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फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.
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SU/BOS/Commerce /7596 Date : 21-9-2010

To,
The Head,
Department of Commerce & Management
Shivaji University,
Kolhapur.

Subject: Regarding the revised syllabi of M.C.A. Part-II (Commerce) (Semester III & IV) (Under Academic Flexibility and Credit System) under the Faculty of Commerce.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi of M.C.A. (Commerce) Part-II (Semester III & IV) (Under Academic Flexibility & Credit system) under the Faculty of Commerce.

This syllabi will be implemented from the academic year 2010-2011, (i.e. from June 2010) onwards. A soft copy (C.D.) containing the syllabus is enclosed herewith. This syllabus is also available on university website www.unishivaji.ac.in.

The question papers on the pre-revised syllabi of above mentioned course will be set for the examinations to be held in October/November-2010 and March /April - 2011. These two chances are available for repeater students, if any.

You are therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Sd/-
Dy. Registrar

Copy to:-

1 Appointment Section
2 O.E-I Section
3 Affiliation Section (P.G.)
4 Computer Centre

SHIVAJI UNIVERSITY, KOLHAPUR

B
(2009)
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Faculty of Commerce
Revised Syllabus For

Master of Computer Application (MCA)
(Under Academic Flexibility, Credit System)

Part – II (Sem- III & IV)

(Subject to the modifications that will be made from time to time)
Syllabus to be implemented from June 2010 onwards.

(Under Academic Flexibility, Credit System)
Introduced From Academic Year 2010-11

MCA Commerce

Proposal for Credit System

1. Introduction: -

MCA (Commerce) is a six-semester course spread over the period of three years. The Department of Commerce, Shivaji University, Kolhapur, offers this course on its campus. It is designed to offer in depth knowledge of recent technologies in use today. Students are also provided extensive laboratory training on the course content and the current requirements of industries and R & D. In the final semester every student has to undertake a project, which is an industrial project.

In addition, the course caters to the requirements of providing complete exposure to NET/SET syllabus for Commerce framed by the U.G.C.

2. Advantages of the course: -

The course provides exposure to the students to the technologies in-vogue and trains them to take up projects relevant to the industrial needs, the R& D activities and self –employment opportunities.

The student after passing the MCA course has many opportunities of employment, self-employment and higher studies.

Employment Opportunities: -

- I.T. Industries (India and Abroad).
- Research and Development Laboratories.
- Employment as a teacher and Other Govt. Organizations.
- Electronics and Telecommunication Industries.
- Process and Manufacturing Industries.

Educational Opportunities: -

- Higher studies in I.I.T, I.I.Sc, and CERE Pilani. (Ph.D.)
- Research in Shivaji University or any other University. (Ph.D.)
- Research abroad.

3. Objectives of the Courses: -

The course is designed with a view to cater to the present day requirements in Industries, R & D fields, higher studies and Self-employment. Moreover the course structure intends to inculcate strong practical skills, so that the student can take up independent projects which will help them to be a successful software engineer as well as entrepreneur. The students passed out from the course will serve as quality human resource to take up the state of art research work of the Department.

4. Title of the Course:

Master Of Computer Application [M.C.A.] (Under Commerce Faculty)

5. Eligibility of the Course:

- Any graduate with 50% of marks.
- Knowledge of mathematics at XII standard level is desirable.

6. Fees for the Course

Class	Total Fees, Paying	Total Fees, EBC/PTC/ STC/ Maji Saineek / FF	Total Fees, SC/NT/ST/ OBC/ SBC	Total Fees, Paying	Total Fees, EBC/PTC/ STC/ Maji Saineek / FF	Total Fees, SC/NT/ST/ OBC/ SBC
M.C.A. Part I	20,575/-	------	------	20,575/-	------	------
M.C.A. Part II	19,975/-	------	------	19,975/-	------	------
M.C.A. Part III	11,400/-	------	------	11,400/-	------	------

For foreign students tuition fees is Rs.80,000/- + 4575/- per year.

7. Strength of the Students:

The intake capacity is 60 + 10 % of the intake.

8. Admission/Selection procedure:

The admission to the MCA (Commerce) course is by entrance examination only. Admissions are given on the basis of merit of entrance examination and following the University rules of admission.

The admission will be by round and the information regarding entrance examination result and the round of admission will be put up on the Shivaji University website www.unishivaji.ac.in.

9. Duration of the Course:

MCA (Under Commerce Faculty) is a three years, six semesters full time course.

10. Period of the Course:

From June to April End as specified in the University Calendar from time to time.

