – DIGITAL ELECTRONICS**  
**MCA Semester - I**

**L    T    P    Credits**  
**3    1    -    4**

**Class Work                               : 25 Marks**  
**Examination                             : 75 Marks**  
**Total                                       : 100 Marks**  
**Duration of Examination           : 03 Hours**

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**UNIT 1 –Fundamentals of Digital Techniques:**Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Numbersystems. Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes.

**Combinational Design using Gates:**Design using gates, Simplifications of SOP and POS Boolean Expressions, Karnaugh map up to four variables.

**UNIT 2 –Combinational Design using MSI Devices:**Multiplexers and Demultiplexers and their use as logic elements, Decoders, Adders / Subtractors, BCD arithmetic circuits, Encoders, Code Converters, Decoders / Drivers for display devices.

**Sequential Circuits:**Flip Flops : S-R, J-K, T, D, master-slave, edge triggered, shift registers, sequence generators, Counters,Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronoussequential circuits.

**UNIT 3 –Digital Logic Families:**Switching mode operation of p-n junction, bipolar and MOS. devices. Bipolar logic families:RTL, DTL, DCTL, HTL,TTL, ECL, MOS, and CMOS logic families. Tristate logic, Interfacing of CMOS and TTL families.

**Semiconductors Memory Devices:**Memory organizations, Characteristics of memory devices, Classifications of semiconductors memories.

**UNIT 4 - A/D and D/A Converters:**Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters.A/ D converters : Quantization, parallel-comparator, successive approximation, counting type, dual-slope ADC,specifications of ADCs.

**Programmable Logic Devices:**PLA, PAL, FPGA and CPLDs.

**TEXT BOOKS :**

1. Modern Digital Electronics(Edition III) : R. P. Jain; TMH
2. Digital Electronics :Green; Pearson

**REFERENCE BOOKS:**

1. Digital Integrated Electronics :Taub& Schilling; MGH
2. Digital Principles and Applications :Malvino& Leach; McGraw Hill.
3. Digital Design : Morris Mano; PHI.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA421 – SOFTWARE LAB-I**  
**(Based on MCA401)**  
**MCA Semester - I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
-	-	3	1.5

<b>Class Work</b>	<b>: 20 Marks</b>
<b>Practical Examination</b>	<b>: 30 Marks</b>
<b>Total</b>	<b>: 50 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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1. Write a program to find the largest of three numbers. (if-then-else).
  2. Write a program to find the largest number out of ten numbers (for-statement).
  3. Write a program to find the average male height & average female heights in the class (input is in form of sex code, height).
  4. Write a program to find roots of quadratic equation using functions and switch statements.
  5. Write a program using arrays to find the largest and second largest no. out of given 50 nos.
  6. Write a program to multiply two matrices.
  7. Write a program to sort numbers using the Quicksort Algorithm.
  8. Represent a deck of playing cards using arrays.
  9. Write a program to check that the input string is a palindrome or not.
  10. Write a program to read a string and write it in reverse order.
  11. Write a program to concatenate two strings.
  12. Write a program which manipulates structures (write, read, and update records).
  13. Write a program which creates a file and writes into it supplied input.
  14. Write a program which manipulates structures into files (write, read, and update records).

**Note: At least 5 to 10 more exercises to be given by the teacher concerned.**

**MCA423 – SOFTWARE LAB-II**  
**(Based on MCA403)**  
**MCA Semester - I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
-	-	3	1.5

<b>Class Work</b>	<b>: 20 Marks</b>
<b>Practical Examination</b>	<b>: 30 Marks</b>
<b>Total</b>	<b>: 50 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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Students are required to perform at least 10 exercises based on the syllabi of subject “**Internet and Web Technologies**”.



## HUM509B – COMMUNICATION SKILLS LAB MCA Semester - I

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Class Work</b>	<b>: 25 Marks</b>
-	-	2x2	2	<b>Practical Examination</b>	<b>: 50 Marks</b>
				<b>Total</b>	<b>: 75 Marks</b>
				<b>Duration of Examination</b>	<b>: 02 Hours</b>

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### OBJECTIVE

To enable students communicate important professional information orally in English.

### COURSE CONTENT

Practising tele-conferencing, video conferencing and web conferencing through mock business situations; conducting and participating mock meetings; Practice in speaking through correct pronunciation and accurate sentence construction

**Requirement:** Technological provision for conducting mock conferencing (audio-as well as video)

NOTE: Conversation in English will be mandatory for all the students.

Students are put to practice English language through simulations and practice sessions of conferencing, meetings. Role Play, a common technique can be used for practising all kinds of remote conferencing. This drilling method would certainly give them a feel of real life situations and make them communicate accurately and fluently.

### RECOMMENDED READING

1. Raman, Meenakshi & Sangeeta Sharma. *Technical communication: Principles and Practice*. Delhi: OUP, 2011.

### SCHEME OF END SEMESTER EXAMINATION (Practical)

An external Practical exam of 50 marks of 2 hour duration for the course will be conducted by an external examiner appointed by the university's Controller of Exams.

**NOTE: Students will be tested for their oral communication competence making them participate in audio/video/web conferencing and in meetings. Students may also be evaluated through a viva conducted by an external examiner.**

**Master of Computer Application (MCA) 1<sup>ST</sup> Year 2<sup>nd</sup> Semester**  
**Credit Based Scheme w.e.f. 2013-14**

Sr. No	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
1.	MCA402	Data Structures using C	3	1	-	25	75	-	100	4	3
2.	MCA404	Visual Programming	3	1	-	25	75	-	100	4	3
3.	HUM506B	Interpersonal Skills and Personality Development	2	1	-	25	75	-	100	3	3
4.	MCA406	Computer Organization and Architecture	3	1	-	25	75	-	100	4	3
5.	MCA408	Information System Analysis & Design	3	1	-	25	75	-	100	4	3
6.	MCA422	Software Lab-III (Based on MCA402)	-	-	3	20	-	30	50	1.5	3
7.	MCA424	Software Lab-IV (Based on MCA404)	-	-	3	20	-	30	50	1.5	3
8.	HUM508B	Interpersonal Skills Lab	-	-	2x2	25	-	75	75	2	2
<b>TOTAL</b>			<b>14</b>	<b>5</b>	<b>10</b>	<b>190</b>	<b>375</b>	<b>135</b>	<b>675</b>	<b>24</b>	

**MCA402 – DATA STRUCTURES USING C**  
**MCA Semester - II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - Basic Terminology: Elementary Data Organization, Data Structure Operations**

Arrays: Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing of Linear Arrays, Insertion and Deletion, Single Dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays, Sparse Matrix.

Stacks and Queues: Operations on Stacks- Push, Pop, Representation of stacks. Application of stacks – polish expression and their compilation conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem, Representation of Queues, Operations on queues: Create, Add, Delete, Priority Queues, Dequeues, Circular Queue.

**UNIT 2**

Linked Lists: Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list, Polynomial Addition, Header Linked List, Doubly linked list, generalized list, Circular Linked List implementation and applications.

**UNIT 3**

Trees: Basic Terminology, Binary Trees and their representation, expression evaluation, Complete Binary trees, Extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees (with and without recursion), AVL trees, Threaded trees, B trees.

Graphs: Terminology and Representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, Adjacency matrices, Transversal Connected Component and Spanning trees, Shortest path

**UNIT 4**

Searching, Sorting methodologies: Array- Bubble sort, Selection Sort, Insertion Sort, Linear Search, Binary Search.

Stack - Quick Sort, Merge Sort, Two way Merge Sort. Queue- Radix Sort. Tree – Heap Sort.

**TEXT AND REFERENCE BOOKS:**

1. An introduction to data structures and application by Jean Paul Tremblay & Pal G. Sorenson (McGraw Hill)
2. R.L. Kruse, B.P. Leary, C.L. Tondo, Data structure and program design in C, PHI
3. R. B. Patel, Expert Data Structures With C, Khanna Publications, Delhi, India, 3rd Edition 2008.
4. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
5. Data Structures and Algorithms by A. V. Aho, J. E. Hopcroft and T. D. Ullman, Original edition, Addison-Wesley, 1999, Low Price Edition.

6. Fundamentals of Data Structure by Ellis Horowitz & Sartaj Sahni, Pub, 1983. AW
7. Data Structure and Program design in C by Robert Kruse, PHI
8. Theory and Problems of Data Structures by Jr. Seymour Lipschitz, Schaum's outline by TMH.
9. Introduction to Computer Science- An algorithms approach, Jean Paul Tremblay, Richard B. Bunt, 2002, TMH.
10. Data Structure and Standard Template Library- Willam J. Collins, 2003, T.M.H

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

## MCA404 – VISUAL PROGRAMMING

### MCA Semester - II

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 – Windows Programming and Visual C++ Programming:** Windows environment , a simple windows program ,windows and messages, creating the window , displaying the window, message loop, message processing , text output , painting and repainting, introduction to, device context, basic drawing, child window controls, Application Framework, MFC library, Visual C++ Components , Event Handling , Mapping modes , fonts, windows common controls, bitmaps.

**UNIT 2 – The Document and View Architecture:** Menus , Keyboard accelerators , rich edit control , toolbars , status bars , reusable frame window base class , separating document from its view ,reading and writing SDI and MDI documents ,splitter window and multiple views, creating DLLs, dialog based applications.

**UNIT 3 – ActiveX and Object Linking and Embedding (OLE):** ActiveX controls Vs. Ordinary Windows Controls ,Installing ActiveX controls , Calendar Control, ActiveX control container programming ,create ActiveX control at runtime ,Component Object Model (COM), containment and aggregation Vs. inheritance ,OLE drag and drop , OLE embedded component and containers, sample applications.

**UNIT 4 – Advanced Concepts:** Database Management with Microsoft ODBC ,Structured Query Language , MFC ODBC classes , sample database applications ,filter and sort strings, DAO concepts ,displaying database records in scrolling view,Threading ,VC++ Networking issues ,Winsock ,WinInet , building a web client , Internet Information Server , ISAPI server extension , chat application ,playing and multimedia (sound and video) files.

#### **TEXT BOOKS:**

1. Charles Petzold, “Windows Programming”, Microsoft press, 1996.
2. David J.Kruglinski, George Shepherd and Scot Wingo, “Programming Visual C++”, Microsoft press, 1999.

#### **REFERENCE BOOKS:**

1. Steve Holtzner, “Visual C++ 6 Programming”, Wiley Dreamtech India Pvt. Ltd., 2003.
2. A.A Puntambekar, ”Visual Programming”, Technical Publications Pune,First Edition-2009.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**HUM506B – INTERPERSONAL SKILLS AND PERSONALITY  
DEVELOPMENT  
MCA Semester - II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>2</b>	<b>1</b>	<b>-</b>	<b>3</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**OBJECTIVE**

To train students to learn interpersonal skills and personality development.

**COURSE CONTENT**

**UNIT1**

**Soft Skills:** Importance of soft skills: self-confidence, attitude, ethics, integrity, responsibility; leadership.

**UNIT 2**

**Interpersonal Skills:** Essentials of speaking skills: pronunciation, fluency; essentials of listening skills; Do's and Don'ts of Formal Group Discussion

**UNIT3**

**Non-Verbal Elements in Interpersonal Skills:** Reading Face, eyes, gesture and body posture, time, space and culture in communicative situations

**UNIT 4**

**Personality Development:**Personality attributes; personality types; personality analysis

**RECOMMENDED READING**

1. Mitra, Barun K. *Personality Development and Soft Skills*. Delhi: OUP, 2011.

**SUGGESTED READING**

1. Raman, Meenakshi and Sangeeta Sharma. *Communication Skills*. Delhi: OUP, 2011
2. Sharma, Sangeeta and Binod Mishra. *Communication Skills for Engineers and scientists*. Delhi: PHI, 2009
3. Ribbens, Geoff and Richard Thompson. *Body Language*. New York: Hodder& Stoughton, 2007.

**SCHEME OF END SEMESTER EXAMINATION (MAJOR TEST) AND INSTRUCTIONS FOR THE EXAMINER**

**Theory**

1. The duration of the exam will be 3 hours.
2. The Question Paper for this course shall have four questions in all. The questions may be divided into parts.
3. Question no. 1, 2 and 4 based on Unit I, II and IV respectively will be of 20 marks each. The questions may have two/three parts with internal choice. The 20 marks of each question can be distributed into/among its parts as per its nature and requirement.
4. Question no. 3 covering various components of the Unit III will be of 15 marks.



**MCA406 – Computer Organization and Architecture**  
**MCA Semester - II**

**L    T    P    Credits**  
**3    1    -    4**

**Class Work                    : 25 Marks**  
**Examination                 : 75 Marks**  
**Total                            : 100 Marks**  
**Duration of Examination    : 03 Hours**

**UNIT 1**

Information Representation: Number systems, BCD codes, error detecting and correcting codes. Binary arithmetic operations, Booths multiplication.

Binary Logic: Boolean algebra, Boolean functions, truth tables, canonical and standard forms, simplification of Boolean functions, digital logic gates. Encoders, decoders, multiplexers, demultiplexers and comparators.

**UNIT 2**

Sequential Logic: Flip-flops, shift registers and counters. RTL. Logic micro operations. Computer instructions. General register organization, RISC, CISC, Memory parameters, signal converters–Analog to Digital & vice-versa.

**UNIT 3**

**CPU Organization:** CPU Architecture types (accumulator, register, stack, memory/ register) Instruction cycle (Fetch-Decode-Execute); Instruction set based classification of processors (RISC, CISC, and their comparison); Addressing modes( register, immediate, direct, indirect, indexed); Operations in the instruction set; Arithmetic and Logical, Data Transfer, Control Flow; Instruction set formats (fixed, variable, hybrid).

**UNIT 4**

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

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

**TEXT BOOKS:**

1. Structured Computer Organisation by A.S. Tanenbaum, 4<sup>th</sup> edition, Prentice-Hall of India, Eastern Economic Edition
2. Computer System Architecture by M. Mano, Prentice-Hall.

**REFERENCE BOOKS:**

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

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA408 – INFORMATION SYSTEM ANALYSIS & DESIGN**  
**MCA Semester - II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - Introduction to System Development:** Categories of Information Systems, Structured analysis method, System prototype method, succeeding as system analyst.

**Analysis:** Feasibility study, Feasibility considerations, Steps in feasibility analysis, Cost and Benefit analysis, Procedure for cost and benefit determination.

**UNIT 2 – Requirement Analysis:** Problem definition, Identification and Investigation of system, Fact finding techniques, Tools for documenting procedures and decisions, Data Flow Diagrams, Data Dictionaries, Decision Tables, and Decision Trees.

**UNIT 3 - Design:** System design considerations, Process and stages of system design: Logical and Physical, Selection of best alternate design strategy.

**Design of Input and Output:** Capturing data for input, Input validation design of output: Output objectives, Types of output, Presentation format of output, Design of software: Top Down Structure, Coupling, Cohesion, Span of control, Module size, Shared modules. Training, Conversion Methods

**UNIT 4 - Object Oriented Design and Modeling:** Introduction to object oriented design, Designing Object responsibilities, and Object reusability.

**Case Study of Some Common Systems:** Inventory control, Laboratory management systems, Hotel reception system, Hospital management system etc./ Seminar on State-of the-art technology.

**TEXT BOOKS:**

1. Senn, J. A., Analysis and Design of Information Systems, Tata McGraw Hill (1989) 2<sup>nd</sup> ed.
2. Whitten, J. and Bentley, L., Introduction to Systems Analysis and Design, Tata McGraw Hill (2006).

**REFERENCE BOOKS:**

1. Hoffer and Hoffer, Modern System Analysis and Design, Pearson Education.

**Note:** Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.

**MCA422 – SOFTWARE LAB-III**  
**(Based on MCA402)**  
**MCA Semester - II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
-	-	3	1.5

<b>Class Work</b>	<b>: 20 Marks</b>
<b>Practical Examination</b>	<b>: 30 Marks</b>
<b>Total</b>	<b>: 50 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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List of Programs:

1. Write a program to perform binary search in an array.
2. Write a program to perform binary search using recursion.
3. Write a program to perform linear search in 2D array.
4. Write a program to perform various operations on matrices.
5. Write a program to swap two nos. using calls by value and reference.
6. Write a program to implement bubble sort.
7. Write a program to implement insertion sort.
8. Write a program to implement selection sort.
9. Write a program of link list implementation of a stack.
10. Write a program of link list implementation of a queue.
11. Write a program of array implementation of a stack.
12. Write a program of array implementation of a queue.
13. Write a program to search an element in a link list.
14. Write a program to maintain a link list.
15. Write a program to implement BST

**Note: Teacher may give 5 to 10 more exercises based on course MCA 402.**

**MCA424 – SOFTWARE LAB-IV**  
**(Based on MCA404)**  
**MCA Semester - II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
-	-	3	1.5

<b>Class Work</b>	<b>: 20 Marks</b>
<b>Practical Examination</b>	<b>: 30 Marks</b>
<b>Total</b>	<b>: 50 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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1. Form Design – Keyboard & Mouse events.
2. Programs on usage of data types - variant, Control arrays.
3. Simple applications using file system controls.
4. Database applications using data control.
5. SDK type programs for creating simple windows with different window styles.
6. SDK type programs code for keyboard and mouse events, GDI objects.
7. Simple Dialog Based application – eg. Calculator, interest computation, money conversions, etc.
8. Creating SDI & MDI applications, Modal and Modeless dialog.
9. Programming for reading and writing into documents.
10. Coding Dynamic controls – slider control, progress control, inheriting CTreeView and CrichteditView.
11. Creating static and dynamic splitter windows.
12. Creating DLLs and using them.
13. Winsock and WinInet& Internet Explorer common controls.
14. Data access through ODBC – Cdatabase, Crecordset.
15. Creating ActiveX control and using it.

**Note: Teacher may give 5 to 10 more exercises based on course MCA503.**

**HUM508B – INTERPERSONAL SKILLS LAB**  
**MCA Semester - II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Class Work</b>	<b>: 25 Marks</b>
-	-	2x2	2	<b>Practical Examination</b>	<b>: 50 Marks</b>
				<b>Total</b>	<b>: 75 Marks</b>
				<b>Duration of Examination</b>	<b>: 02 Hours</b>

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**OBJECTIVE**

To improve students' interpersonal skills for personality development.

**COURSE CONTENT**

Practice of Conversation – Interpersonal and Telephonic Conversation; Formal Group Discussion; practice of non-verbal communication (Body Language) with verbal to acquire effective Oral communication

NOTE: Conversation in English will be mandatory for all the students in the class.

Students are put to practice English conversation, formal GDs through simulations and practice sessions.

**RECOMMENDED READING**

Mitra, Barun K. *Personality Development and Soft Skills*. Delhi: OUP, 2011.

Ribbens, Geoff and Richard Thompson. *Body Language*. New York: Hodder& Stoughton, 2007.

**SCHEME OF END SEMESTER EXAMINATION (Practical)**

An external Practical exam of 50 marks of 2 hour duration for the course will be conducted by an external examiner appointed by the university's Controller of Exams.

NOTE: Students will be tested for their oral communication competence making them participate in formal and informal conversations and group discussions. Students may also be evaluated through a viva conducted by an external examiner.

**Master of Computer Application (MCA) 2<sup>nd</sup> Year 3<sup>rd</sup> Semester**  
**Credit Based Scheme w.e.f. 2014-15**

Sr. No.	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
8.	MCA501	Object Oriented Programming using C++	3	1	-	25	75	-	100	4	3
9.	MCA503	Database Management Systems	3	1	-	25	75	-	100	4	3
10.	MCA505	Operating System	3	1	-	25	75	-	100	4	3
11.	MCA507	Algorithm Analysis & Design	3	1	-	25	75	-	100	4	3
12.	MCA509	Software Engineering	3	1	-	25	75	-	100	4	3
13.	MCA521	Software Lab-V (Based on MCA501)	-	-	3	20	-	30	50	1.5	3
14.	MCA523	Software Lab-VI (Based on MCA503)	-	-	3	20	-	30	50	1.5	3
		<b>TOTAL</b>	<b>15</b>	<b>5</b>	<b>6</b>	<b>165</b>	<b>375</b>	<b>60</b>	<b>600</b>	<b>23</b>	

**MCA501 – OBJECT ORIENTED PROGRAMMING USING C++**  
**MCA Semester - III**

**L T P Credits**  
**3 1 - 4**

**Class Work : 25 Marks**  
**Examination : 75 Marks**  
**Total : 100 Marks**  
**Duration of Examination : 03 Hours**

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**UNIT 1 - Introduction to programming language:** Programming language, Features of programming language, types of programming language: procedural, non- procedural, object based, object oriented

**Introduction to C++:** C++ Standard Library, Basics of a Typical C++ Environment, Pre-processors Directives, Illustrative Simple C++ Programs. Header Files and Namespaces, library files.