11.Teachers Qualification:

a) Good academic record

b) MCA with minimum 55% (MCA under any faculty)

c) NET/SET if candidate has Ph.D. in the subject, he will be exempted from NET/SET as per UGC and university rules.

12. Credit system implementation

MCA (Under Commerce Faculty) is a six semester course. For I, III, V course consists of five theory courses, one laboratory (Practical) course and one Seminar each carrying weightage of 100 marks (4 credits) each. For II, IV semester course consists of five theory courses and two laboratory (practical +project) courses each carrying weightage of 100 marks (4 credits) each. However, in the final semester, there will be one project. In order to qualify for three-year master's degree a student must acquire minimum of 60 credits (10 credits each semester) which are distributed as given below.

i. 20 credits in compulsory courses

ii. 04 credits in practical course.

iii. 04 credits in project

iv. 04 Credits in Seminar

Credit as defined is the workload of a student in

1. Lectures
2. Practical
3. Seminar
4. Project
5. Private work in the library/home
6. Examination
7. Other assessment activities

The credit system permits students to

- learn at their own pace
- choose electives from a wide range of elective courses offered by the University departments
- undergo additional courses and acquire more than the required number of credits
- adopt an inter-disciplinary approach in learning
- make best use of the expertise of available faculty

How much time a student gives for the examination per semester?

1) 5 Theory papers per semester each of 3 hours duration. Time required is 15 hours
2) One practical with two lab assignment (for semester I, III, & V)
3) One practical with two lab assignment and one project (for semester II, IV)
4) One Industrial project for 6th semester.

5) One Seminar per subject (For Semesters I, III & IV)

Total time for a semester (I, III, V) examination is

15(theory) + 1(practical) + 1(Seminar) = 17hours.

Total time for a semester (II, IV) examination is

15(theory) + 2(practical) + ½hr (project) = 17½hours.

Total time for a semester (VI) examination is

45 minutes (project) = 45 minutes

Time required for the other activities.

- Projects – synopsis
- Discussions
- Library – Book issue, Journal reference, Internet access. Reading magazines and relevant information
- Private work – Project material, Books purchase, Xerox, availing outside facilities etc
- Home – Study, Notes preparation, Computations, tutorials, assignments etc.

Types of credits

1) Credit by examination – Tests (theory , Practical and Projects, Seminar)
2) Credit by non examination –Proficiency in state National and International sports achievements, Social service (NSS), Military services (NCC), Colloquium & debate, Cultural programs etc

Credits by lectures and practicals

- 1 credit is equivalent to 15 contact hours
- Total instructional days as per the UGC norms are 180
- For the M.CA course there are 5 theory papers with 4 hours teaching per week so the instructional days for theory papers in a semester are 5 X 15(weeks) = 75 days.
- There are 1 practical + 1 Seminar per subject each of 4 hrs per week for semester-I,III ,V
- There are 2 practicals (with one project) each of 6 hrs per week for semester-II ,IV
- The total practical workload is of 12 hours. Thus the instructional days for the practical course of 2 practicals are 6 x 15 = 90 days.
- 60 days are common for theory and practicals there for the time for which a student is busy in a semester is 60(theory + practical) + 30(practical) = 90 days.

- With 4 credits per subjects there will be 4 x 5 = 20 credits for the theory papers and 2 x 4 = 8 credits for the practicals. Every practical (project) of 100 marks carries 4 credits.
- Number of credits for the MCA course per semester will be 20+8 = 28.
- Total number of credits for the entire MCA course
- = 5 x 28+ 8(for 6th semester) = 148.

The implementation of the credit system:

- Under the credit system every semester duration will be of at least 15 weeks.
- The examination must be scheduled in one month's time.
- The students must get at least 3 weeks time for the examination preparations.
- Every theory paper syllabus should consist of 4 units (sub units allowed) each carrying 1 credit.
- In order to have uniformity in the credit transfer internal examination in all the P.G.departments shall have equal weightage 80 external +20 internal.

Theory paper	Contact hours	credits
Unit –I (sub units if any)	15	1
Unit –II (sub units if any)	15	1
Unit –IIII (sub units if any)	15	1
Unit –IV (sub units if any)	15	1

- The practical course credit distribution

a) Practical paper contact hours

Paper-I	6
Project	6

Total credits for practical papers= 12 hrs for the semester (II, IV)

b) Practical paper contact hours

Paper-I	6

Total credits for practical papers= 6 hrs for the semester (I, III, V)

A project of 100 marks will carry 4 credits. Where a project of 100 marks is offered to the student, the student will have to perform 1 project and 1 practical paper for that semester. Time for the explanation for the practical course (contact hours) will be one week (12 hrs).