**Object Oriented Concepts:** Introduction to Objects and Object Oriented Programming, Encapsulation (Information Hiding), Access Modifiers: Controlling access to a class, method, or variable (public, protected, private, package), Other Modifiers, Polymorphism: Overloading,, Inheritance, Overriding Methods, Abstract Classes, Reusability, Class's Behaviors.

**UNIT 2 - Classes and Data Abstraction:** Introduction, Structure Definitions, Accessing Members of Structures, Class Scope and Accessing Class Members, Separating Interface from Implementation, Controlling Access Function And Utility Functions,

**Initializing Class Objects:** Constructors, Using Default Arguments With Constructors, Using Destructors, Classes : Const(Constant) Object And Const Member Functions, Object as Member of Classes, Friend Function and Friend Classes, Using This Pointer, Dynamic Memory Allocation with New and Delete, Static Class Members, Container Classes And Integrators, Proxy Classes, Function overloading.

**UNIT 3 - Operator Overloading:** Introduction, Fundamentals of Operator Overloading, Restrictions On Operators Overloading, Operator Functions as Class Members vs. as Friend Functions, Overloading, <<, >> Overloading Unary Operators, Overloading ,Binary Operators.

**Inheritance:** Introduction, Inheritance: Base Classes And Derived Classes, Protected Members, Casting Base- Class, Pointers to Derived- Class Pointers, Using Member Functions, Overriding Base –Class Members in a Derived Class, Public, Protected and Private Inheritance, Using Constructors and Destructors in derived Classes, Implicit Derived –Class Object To Base- Class Object Conversion, Composition Vs. Inheritance.

**UNIT 4 - Virtual Functions and Polymorphism:** Introduction to Virtual Functions, Abstract Base Classes And Concrete Classes, Polymorphism, New Classes And Dynamic Binding, Virtual Destructors, polymorphism, Dynamic Binding.

**Files and I/O Streams:** Files and Streams, Creating a Sequential Access File, Reading Data From A Sequential Access File, Updating Sequential Access Files, Random Access Files, Creating A Random Access File, Writing Data Randomly To a Random Access File, Reading Data Sequentially from a Random Access File. Stream Input/Output Classes and Objects, Stream

Output, Stream Input, Unformatted I/O (with read and write), Stream Manipulators, Stream Format States, Stream Error States.

**Templates & Exception Handling:** Function Templates, Overloading Template Functions, Class Template, Class Templates and Non-Type Parameters, Templates and Inheritance, Templates and Friends, Templates and Static Members.**Basics of C++ Exception Handling:** Try Throw, Catch, Throwing an Exception, Catching an Exception, Rethrowing an Exception, Exception specifications, Processing Unexpected Exceptions, Stack Unwinding, Constructors, Destructors and Exception Handling, Exceptions and Inheritance.

**TEXT AND REFERENCE BOOKS:**

1. C++ How to Program by H M Deitel and P J Deitel, 1998, Prentice Hall
2. Object Oriented Programming in Turbo C++ by Robert Lafore ,1994.
3. Programming with C++ By D Ravichandran, 2003, T.M.H Reference Books.
4. Object oriented Programming with C++ by E Balagurusamy, 2001, Tata McGraw-Hill
5. Computing Concepts with C++ Essentials by Horstmann, 2003, John Wiley,
6. The Complete Reference in C++ By Herbert Schildt, 2002, TMH.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**



**MCA503 – DATABASE MANAGEMENT SYSTEMS**  
**MCA Semester - III**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1** - DBMS an overview, Advantages of DBMS, Network, Hierarchical and Relational Model, Levels of abstraction, Data Independence, Data Models, Instances and schemes, Data independence Structures of a DBMS, Application Programmers & Data Base administrators – their function, Transaction Management Entity Relationship Model: Entities, Attributes and Entity Sets, Relation and Relationships sets, mapping and participation constraints, Aggregation, Specialization and Generalization, Features of E-R Model.

**UNIT 2** - Relational Model: Introduction to relational model, Integrity constraints over relations, Enforcing Data Integrity, Integrity Constraints, Relational Data, Logical Data Base Design, Reduction of E-R Diagrams to relations, Introduction to views, Querying Relational Algebra and Relational Calculus, Operations on Relational Algebra, Operations on Relational Calculus, Tuple Relational Calculus, Domain Relational Calculus

**UNIT 3** - Database Design, Data Redundancy, Introduction to Schema Refinement, Functional Dependencies, Normal Forms-First , Second, Third, Boyce code, Fourth and Multivalued Dependencies  
Structured Query Language:Basic SQL Queries, Nested Queries, Aggregate operator, Null Values, implementation of Various Relational Algebra operations, Embedded SQL

**UNIT 4** - Transaction management: ACID Properties, Transaction states,  
Concurrency control: Concurrency Control –Overview, Concurrency control problems, Locks, Locking Protocols, Deadlocks, Serializability,  
Recovery System: Types of Failures, Recovery Techniques, ARIES

**TEXT BOOKS:**

1. Korth, Silberschatz, Database System Concepts , 4th Ed., TMH, 2000.
2. Date C. J., An Introduction to Database Systems , 7th Ed., Narosa Publishing, 2004

**REFERENCE BOOKS:**

1. ElmasriNavathe, Fundamentals of Database Systems, 5<sup>th</sup> Edition Pearson Education
2. Vipin.C.Desai , An introduction to Database System , West Pub. Co.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA505 – OPERATING SYSTEMS**  
**MCA Semester - III**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - Introduction:** Introduction to Operating System Concepts (including Multitasking, multiprogramming, multi user, Multithreading etc)., Types of Operating Systems: Batch operating system, Time-sharing systems, Distributed OS, Network OS, Real Time OS; Various Operating system services, architecture, System programs and calls.

**UNIT 2 - Process Management:** Process concept, process scheduling, operation on processes; CPU scheduling, scheduling criteria, scheduling algorithms -First Come First Serve (FCFS), Shortest-Job-First (SJF), Priority Scheduling, Round Robin(RR), Multilevel Queue Scheduling.

**UNIT 3 - Memory Management:** Logical & Physical Address Space, swapping, contiguous memory allocation, non-contiguous memory allocation paging and segmentation techniques, segmentation with paging; virtual memory management - Demand Paging & Page-Replacement Algorithms; Demand Segmentation.

**UNIT 4 - File System:** Different types of files and their access methods, directory structures, various allocation methods, disk scheduling and management and its associated algorithms, Introduction to distributed file system.

**Process-Synchronization & Deadlocks:** Critical Section Problems, semaphores; methods for handling deadlocks deadlock prevention, avoidance & detection; deadlock recovery.

**Text Books:**

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

**Reference Books:**

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

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA507 – ALGORITHM ANALYSIS AND DESIGN**  
**MCA Semester – III**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - Brief Review** of Graphs, Sets and disjoint sets, union, sorting and searching algorithms and their analysis in terms of space and time complexity.

**Divide and Conquer:** General method, binary search, merge sort, quick sort, selection sort, Strassen's matrix multiplication algorithms and analysis of algorithms for these problems.

**UNIT 2 - Greedy Method:** General method, knapsack problem, job sequencing with dead lines, minimum spanning trees, single source paths and analysis of these problems.

**Dynamic Programming:** General method, optimal binary search trees, 0/1 knapsack, the traveling salesperson problem.

**UNIT 3 - Back Tracking:** General method, 8 queen's problem, graph colouring, Hamiltonian cycles, analysis of these problems.

**Branch and Bound:** Method, 0/1 knapsack and traveling salesperson problem, efficiency considerations. Techniques for algebraic problems, some lower bounds on parallel computations.

**UNIT 4 - NP Hard and NP Complete Problems:** Basic concepts, Cook's theorem, NP hard graph and NP scheduling problems some simplified NP hard problems.

**TEXT BOOKS:**

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, 1978, Galgotia Publ.,
2. Introduction To Algorithms, Thomas H Cormen, Charles E Leiserson And Ronald L Rivest: 1990, TMH

**REFERENCE BOOKS:**

1. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.
2. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P. Bizard, P., 1986. Johan Wiley & Sons,
3. Introduction to Design and Analysis of Algorithm, Goodman, S.E. & Hedetniemi, 1997, MGH.
4. Introduction to Computers Science- An algorithms approach , Jean Paul Trembley, Richard B. Bunt, 2002, T.M.H.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA509 – SOFTWARE ENGINEERING**  
**MCA Semester - III**

**L    T    P    Credits**  
**3    1    -    4**

**Class Work                               : 25 Marks**  
**Examination                             : 75 Marks**  
**Total                                       : 100 Marks**  
**Duration of Examination           : 03 Hours**

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**UNIT 1 - Introduction:** Introduction to Software Engineering, importance of Software, The Software Evolution, Software Characteristics, Software Applications, Software Crisis: Problem and Causes.

**Software Development Life Cycle:** Waterfall model, Incremental and Evolutionary process models, Personal Software process (PSP) and Team Software process (TSP), Overview of agile process and aspect oriented programming

**Software Requirement Specification:** Problem Analysis, Requirement elicitation and Validation, Requirements modeling: Scenarios, Information and analysis classes, flow and behavioral modeling, documenting Software Requirement Specification (SRS).

**UNIT 2 - System Design:** Design Concepts, design models for architecture, component, data and user interfaces; Problem Partitioning, Abstraction, Cohesiveness, Coupling, Top Down and Bottom Up design approaches; Functional Versus Object Oriented Approach, Design Specification, 4GL.

**Coding:** TOP-DOWN and BOTTOM-UP structure programming, Information Hiding, Programming Style, and Internal Documentation, Verification.

**UNIT 3 - Software Testing:** Levels of Testing, Functional Testing, Structural Testing, Test Plan, Test Case Specification, Software Testing Strategies, Verification & Validation, Unit, Integration Testing, Top Down and Bottom Up Integration Testing, Alpha & Beta Testing, White box and black box testing techniques, System Testing and Debugging.

**Software Quality Assurance:** Software Configuration Management, Overview of Software Quality Control and Quality Assurance, ISO 9000 Certification for Software Industry, SEI Capability Maturity Model (CMM) and Comparison between ISO & SEI CMM.

**UNIT 4 - Technical Metrics for Software:** A Framework for Technical Software Metrics, Metrics for the Analysis Model, Metrics for Design Model, Metrics for Source Code, Metrics for Testing, Metrics for Maintenance.

**CASE (Computer Aided Software Engineering):** CASE and its Scope, CASE support in Software Life Cycle, Documentation Support, Architecture of CASE Environment. Exposure to CASE tools like Rational Software suit, Turbo Analyst, SilkSuite etc.

**TEXT BOOKS:**

1. Roger S. Pressman, Software Engineering, A Practitioner's Approach, McGrawHill International Edition (2009) 7<sup>th</sup> edition.

2. Ian Sommerville, Software Engineering, Addison-Wesley Publishing Company, (2006) 8<sup>th</sup> ed.
3. KK Aggarwal, Yogesh Singh, Software Engineering,(2012), 3<sup>rd</sup> Edition, New Age International.

**REFERENCE BOOKS:**

1. James F. Peter, Software Engineering - An Engineering Approach, John Wiley (2004).
2. Pankaj Jalote, An integrated Approach to Software Engineering, Narosa (2005).

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA521 – SOFTWARE LAB-V**  
**(Based on MCA501)**  
**MCA Semester - III**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
-	-	3	1.5

<b>Class Work</b>	<b>: 20 Marks</b>
<b>Practical Examination</b>	<b>: 30 Marks</b>
<b>Total</b>	<b>: 50 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

- 
1. Raising a number  $n$  to a power  $p$  is the same as multiplying  $n$  by itself  $p$  times. Write a function called `power ( )` that takes a double value for  $n$  and an int value for  $p$ , and returns the result as double value. Use a default argument of 2 for  $p$ , so that if this argument is omitted, the number will be squared. Write a `main ( )` function that gets values from the user to test this function.
  2. A point on the two dimensional plane can be represented by two numbers: an X coordinate and a Y coordinate. For example, (4,5) represents a point 4 units to the right of the origin along the X axis and 5 units up the Y axis. The sum of two points can be defined as a new point whose X coordinate is the sum of the X coordinates of the points and whose Y coordinate is the sum of their Y coordinates.  
Write a program that uses a structure called `point` to model a point. Define three points, and have the user input values to two of them. Then set the third point equal to the sum of the other two, and display the value of the new point. Interaction with the program might look like this:  
Enter coordinates for P1: 3 4  
Enter coordinates for P2: 5 7  
Coordinates of P1 + P2 are : 8, 11
  3. Create the equivalent of a four function calculator. The program should request the user to enter a number, an operator, and another number. It should then carry out the specified arithmetical operation: adding, subtracting, multiplying, or dividing the two numbers. (It should use a switch statement to select the operation). Finally it should display the result. When it finishes the calculation, the program should ask if the user wants to do another calculation. The response can be 'Y' or 'N'. Some sample interaction with the program might look like this.  
Enter first number, operator, second number: 10/ 3  
Answer = 3.333333  
Do another (Y/ N)? Y  
Enter first number, operator, second number 12 + 100 , Answer = 112, Do another (Y/ N) ? N
  4. A phone number, such as (212) 767-8900, can be thought of as having three parts: the area code (212), the exchange (767) and the number (8900). Write a program that uses a structure to store these three parts of a phone number separately. Call the structure `phone`. Create two structure variables of type `phone`. Initialize one, and have the user input a number for the other one. Then display both numbers. The interchange might look like this:  
Enter your area code, exchange, and number: 415 555 1212

My number is (212) 767-8900

Your number is (415) 555-1212

5. Create two classes DM and DB which store the value of distances. DM stores distances in metres and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the results are required. The display should be in the format of feet and inches or metres and centimetres depending on the object on display.
6. Create a class rational which represents a numerical value by two double values- NUMERATOR & DENOMINATOR. Include the following public member Functions:
  - constructor with no arguments (default).
  - constructor with two arguments.
  - void reduce( ) that reduces the rational number by eliminating the highest common factor between the numerator and denominator.
  - Overload + operator to add two rational number.
  - Overload >> operator to enable input through cin.
  - Overload << operator to enable output through cout.
  - Write a main ( ) to test all the functions in the class.
7. Consider the following class definition

```
class father {
protected :int age;
public;
father (int x) {age = x;}
virtual void iam ( )
{ cout<< "I AM THE FATHER, my age is : "<< age<< endl;}
};
```

Derive the two classes son and daughter from the above class and for each, define iam ( ) to write similar but appropriate messages. You should also define suitable constructors for these classes.  
Now, write a main ( ) that creates objects of the three classes and then calls iam ( ) for them. Declare pointer to father. Successively, assign addresses of objects of the two derived classes to this pointer and in each case, call iam ( ) through the pointer to demonstrate polymorphism in action.
8. Write a program that creates a binary file by reading the data for the students from the terminal. The data of each student consist of roll no., name ( a string of 30 or lesser no. of characters) and marks.
9. A hospital wants to create a database regarding its indoor patients. The information to store include
  - a) Name of the patient
  - b) Date of admission
  - c) Disease
  - d) Date of discharge

Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived

class to store the age of the patients. List the information about all the to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).

10. Make a class **Employee** with a name and salary. Make a class **Manager** inherit from **Employee**. Add an instance variable, named department, of type string. Supply a method to **toString** that prints the manager's name, department and salary. Make a class **Executive** inherit from **Manager**. Supply a method to **String** that prints the string "Executive" followed by the information stored in the **Manager** superclass object. Supply a test program that tests these classes and methods.
11. Imagine a tollbooth with a class called toll Booth. The two data items are a type unsigned int to hold the total number of cars, and a type double to hold the total amount of money collected. A constructor initializes both these to 0. A member function called payingCar( ) increments the car total and adds 0.50 to the cash total. Another function, called nopayCar( ), increments the car total but adds nothing to the cash total. Finally, a member function called displays the two totals.  
Include a program to test this class. This program should allow the user to push one key to count a paying car, and another to count a nonpaying car. Pushing the ESC key should cause the program to print out the total cars and total cash and then exit.
12. Write a function called reversit ( ) that reverses a string (an array of char). Use a for loop that swaps the first and last characters, then the second and next to last characters and so on. The string should be passed to reversit ( ) as an argument.  
Write a program to exercise reversit ( ). The program should get a string from the user, call reversit( ), and print out the result. Use an input method that allows embedded blanks. Test the program with Napoleon's famous phrase, "Able was I ere I saw Elba".
13. Create some objects of the string class, and put them in a Deque-some at the head of the Deque and some at the tail. Display the contents of the Deque using the forEach ( ) function and a user written display function. Then search the Deque for a particular string, using the first That( ) function and display any strings that match. Finally remove all the items from the Deque using the getLeft( ) function and display each item. Notice the order in which the items are displayed: Using getLeft( ), those inserted on the left (head) of the Deque are removed in "last in first out" order while those put on the right side are removed in "first in first out" order. The opposite would be true if getRight( ) were used.
14. Create a base class called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function get\_data( ) to initialize base class data members and another member function display\_area ( ) to compute and display the area of figures. Make display\_area( ) as 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 dimensions of a triangle or a rectangle interactively and display the area.

Remember the two values given as input will be treated as lengths of two sides in the case of rectangles and as base and height in the case of triangles and used as follows:

Area of rectangle =  $x * y$

Area of triangle =  $\frac{1}{2} * x * y$



**MCA523 – SOFTWARE LAB-VI**  
**(Based on MCA503)**  
**MCA Semester - III**

**L T P Credits**  
**- - 3 1.5**

**Class Work : 20 Marks**  
**Practical Examination : 30 Marks**  
**Total : 50 Marks**  
**Duration of Examination : 03 Hours**

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1. Introduction to SQL.
  2. To study Basic SQL commands (create database, create table, use , drop, insert) and execute the following queries using these commands:
    - Create a database named ‘ Employee’.
    - Use the database ‘Employee’ and create a table ‘Emp’ with attributes‘ename’, ‘ecity’, ‘salary’, ‘enumber’, ‘eaddress’, ‘depttname’.
    - Create another table ‘Company’ with attributes‘cname’, ‘ccity’, ‘numberofemp’, ‘empnumber’ in the database ‘Employee’.
  3. To study the viewing commands (select , update) and execute the followingqueries using these commands:
    - Find the names of all employees who live in Delhi.
    - Increase the salary of all employees by Rs. 5,000.
    - Find the company names where the number of employees is greater than 10,000.
    - Change the Company City to Gurgaon where the Company name is ‘TCS’.
  4. To study the commands to modify the structure of table (alter, delete) and execute the following queries using these commands:
    - Add an attribute named ‘ Designation’ to the table ‘Emp’.
    - Modify the table ‘Emp’, Change the datatype of ‘salary’ attribute to float.
    - Drop the attribute ‘depttname’ from the table ‘emp’.
    - Delete the entries from the table ‘ Company’ where the number of employees are less than500.
  5. To study the commands that involve compound conditions (and, or, in , not in, between , notbetween , like , not like) and execute the following queries using these commands:
    - Find the names of all employees who live in ‘ Gurgaon’ and whose salary is between Rs.20,000 and Rs. 30,000.
    - Find the names of all employees whose names begin with either letter ‘A’ or ‘B’.
    - Find the company names where the company city is ‘Delhi’ and the number of employees isnot between 5000 and 10,000.
    - Find the names of all companies that do not end with letter ‘A’.
  6. To study the aggregate functions (sum, count, max, min, average) and execute the followingqueries using these commands:
    - Find the sum and average of salaries of all employees in computer science department.
    - Find the number of all employees in company ‘TCS’.
    - Find the maximum and the minimum salary in the HR department.