Grades, grade point and average grade point's calculations

Table showing the grades, grade points and marks scored by a student

Grades	Grade points	marks out of 100
A+	9	91 to 100
A	8	81 to 90
A-	7	71 to 80
B+	6	61 to 70
B	5	51 to 60
B-	4	41 to 50
C+	3	31 to 40
C	2	21 to 30
C-	1	11 to 20
F	0	0 to 10

Semester Grade Point Average (SGPA):-It is a semester index grade of a student.

1. SGPA = $(g_1xc_1) + (g_2xc_2)$ +----- + (g_6xc_6)/ Total credits offered by the student in a semester.
2. Cumulative Grade Point Average (CGPA) :- It is a cumulative index grade point average of a student

   CGPA = $(g_1xc_1) + (g_2xc_2)$ +----- + (g_6xc_6)/ Total number of credits offered by a student upto and including the semester for which the cumulative average is required.
3. Final Grade Point Average (FGPA):- It is a final index of a student in the course

   FGPA = $(n / \sum ci \times gi) / (n/ cl)$

   Where c_i – credit of the course (paper) (4)

   g_i – grade pints secured (see the table for conversion)

   n - number of courses (number of papers offered)

   cl – Total number of credits for the entire M.Sc course (96)

Rules for opting for the credits

1. Admission to the students from the other departments for the credits will be restricted to the core papers or practicals only.
2. A student from the other department will be offered credits of his choice in multiples of 4. A theory paper or the practical course can be offered as the credit. However number of such admissions will depend upon the seats available, classroom seating capacity and the laboratory facilities.
3. Core Courses

   Core courses are those, knowledge of which is deemed essential for students registered for a particular Master's programme. As such all core courses shall be mandatory and a student must pass in all the core courses prescribed for the programme. Core courses shall be spread over all the four semesters.

4. Any student can have credits from the Management course.

5. Attendance: As per the university rule the attendance of the student must be at least 75 %. For attendance in the classroom or laboratory student will have to sign the attendance sheet. Merely 'P' for present or 'A' for absent will not be considered valid.
6. A teacher offering the course will be responsible for maintaining the attendance and the performance sheets of all the students offering that course. The attendance sheet will have to be deposited to the department office by every teacher bearing his signature at the end of every semester.

Nature of the internal examination:-

- For every theory paper there will be two internal examination(s) carrying 10 marks each. The total of the marks scored in these two examinations will be taken for the final score out of 20.
- The nature of this examination will be as follows.
- There will be 10 questions of objective type only in the internal examination.
- No student will be allowed to take reexamination if he/she remains absent unless the reason is genuine.
- The decision regarding such cases will be taken in a department committee meeting.
- The result of the internal assessment will be declared after one week from the date of examination. The student will be shown the answer papers by the concerned teachers.

The assessment of the practicals (examination): -

1) Every practical a student performs day to day in the laboratory shall be of two hours durations. A student will have to carry out practical assignments in Lab.
   - Marks for the practicals (practical + Project) for semester (II, III)shall be 200.
   - Marks for the practicals (practical) for semester (I, III, V) shall be 100.
2) There will be no external examination for the practical. These examinations will be internally conducted. In every semester there will be two internal practical examinations each carrying 50 marks. For 50 marks examination a student will have to perform three experiments.
3) For the assessment of the project specialization wise panel of expert will be appointed. The panel of expert will be as follows.

   i) Project guide

   ii) One expert from the industry/academic institute in the subject

   iii) 1 teacher from the department.

   The distribution of the project marks shall be as follows.

i) Project presentation	(20%)
ii) Demonstration of the project	(30%)
iii) Orals	(30%)
iv) Report	(20%)

4) The workload of a teacher will be as per the UGC norms as far as the theory and practicals are concerned.

5) The Assessment of Seminar:-

There will be internal evaluation of the seminar. The student should deliver the seminar & submit the report to the concerned teacher. For this seminar 100 marks are given. The distribution of 100 marks is as follows: 20 marks for each subject's seminar. (20 * 5 = 100) Every teacher should conduct the seminar of his subject & collect seminar reports & evaluate the report for 20 marks.

13. **Nature of the Question Paper:**

The model question paper is as follows

TITLE OF THE PAPER

Paper- X Marks: 80

Time- 3 Hrs. Day and Date

Instructions:

1. All questions carry equal marks.
2. Attempt any 5 questions
3. Each question carries 16 marks.

- Total number of questions in theory question paper are- 7
- Questions can have sub questions in them.

Structure and titles of the semester courses

For an example the marks obtained and the grade is given using the above rules.