7. To study the grouping commands (group by, order by) and execute the following queries using these commands:
  - List all employee names in descending order.
  - Find number of employees in each department where number of employees is greater than 5.
  - List all the department names where average salary of a department is Rs.10,000.
8. To study the commands involving data constraints and execute the following queries using these commands:
  - Alter table 'Emp' and make 'enumber' as the primary key.
  - Alter table 'Company' and add the foreign key constraint.
  - Add a check constraint in the table 'Emp' such that salary has the value between 0 and Rs.1,00,000.
9. To study the commands for aliasing and renaming and execute the following queries using these commands:
  - Rename the name of database to 'Employee1'.
  - Rename the name of table 'Emp' to 'Emp1'.
  - Change the name of the attribute 'ename' to 'empname'.
10. To study the commands for joins ( cross join, inner join, outer join) and execute the following queries using these commands:
  - Retrieve the complete record of an employee and its company from both the table using joins.
  - List all the employees working in the company 'TCS'.
11. To study the various set operations and execute the following queries using these commands:
  - List the number of all employees who live in Delhi and whose company is in Gurgaon or if both conditions are true.
  - List the number of all employees who live in Delhi but whose company is not in Gurgaon.
12. To study the various scalar functions and string functions ( power, square, substring, reverse, upper, lower, concatenation) and execute the following queries using these commands:
  - Reverse the names of all employees.
  - Change the names of company cities to uppercase.
  - Concatenate name and city of the employee.
13. To study the commands for views and execute the following queries using these commands:
  - Create a view having ename and ecity.
  - In the above view change the ecity to 'Delhi' where ename is 'John'.
  - Create a view having attributes from both the tables.
  - Update the above view and increase the salary of all employees of IT department by Rs.1000.
14. Study of Integrity Constraints in SQL.
15. Study of Use of Group By and Having Clause.
16. Study of various types of Views.
17. Study of Indexes in SQL.
18. Study of Aggregate Functions in SQL.

**Master of Computer Application (MCA) 2<sup>nd</sup> Year 4<sup>th</sup> Semester  
Credit Based Scheme w.e.f. 2014-15**

Sr. No.	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
8.	MCA502	Computer Graphics	3	1	-	25	75	-	100	4	3
9.	MCA504	Java Programming	3	1	-	25	75	-	100	4	3
10.	MCA506	Computer Networks	3	1	-	25	75	-	100	4	3
11.	MCA508	Artificial Intelligence	3	1	-	25	75	-	100	4	3
12.		Elective-I	3	1	-	25	75	-	100	4	3
13.	MCA522	Software Lab-VII (Based on MCA502)	-	-	3	20	-	30	50	1.5	3
14.	MCA524	Software Lab-VIII (Based on MCA504)	-	-	3	20	-	30	50	1.5	3
		<b>TOTAL</b>	<b>15</b>	<b>5</b>	<b>6</b>	<b>165</b>	<b>375</b>	<b>60</b>	<b>600</b>	<b>23</b>	

**Elective-I**

MCA552	Theory of Computation
MCA554	Optimization Techniques
MCA556	Network Security and Management
MCA558	Digital Image Processing

## MCA502 – COMPUTER GRAPHICS

### MCA Semester - IV

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - Introduction to Computer Graphics:** What is Computer Graphics, Computer Graphics Applications, Computer Graphics Hardware and software, Two dimensional Graphics Primitives: Points and Lines, Line drawing algorithms: DDA, Bresenham's; Circle drawing algorithms: Using polar coordinates, Bresenham's circle drawing, mid point circle drawing algorithm; Filled area algorithms: Scanline: Polygon filling algorithm, boundary filled algorithm.

**UNIT 2 - Two/Three Dimensional Viewing:** The 2-D viewing pipeline, windows, viewports, window to view port mapping; Clipping: point, clipping line (algorithms):- 4 bit code algorithm, Sutherland-cohen algorithm, parametric line clipping algorithm (Cyrus Beck). Polygon clipping algorithm: Sutherland-Hodgeman polygon clipping algorithm. Two dimensional transformations: transformations, translation, scaling, rotation, reflection, composite transformation.

Three dimensional transformations: Three dimensional graphics concept, Matrix representation of 3-D transformations, Composition of 3-D transformation.

**UNIT 3 - Viewing in 3D:** Projections, types of projections, the mathematics of planar geometric projections, coordinate systems.

**Hidden surface removal:** Introduction to hidden surface removal .Z- buffer algorithm ,scanline algorithm, area sub-division algorithm.

**UNIT 4 - Representing Curves and Surfaces:** Parametric representation of curves: Bezier curves, B-Spline curves. Parametric representation of surfaces; Interpolation method.

**Illumination, shading, image manipulation:** Illumination models, shading models for polygons, shadows, transparency. What is an image? Filtering, image processing, geometric transformation of images.

#### **TEXT BOOKS:**

1. Computer Graphics Principles and Practices second edition by James D. Foley, Andeies van Dam, Stevan K. Feiner and Johb F. Hughes, 2000, Addison Wesley.
2. Computer Graphics by Donald Hearn and M. Pauline Baker, 2nd Edition, 1999, PHI

#### **REFERENCE BOOKS:**

1. Procedural Elements for Computer Graphics – David F. Rogers, 2001, T.M.H Second Edition.
2. Fundamentals of 3 Dimensional Computer Graphics by Alan Watt, 1999, Addison Wesley.
3. Computer Graphics: Secrets and Solutions by Corrign John, BPB
4. Graphics, GUI, Games & Multimedia Projects in C by Pilania & Mahendra, Standard Publ.
5. Computer Graphics Secrets and solutions by Corrign John, 1994, BPV
6. Introduction to Computer Graphics By N. Krishanmurthy T.M.H 2002

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA504 – JAVA PROGRAMMING**  
**MCA Semester - IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1- Java Fundamentals:** Features of Java, OOPs concepts, Java virtual machine, Reflection byte codes, Byte code interpretation, Data types, variable, arrays, expressions, operators, and control structures , Objects and classes

**UNIT 2 - Java Classes:**Abstract classes, Static classes, Inner classes, Packages, Wrapper classes, Interfaces, This, Super, Access control

**Exception handling:** Exception as objects, Exception hierarchy, Try catch finally, Throw

**UNIT 3 - IO package:**Input streams, Output streams, Object serialization, Deserialization ,Sample programs on IO files, Filter and pipe streams

**Multi threading:** Thread Life cycle, Multi threading advantages and issues, Simple thread program, Thread synchronization

**UNIT 4 - GUI:** Introduction to AWT programming, Layout and component managers, Event handling

**Applet class:**Applet life-cycle, Passing parameters embedding in HTML

**Swing components** – JApplet, JButton, JFrame, etc.

**TEXT AND REFERENCE BOOKS:**

1. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies
2. Java Programming John P. Flynt Thomson 2nd
3. Java Programming Language Ken Arnold Pearson
4. The complete reference JAVA2, Herbert schildt. TMH
5. Big Java, Cay Horstmann 2nd edition, Wiley India Edition
6. Core Java, Dietel and Dietel
7. Java – Balaguruswamy
8. Java server programming, Ivan Bayross SPD

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

## **MCA506 – COMPUTER NETWORKS**

### **MCA Semester - IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - OSI Reference Model and Network Architecture:** Introduction to Computer Networks, ARPANET, Internet, Private Networks, Network Topologies, Types of Networks; Layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer, Switching approaches, Transmission media and systems, multiplexing and signaling techniques, Error detection and correction, ISDN and BISDN., Socket System calls.

**Packet Switching Networks :**Packet Network topology, Datagrams and Virtual Circuits – Structure of Switch / Router, virtual circuit packet switching, X.25, Routing Algorithms, ATM Networks, Traffic Management and QoS – FIFO, Priority Queues, Fair Queuing, Congestion control techniques

**UNIT 2 - Peer-To-Peer Protocols:** Protocols, Service Models and end-to-end requirements, ARQ, Sliding window, RTP, HDLC, PPP protocols, Statistical multiplexing.

**MAC and LAN Protocols:** Multiple access communication, Random Access – ALOHA, Slotted ALOHA, CSMA, CSMA/CD, Channelization: FDMA, TDMA, CDMA, Channelization in cellular networks, LAN standards 0 802.11, LAN Bridges.

**UNIT 3 - TCP/IP:** Introduction, History of TCP/IP, Architecture ,Layers of TCP/IP, Protocols, Internet Protocol, Transmission Control Protocol , User Datagram Protocol, IP Addressing, IP address classes, Internet Protocols – IP packet, addressing, Subnet Addressing, IP routing, CIDR, ARP, RARP, ICMP, Reassembly, IPv6, UDP, Transmission control Protocol – TCP, Reliable stream service, Operation Protocol, DHCP, Mobile IP, Internet Routing Protocols, Multicast routing

**UNIT 4.- Wide Area Networks:** Introduction of WANs, Routing, Congestion Control, WAN Technologies, Distributed Queue Dual Bus (DQDB), Synchronous Digital Hierarchy (SDH)/ Synchronous Optical Network (SONET), Asynchronous Transfer Mode (ATM), Frame Relay. Wireless Links.

**Introduction to Network Management:** Remote Monitoring Techniques: Polling, Traps, Performance Management, Class of Service, Quality of Service, Security management, Firewalls, VLANs, Proxy Servers, Introduction to Network Operating Systems: Client-Server infrastructure, Windows NT/2000.

#### **TEXT BOOKS:**

1. Computer Networks (3rd edition), Tanenbaum Andrew S., International edition, 1996.
2. Computer Networks, Dave Mayank, CENGAGE Learning Publication.

**REFERENCE BOOKS:**

1. Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley, Low Price Edition.
2. Computer Networks – A System Approach, Larry L. Peterson & Bruce S. Davie, 2 Edition
3. Computer Networking – ED Tittel , 2002, T.M.H.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**



# MCA508 – ARTIFICIAL INTELLIGENCE

## MCA Semester - IV

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1** - Foundational issues in intelligent systems: Foundation and history of AI, AI problems Breadth first- Depth first- heuristic search techniques, constraint satisfaction problems, stochastic search methods, game tree: Min max algorithms, game playing- alpha beta pruning.

**UNIT 2** - Knowledge representation issues, predicate logic, constraint propagation, representing knowledge using rules, rules of inference; converting arbitrary wff to conjunction of clauses, rules based deduction systems: Resolution in Predicate Logic, Unification, Strategies for Resolution by Refutation.

**UNIT 3** - Reasoning under uncertainty, review of probability, Bayesian probabilistic interferences and Dempstershafer theory, Heuristic methods, symbolic reasoning under uncertainty, Statistical reasoning, Non monotonic reasoning.

**UNIT 4** - Planning: planning in situational calculus, representation for planning, partial order planning algorithm, learning from examples, discovery as learning, learning by analogy, explanation based learning, Rote learning, neural learning. Principles of Natural language processing, AI application to robotics, and current trends in artificial intelligence.

### TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach,. Russell &Norvig. 1995, Prentice Hall.
2. E. Rich and K. Knight, Artificial Intelligence, Tata McGraw Hill, 2ndEd, 1991.

### REFERENCE BOOKS:

1. N. J. Nilsson, Principles of Artificial Intelligence, Narosa, 1986.
2. D. W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hallof India, 2006.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA552 – THEORY OF COMPUTATION**  
**MCA Semester - IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 -Basic Computational Constructs :** Finite State Systems, Basic Definitions Non-Deterministic finite automata (NFA), Deterministic finite automata (DFA), Equivalence of DFA and NFA Finite automata with E-moves, Regular Expressions, Equivalence of finite automata and Regular Expressions, Regular expression conversion and vice versa. Conversion of NFA to DFA by Arden's Method.

Concept of basic Machine, Properties and limitations of FSM, Moore and Mealy Machines, Equivalence of Moore and Mealy machines,.

**UNIT 2 - Regular Sets & Grammars :** The Pumping Lemma for Regular Sets, Applications of the pumping lemma, Closure properties of regular sets, Myhill-Nerode Theorem and minimization of finite Automata, Minimization Algorithm.

Definition, Context free and Context sensitive grammar, Ambiguity regular grammar, Reduced forms, Removal of useless Symbols and unit production, Chomsky Normal Form (CNF), Greibach Normal Form (GNF).

**UNIT 3 - Pushdown Automata & Turing Machines :** Introduction to Pushdown Machines, Applications of Pushdown Machines Deterministic and Non-Deterministic Turing Machines, Design of T.M, Halting problem of T.M., Post's Correspondence Problem.

**UNIT 4 - Chomsky Hierarchies & Computability:** Chomsky hierarchies of grammars, Unrestricted grammars, Context sensitive languages, Relation between languages of classes. Primitive Recursive Functions.

**TEXT BOOK:**

1. Introduction to automata theory, language & computations- Hopcroft & O.D.Ullman, R Mothwani, Addison Wesley Publishers

**REFERENCE BOOKS:**

1. Theory of Computer Sc.(Automata, Languages and computation): K.L.P.Mishra & N.Chandrasekaran, 2000, PHI.
2. Introduction to formal Languages & Automata-Peter Linz, 2001, Narosa Publ..
3. Fundamentals of the Theory of Computation- Principles and Practice by Ramond Greenlaw and H. James Hoover, 1998, Harcourt India Pvt. Ltd..

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA554 – OPTIMIZATION TECHNIQUES**  
**MCA Semester - IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1** - Linear optimization, Simplex Method, Revised Simplex Method, Karmarkar's Method and dual Simplex Method.

**UNIT 2** - Sensitivity Analysis on an LPP, Assignment and Transportation Problem.

**UNIT 3 - Nonlinear programming:** Single variable optimization, multivariable optimization with constraints (Lagrange multipliers, Newton-Raphson method, Penalty function, Kuhn-Tucker conditions)

**UNIT 4 - Network Analysis:** Network minimum span problem, shortest-route problem, maximal flow problem, finding a positive flow path.

**Project Planning using PERT/CPM: PERT/CPM.** Construction of the network, (arrow diagram, critical path computations for CPM, critical path computations for PERT, Project time Vs project cost.

**TEXT AND REFERENCE BOOKS:**

1. Operations Research: S D Sharma, Khanna Publications.
2. Optimization :R Fletcher, Academic Press.
3. Operations Research: Heera& Gupta.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA556 – NETWORK SECURITY AND MANAGEMENT**  
**MCA Semester - IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 -Introduction:** Codes and Ciphers, Some Classical systems, Statistical theory of cipher systems, Complexity theory of crypto systems, Stream ciphers, Block ciphers.

**UNIT 2 - Stream Ciphers:** Rotor based system, shift register based systems, Design considerations for stream ciphers, Cryptanalysis of stream ciphers, Combined encryption and encoding. Block Ciphers, DES and variant, modes of use of DES, Public key systems, Knapsack systems, RSK, Diffie Hellman Exchange, Authentication and Digital signatures, Elliptic curve based systems.

**UNIT 3 - System Identification and clustering:** Cryptology of speech signals, narrow band and wide band systems, Analogue & Digital Systems of speech encryption.

**UNIT 4 - Security:** Hash function, Authentication Protocols, Digital Signature standards. Electronics Mail Security, PGP (Pretty Good Privacy) MIME, data Compression technique. IP Security: Architecture, Authentication Leader, Encapsulating security Payload, Key Management.

**Web security:** Secure Socket Layer & Transport Layer security, Secureelectronics transactions. Firewalls Design principle, established systems.

**TEXT BOOKS:**

1. Cryptography and Network Security: Principal & Practices, 2nd Edition by Upper Saddle River, PHI
2. Network Management Principles & Practices by Subramanian, Mani (AWL)
3. SNMP, Stalling, Willian (AWL)

**REFERENCE BOOKS:**

1. SNMP: A Guide to Network Management (MGH)
2. Telecom Network Management by H.H. Wang (MGH)
3. Network Management by U. Dlack (MGH)

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA558 – DIGITAL IMAGE PROCESSING**  
**MCA Semester - IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 -Introduction and Fundamental to Digital Image Processing:** What is Digital Image Processing, Origin of Digital Image Processing, Examples that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of Digital Image Processing System, Image sensing and acquisition, Image sampling, quantization and representation, Basic relationship between pixels.

**UNIT 2 -Image Enhancement:** Image Enhancement in the Spatial Domain & Frequency domain: Background, Basic gray level transformation, Histogram processing, Basics of spatial filtering, Smoothing and Sharpening Spatial filters, Introduction to Fourier Transform and the Frequency Domain, Discrete Fourier Transform. Smoothing and Sharpening Frequency-Domain filters.

**UNIT 3 -Image Restoration:** Image Degradation/Restoration Process, Noise models, Restoration in presence of noise, Inverse Filtering, Minimum Mean Square Filtering, Geometric mean filter, Geometric transformations.

**Color Image Processing:** Color Fundamentals, Color models, Basis of full color image processing, Color transformations.

**UNIT 4 -Image Compression:** Fundamentals, Image compression models, Error free compression, Lossy compression.

**Image Segmentation:** Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.

**Representation, Description and Recognition:** Representation-chain codes, polygonal approximation and skeletons, Boundary descriptors-simple descriptors, shape numbers, Regional descriptors- simple, topological descriptors, Pattern and Pattern classes-Recognition based on matching techniques.

**TEXT BOOK:**

- Digital Image Processing by Rafael C.Gonzalez & Richard E. Woods –2002, Pearson Education

**REFERENCE BOOKS:**

- Digital Image Processing by A.K. Jain, 1995,-PHI

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA522 – SOFTWARE LAB-VII**  
**(Based on MCA502)**  
**MCA Semester - IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
-	-	3	1.5

<b>Class Work</b>	<b>: 20 Marks</b>
<b>Practical Examination</b>	<b>: 30 Marks</b>
<b>Total</b>	<b>: 50 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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1. Write a program for 2D line drawing as Raster Graphics Display.
  2. Write a program for circle drawing as Raster Graphics Display.
  3. Write a program for polygon filling as Raster Graphics Display
  4. Write a program for line clipping.
  5. Write a program for polygon clipping.
  6. Write a program for displaying 3D objects as 2D display using perspective  
1. transformation.
  7. Write a program for rotation of a 3D object about arbitrary axis.
  8. Write a program for Hidden surface removal from a 3D object.

**NOTE: At least 5 more exercises to be given by the concerned teacher.**

**MCA524 – SOFTWARE LAB-VIII**  
**(Based on MCA504)**  
**MCA Semester - IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
-	-	3	1.5

<b>Class Work</b>	<b>: 20 Marks</b>
<b>Practical Examination</b>	<b>: 30 Marks</b>
<b>Total</b>	<b>: 50 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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Students are required to perform at least 10 exercises based on the syllabi of subject MCA504 “**Java Programming**”.

**Master of Computer Application (MCA) 3<sup>rd</sup> Year 5<sup>th</sup> Semester**  
**Credit Based Scheme w.e.f. 2015-16**

Sr. No.	Course No.	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Exam Duration
			L	T	P		Theory	Practical			
8.	MCA601	Advanced Java	3	1	-	25	75	-	100	4	3
9.	MCA603	.Net Framework with C#	3	1	-	25	75	-	100	4	3
10.	MCA605	Software Project Management	3	1	-	25	75	-	100	4	3
11.		Elective – II	3	1	-	25	75	-	100	4	3
12.		Elective – III	3	1	-	25	75	-	100	4	3
13.	MCA621	Software Lab. - IX (Based on MCA601)	-	-	3	20	-	30	50	1.5	3
14.	MCA623	Software Lab. - X (Based on MCA603)	-	-	3	20	-	30	50	1.5	3
		<b>Total</b>	<b>15</b>	<b>5</b>	<b>6</b>	<b>165</b>	<b>375</b>	<b>60</b>	<b>600</b>	<b>23</b>	

**Elective-II**

MCA651 Linux & Shell Programming  
MCA653 Data Base Administration  
MCA655 Network Administration  
MCA657 J2EE and Applications

**Elective-III**

MCA661 Software Testing & Quality  
MCA663 Data Warehousing & Mining  
MCA665 Numerical and Statistical Method  
MCA667 Compiler Design



**MCA601 – ADVANCED JAVA**  
**MCA Semester - V**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 – Core Java:** Introduction to Java, Data types, variables, operators, Arrays, Control Statements, Classes & Methods, Inheritance, Exception Handling, Multithreading, Collections, I/O streams, AVVT & Aplet Programming.

**Networking:** Connecting to a Server, Implementing Servers, Sending E-Mail, Making URL Connections, Advanced Socket Programming

**UNIT 2 - Database Networking:** Design of JDBC, Structured Query Language, JDBC Installation, Basic JDBC Programming Concepts, Query Execution, Scrollable and Updatable Result Sets, Metadata, Row Sets, Transactions, Advanced Connection Management, Introduction of LDAP

**Distributed Objects:** Roles of Client and Server, Remote Method Invocations, Setup for Remote Method Invocation, Parameter Passing in Remote Methods Server Object Activation, Java IDL and CCRA, Remote Method Calls with SOAP

**UNIT 3 - Swing:** Lists, Trees, Tables, Styled Text Components, Progress Indicators, Component Organizers

**AWT:** The Rendering Pipeline, Shapes, Areas, Strokes, Paint, Coordinate Transformations, Clipping, Transparency and Composition, Rendering Hints, Readers and Writers for Images, Image Manipulation, Printing. The Clipboard, Drag and Drop

**UNIT 4 – Java Beans Components:** Beans, The Bean-Writing Process, Using Beans to Build an Application, Naming Patterns for Bean Components and Events Bean Property Tubes Beaninfo Classes Property Editors Customizes

**Security:** Class Loaders, Bytecode Verification, Security Managers and Permissions, Digital Signatures, Code Signing, Encryption

**TEXT BOOK:**

- Core Java™ 2, Volume II-Advanced Features, 7th Edition by Cay Horstmann, Gary Cornell Pearson Publisher, 2004

**REFERENCE BOOKS:**

1. Professional Java Programming by Brett Spell, WROX Publication
2. Advanced Java 2 Platform, How to Program, 2nd Edition, Harvey. M. Dietal, Prentice Hall

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA603 – .NET FRAMEWORK WITH C#**  
**MCA Semester - V**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1** - The .Net framework: Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes

**UNIT 2** - C -Sharp Language (C#): Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events Type conversion.

**UNIT 3** - C# Using Libraries: Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

**UNIT 4** - Advanced Features Using C#: Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#. .Net Assemblies and Attribute: .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute.

**TEXT BOOK:**

1. Balagurusamy, ” Programming with C#”, (TMH)

**REFERENCE BOOKS:**

1. Wiley, ” Beginning Visual C# 2008”, Wrox
2. Fergal Grimes, ” Microsoft .Net for Programmers”. (SPI)
3. Mark Michaelis, “Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education
4. ShibiParikkar, “ C# with .Net Frame Work”, Firewall Media.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

## MCA605 – SOFTWARE PROJECT MANAGEMENT

### MCA Semester - V

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - Introduction to Software Project Management (SPM):** Definition of a Software Project (SP), SP Vs. other types of projects activities covered by SPM, categorizing SPs, project as a system, management control, requirement specification, information and control in organization.

**Stepwise Project planning:** Introduction, selecting a project, identifying project scope and objectives, identifying project infrastructure, analyzing project characteristics, identifying project products and activities, estimate efforts each activity, identifying activity risk, allocate resources, review/ publicize plan.

**UNIT 2 - Project Evaluation & Estimation:** Cost benefit analysis, cash flow forecasting, cost benefit evaluation techniques, risk evaluation. Selection of an appropriate project report; Choosing technologies, choice of process model, structured methods, rapid application development, water fall-, V-process-, spiral- models. Prototyping, delivery. Albrecht function point analysis.

**Activity planning & Risk Management:** Objectives of activity planning, project schedule, projects and activities, sequencing and scheduling activities, network planning model, representation of lagged activities, adding the time dimension, backward and forward pass, identifying critical path, activity throat, shortening project , precedence networks.

**Risk Management:** Introduction, the nature of risk, managing risk, risk identification, risk analysis, reducing the risks, evaluating risks to the schedule, calculating the z values.

**UNIT 3 - Resource allocation & Monitoring the control:** Introduction, the nature of resources, identifying resource requirements, scheduling resources creating critical paths, counting the cost, being specific, publishing the resource schedule, cost schedules, the scheduling sequence.

**Monitoring the control:** Introduction, creating the frame work, collecting the data, visualizing progress, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, change control.

**Managing contracts and people:** Introduction, types of contract, stages in contract, placement, typical terms of a contract, contract management, acceptance, Managing people and organizing terms: Introduction, understanding behavior, organizational behavior: a back ground, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures, conclusion, further exercises.

**UNIT 4 - Software quality:** Introduction, the place of software quality in project planning, the importance of software quality, defining software quality, ISO 9126, Practical software quality

measures, product versus process quality management, external standards, techniques to help enhance software quality.

**Study of Any Software Project Management software:** viz Project 2000 or equivalent

**TEXT BOOK:**

- Software Project Management (2nd Edition), by Bob Hughes and Mike Cotterell, 1999, TMH

**REFERENCE BOOKS:**

1. Software Engineering – A Practitioner’s approach, Roger S. Pressman (5th edi), 2001, MGH
2. Software Project Management, Walker Royce, 1998, Addison Wesley.
3. Project Management 2/c. Maylor
4. Managing Global software Projects, Ramesh, 2001, TMH.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA621 – SOFTWARE LAB-IX**  
**(Based on MCA601)**  
**MCA Semester - V**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
-	-	3	1.5

<b>Class Work</b>	<b>: 20 Marks</b>
<b>Practical Examination</b>	<b>: 30 Marks</b>
<b>Total</b>	<b>: 50 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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Students are required to perform at least 10 exercises based on the syllabi of subject MCA601“**Advanced Java**”.

**MCA623 – SOFTWARE LAB-X**  
**(Based on MCA603)**  
**MCA Semester - IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
-	-	3	1.5

<b>Class Work</b>	<b>: 20 Marks</b>
<b>Practical Examination</b>	<b>: 30 Marks</b>
<b>Total</b>	<b>: 50 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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Students are required to perform at least 10 exercises based on the syllabi of subject MCA603 “**.Net with C#**”.

## MCA651 – LINUX AND SHELL PROGRAMMING

### MCA Semester - V

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - Linux introduction and file system:** Basic Features, Advantages, Installing requirement, Partitioning the Hard drive for Linux, Installing the Linux system, System startup and shut-down process, init and run levels. Basic architecture of Unix/Linux system, Kernel, Shell. Linux File system-Boot block, super block, Inode table, data blocks, file storage, file access, Linux standard directories. Commands for files and directories, creating and viewing files using cat, file comparisons – cmp&comm, View files, disk related commands, checking disk free spaces.

**UNIT 2 - Essential linux commands, Understanding shells, Processes in linux-process fundamentals, connecting processes with pipes, tee, Redirecting input output, manual help, Background processing, managing multiple processes, changing process priority with nice, scheduling of processes at, cron, batch, time, kill, ps, who, sleep, Printing commands, find, sort, touch, file, file related commands-ws, sat, cut, dd, etc. Mathematical commands- bc, expr, factor, units. Creating and editing files with vi, joe& vim editor, network files, security, privileges, authentication, Password administration, archiving.**

**UNIT 3 - System administration:** Common administrative tasks, identifying administrative files: configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disable user's accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, becoming super user using su. Getting system information with uname, host name, disk partitions & sizes, users, kernel. Backup and restore files, reconfiguration hardware with kudzu, installing and removing packages with rpm command. Configure X-windows desktop, starting & using X desktop. KDE & Gnome graphical interfaces, changing X settings.

**UNIT 4 - Shell programming:** Basic of shell programming, Various types of shell available in Linux, comparisons between various shells, shell programming in bash, read command, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, system shell variables, shell keywords, Creating Shell programs for automate system tasks. Simple filter commands – pr, head, tail, cut, paste, sort, uniq, tr. Filter using regular expressions – grep, egrep, and sed. awk programming – report printing with awk.

#### **TEXT AND REFERENCE BOOKS:**

1. UNIX – Concepts & Applications (Third Ed.) – Sumitabha Das, Tata McGraw Hill Publications.

2. Unix for programmers and users (Third Ed.) – Graham Glass & King Ables, Pearson Education India.
3. Red Hat Linux 9 Bible – Cristopher Negus, IDG Books India Ltd.
4. A Practical Guide to Ubuntu Linux – Mark G.Sobell

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA653 – DATABASE ADMINISTRATION**  
**MCA Semester - V**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1** - Oracle overview and Architecture, Installing and managing oracle, creating a database and data dictionary, control and redo log files, Managing Table spaces and data files, Managing tables, indexes, and constraints, Managing users and security.

**UNIT 2**- Basic Oracle net architecture - basic net server side configuration, basic net client-side configuration, usage and configuration of Oracle shared server architecture. Backup and Recovery, Transporting data between databases - export and import utility, Loading data into database-SQL\*loader, database performance tuning.

**UNIT 3** - Basic constructs of PL/SQL , Cursors: need, types and implementation, Stored Procedures, functions

**UNIT 4** - Active Database, ECA Rules, implementing ECA rules in PL/SQL. CUBE technology, Data ware house, creating a Data ware House in oracle.

**Text Books:**

1. Kevin loney, Bob Baryla Oracle database 10g: DBA handbook, Tata McgrawHills.
2. Biju Thomas, Bob Baryla, Oracle DBA Fundamental-I, BPB publications

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**



**MCA655 – NETWORK ADMINISTRATION**  
**MCA Semester - V**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - N/w Administration:** Intro. to networks, TCP/IP model, IP addressing, Subnetting, NAT, VLAN. Basic Concepts of proxy server, webserver, DNS, Firewall, Router, Mail Server and their respective configuration settings. Various Interconnecting Devices: Hub, Switch, Bridges, Routers, Gateway, repeater, brouter. Knowledge about various network related commands: ping, netstat, tracert, traceroute, ifconfig, ipconfig etc. Steps followed in establishing a network

**UNIT 2 – Security:** Concept of security, its need, issues, cryptography techniques:- ciphers, substitution cipher, transposition, symmetric key algorithms like AES, DES, public key algo's like RSA, Authentication algorithms , IPSEC, VAN, Digital signatures, IDS, Firewall. Types of attacks, access control list, filtering rules

**UNIT 3 - Host Administration:** Introduction to system Administration, what are the necessary issues to be tackled in host management, installation of unix, linux, windows OS, formatting, file systems like FAT , NTFS, ETC., Booting process in various OS, User accounts, group accounts, passwords, shadow passwords, directory structure of various OS. Process, ps, zombie process, backup, recovery, commands like tar, zip etc. , performance analysis of host machine and how to improve the systems performance

**UNIT 4 - Knowledge of UNIX commands:** directory related files, disk related commands, File related commands, I/O redirection and piping, Unix editor vi, Process related commands, communication related commands, Printing related commands, Programming in the Borne and C-Shell; Wild cards; Simple shell programs; Shell variables; Shell programming constructs; interactive shell scripts; Decision structures in shell, Loop Control structure. Role and functions of a system manager, adding and removing users, starting up the system, shutting the system down, Disk management: mounting and unmounting file system, maintaining user accounts. AWK utility

**TEXT AND REFERENCE BOOKS:**

1. Practice of System and Network Administration, The (2nd Edition) by Thomas A. Limoncelli, Christina J. Hogan, and Strata R. Chalup.
2. Principles of Network and System Administration by Mark Burgess.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA657 – J2EE AND APPLICATIONS**  
**MCA Semester - V**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 – RMI:** Introduction to Distributed Applications, RPC, RMI Architecture, RMI Examples, RMI Over IIOP, Dynamic Stub Loading & Bootstrapping, Java Naming and Directory Interface.

**XML:** Markup Languages, Why XML?, DTD, XML Schemas, XML Parsers

**UNIT 2 - Java Mail API:** Internet Mail Protocols, Architecture of Java Mail API, Send & Receive Mail using Java Mail API, Working with Mail Attachments, JAAS.

**UNIT 3 - Java Message Service [JMS]:** Overview of Message Oriented Middleware, JMS Architecture, JMS Messaging Domains, Point to-Point Messaging, Publish/Subscribe Messaging JMS API Programming Model & Examples, Message Driven Beans, Web Services, Interoperability, CORBA

**UNIT 4 - Enterprise Java Beans:** Introduction to EJB Component Technology, EJB Architecture, Session Beans, Entity Beans, Transaction Attributes, Transaction in EJB

**AJAX:** AJAX Example.

**TEXT AND REFERENCE BOOKS:**

1. Professional Java Programming by Brett Spell, WROX Publication.
2. Advanced Java 2 Platform, How to Program, 2nd Edition, Harvey. M. Dietal, Prentice Hall

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

## **MCA661 – SOFTWARE TESTING AND QUALITY**

### **MCA Semester - V**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1 - Software Testing Fundamentals:** Testing-Related Terminology, Key Issues: Test selection criteria/Test adequacy criteria, Testing effectiveness/Objectives for testing, Testing for defect identification, Theoretical and practical limitations of testing, the problem of infeasible paths, Testability, Relationship of Testing with other activities, Testing Levels: Unit Testing, Integration Testing, System Testing, Acceptance Testing.

**UNIT 2 - Testing Techniques:** Based on the software engineer's intuition and experience, Ad hoc testing, Exploratory testing, Specification-based techniques, Equivalence partitioning, Boundary-value analysis, Decision Table Testing, Testing with Formal Specifications, Finite State Machine based, Code Based, Data Flow Based, Mutation Testing, Techniques based on nature of the application: Object-oriented testing, Component-based testing, Web-based testing, GUI testing, Testing of concurrent programs, Protocol conformance testing, Testing of real-time systems, Testing of safety-critical Systems, Selecting and combining techniques.

**UNIT 3 - Software Quality:** Software Engineering Culture and Ethics, Value and Cost of Quality, Models and Quality Characteristics: Software Engineering Process Quality, Software Product Quality, Quality Improvement, Software Quality Management Processes: Quality assurance process, Verification process, Validation process, Review process, Audit process, Practical Considerations: Software Quality Requirements, Dependability, Integrity levels of software, Defect Characterization.

**Quality Assurance:** Inputs, Quality Management Plan, Results of Quality Control Measurements, Operational Definitions, Quality Planning tools and techniques, Quality Audits, Quality Improvements.

**UNIT 4 - Software Quality Management:** Techniques, Software Quality Measurement, ISO 9000:2000 Quality management systems --Fundamentals and vocabulary, ISO 9001:2000 Quality management systems --Requirements, ISO 9004:2000 Quality management systems --Guidelines for performance improvements, Quality Management Processes: Quality Planning, Quality Assurance, Quality Control.

**Quality Planning:** Inputs, Tools and Techniques, Outputs.

**Quality Control:** Inputs, Tools and Techniques: Inspection, Control Charts, Pareto Diagrams, Statistical Sampling, Flowcharting, Trend Analysis, Outputs: Quality Improvements, Acceptance Decisions, Rework, Completed Checklist, Process Adjustments.

**TEXT BOOKS:**

1. Boris Beizer, Software Testing Techniques, John Wiley & Dreamtech (2002).
2. William Perry, Effective Methods for Software Testing, John Wiley & Sons, Inc. (2006) 3<sup>rd</sup> edition.
3. Aditya P. Mathur, Foundations of Software Testing, Pearson Education (2008).
4. Kamna Malik, Praveen Choudhary, Software Quality - A Practitioner's Approach, Tata McGraw Hill (1999).
5. Daniel Galin, Software Quality Assurance from Theory to Implementation, Pearson Education (2003).

**REFERENCE BOOKS:**

1. Watts Humphery, A discipline for Software Engineering, Addison Wesley.
2. Roger S. Pressman, Software Engineering a Practitioners Approach, McGraw Hill.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA663 – DATA WAREHOUSING AND MINING**  
**MCA Semester - V**

**L    T    P    Credits**  
**3    1    -    4**

**Class Work                               : 25 Marks**  
**Examination                             : 75 Marks**  
**Total                                       : 100 Marks**  
**Duration of Examination           : 03 Hours**

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**UNIT 1** - Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data ,Preprocessing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

**UNIT 2** - Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi- Dimensional Association rules from Relational Databases.

**UNIT 3** - What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

**UNIT 4** - Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

**TEXT AND REFERENCE BOOKS:**

1. “Introduction to Data Mining” Authors :Pang-Ning Tan,Michael Steinbach,Vipin Kumar, Addison-Wesley
2. “Data Mining: Concepts and Techniques” Authors :Jiawei Han , MichelineKamber, Jian Pei

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA665– NUMERICAL AND STATISTICAL METHODS**  
**MCA Semester – V**

**L T P Credits**  
**3 1 - 4**

**Class Work : 25 Marks**  
**Examination : 75 Marks**  
**Total : 100 Marks**  
**Duration of Examination : 03 Hours**

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**UNIT 1 – Computer Arithmetic:** Floating point representation of numbers, arithmetic operations with normalized floating point numbers and their consequences. Error in number representation - pitfalls in computing. **Iterative Methods:** Bisection, False position, Newton-Raphson methods, Discussion of convergences, Polynomial evaluation, Solving polynomial equations (Bairstow's Method).

**UNIT 2- Solving of Simultaneous Linear Equations and ordinary Differential Equations:** Gauss elimination method, ill-conditioned equations, Gauss-Seidal iterative method, Taylors series and Euler methods, Runge-kutta methods, Predictor corrector methods.

**Numerical Differentiation and Integration:** Differentiation formulae based on polynomial fit, Pitfalls in differentiation, Trapezoidal, Simpson's rules and Gaussian Quadrature.

**UNIT 3- Interpolation and Approximation:** Polynomial interpolation, Difference tables, Inverse interpolation, Polynomial fitting and other curve fitting. Approximation of functions by Taylor series and Chebyshev polynomials, Regression Analysis and least square curve fitting.

**UNIT 4- Statistical methods:** Sample distributions, Test of Significance, chi-square, t- test and F test.

**Analysis of Variance:** Definition, Assumptions, Cochran's Theorem, One-way classification, ANOVA Table, Two-way classification (with one observation per cell).

**Time Series Analysis:** Components and Analysis of Time Series, Measurement of Trend, Seasonal fluctuations and cyclic movement.

**TEXT BOOKS:**

- B.S.Grewal, Numerical Methods, Khanna Publications
- Gupta S.C. and Kapoor, V.K., Fundamentals of Applied Statistics, Sultan Chand & Sons, 1996.

**REFERENCE BOOKS:**

- Jain M.K, Iyengar S.R.K, Jain R.K, Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd.
- Gupta S.P. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons, 1995.
- Rajaraman V., Computer Oriented Numerical Methods, Prentice Hall, India.

- Graybill, Introduction to Statistics, McGraw

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**

**MCA667 – COMPILER DESIGN**  
**MCA Semester - V**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75 Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 03 Hours</b>

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**UNIT 1** - Structure of compiler, Application of compiler Technology, Compiler construction tool, Lexical analyzer, Input Buffering, Regular Expression, Finite Automata, DFA and NFA, Conversion of NFA to DFA with E-move, Minimization of DFA

**UNIT 2** - Parser, Role of parser, Context free grammar, Parser Tree, Ambiguity, Top down and bottom up parsing Techniques : Shift reduce parser, Operator precedence parser, Recursive Descent Parsing, Predictive parsing ,LL(1) Parsing, LR parser, SLR Parser

**UNIT 3** - Syntax – Directed Translation, Syntax Tree, Syntax Directed translation scheme, Variants of Syntax Tree, Three- address Code, Translation of Expressions, Type Checking, Symbol Table , its content and data structure for symbol table

**UNIT 4** -Issues in the design of a code generator, the target machine, dynamic storagemanagement, translating basic blocks, a simple code generator , Basic Blocks and flow graphs, optimization of basic blocks, A simple Code generator Peephole optimization, Register allocation and assignment

**TEXT BOOK:**

4. Compilers Principle, Techniques & Tools - Alfreed V. AHO, Ravi Sethi& J.D. Ullman , Second Edition.

**REFERENCE BOOKS:**

1. Compiler Design by O.G. Kakde, 1995, Laxmi Publ.
5. Principles of compiler Design, Narosa Publication
6. Theory and practice of compiler writing, Tremblay & Sorenson, 1985, Mc. Graw Hill.

**Note: Eight questions will be set in all by the examiners taking at least two questions from each unit. Students will be required to attempt five questions in all taking at least one question from each unit.**