MCA-Semester-I

Sr. No.	Course	Credits	Letter Grade	Marks Obtain.	Grade Value	Credit value	Grade Points
1	Fundamentals of Information Technology	4	B-	45	4	4*4	16
2	Procedure Oriented Programming with C	4	A	85	8	4*8	32
3	Discrete Mathematics	4	B+	70	6	4*6	16
4	Computer Organization and Architecture	4	B	56	5	4*5	20
5	Introduction to Management Function	4	C+	32	3	4*3	12
6	Business Communication	4	B	59	5	4*5	20
7	Practical I (Procedure Oriented Programming with C)	4	B-	48	4	4*4	16
	Total	28				Total	132

$$GPA = \frac{\text{Total no. of Grade Points}}{\text{Total no. of Credit points}} = \frac{132}{28} = 4.71$$

Practical Lab Assignments (On Procedure Oriented Programming with C) **:**

1) Write a program to print or display “Hello C”.
2) Input and output your name, address and age to an appropriate structure.
3) Write a C program for addition, subtraction, multiplication and division of two numbers.
4) Write a program that works out the largest and smallest values from a set of 10 inputted numbers.
5) Write a program to read in 10 numbers and compute the average, maximum and minimum values.
6) Write a program that displays-
   - “Hi” when the user enters input value as 1.
   - “ Hello” when the user enters input value as 2.
   - “Hey” when the user enters input value as 3.
   - “Excuse me” when the user enters input value other than 1,2 or 3
7) Calculate the sum of the numbers starting from 0 to 12.
8) Write a program that calculate LCM and GCD of 2 input numbers.
9) Write a recursive function factorial that calculate factorial of given number.
10) Write a program that find maximum number from the following set of numbers (34,23,22) (314,123,122).
11) Write a program that changes the value of variable I from 10 to 60 through pointer.
12) Write a program that stores integer value 10 on heap and frees it.
13) Write a program that accepts roll number , PCM percentage of 10 students and stores in a file. Access the roll number of 7th student and display PCM average of that student.

MCA-Semester-II

Sr. No.	Course	Credits	Letter Grade	Marks Obtain.	Grade Value	Credit value	Grade Points
1	Software Engineering	4	A-	77	7	4*7	28
2	Data Structure	4	B-	45	4	4*4	16
3	Statistical Computing	4	B	53	5	4*5	20
4	Database Management System	4	C+	40	3	4*3	12
5	Accounting and Financial Management	4	C-	19	1	4*1	04
6	Practical – II (Data Structure, DBMS)	4	C+	33	3	4*3	12
7	Project & Viva	4	B-	50	4	4*4	16
	Total	28				Total	108

Total no. of Grade Points 108

GPA = ---------- = ------ = 3.85

Total no. of Credit points 28

CGPA = (132/28) + (108/28) =

Practical Lab Assignments (Data structure and SQL) **:**

1) write a program to implement Queue
2) write a program to convert an infix expression into postfix expression
3) write a program to implement doubly linked list
4) write a program for Tower of Honoi problem
5) write a program to implement tree with insert ,delete and search
6) write a program to for inorder, postorder and preorder traversal of tree
7) write a program for binary and sequential search
8) write a program for bubble sort ,insertion sort & quick sort
9) write a program for shortest path finding
10) write a program to implement linked list with inset ,delete,search,view function
11) create a table 'student' which store information about student & display the information
12) Alter table student by adding a primary key on the column roll. no
13) write a PL/SQL block to accept an employee number & the branch number followed by updating branch number of that employee to which he belongs appropriately.
14) write a PL/SQL block that will display the customer name, fixed deposit no. the fixed deposit amount of the five customer holding the highest amount in fixed deposit
15) write a stored procedure to calculate addition of two no.

MCA-Semester-III

Sr. No.	Course	Credits	Letter Grade	Marks Obtain.	Grade Value	Credit value	Grade Points
3.1	Operating System	4	B-	44	4	4*4	16
3.2	Object Oriented Programming C++	4	A	81	8	4*8	32
3.3	Visual Programming With VB	4	C	27	2	4*2	08
3.4	Computer Oriented Optimization Techniques	4	A+	93	9	4*9	36
3.5	Organization Behavior	4	B	57	5	4*5	20
3.6	Practical – III (Based on paper no.3.2 and 3.3)	4	B-	47	4	4*4	16
3.7	Project & Viva	4	C+	33	3	4*3	12
	Total	28				Total	140

Total no. of Grade Points 140

GPA = ---------- = ------ = 5.0

Total no. of Credit points 28

CGPA = (132/28) + (108/28) + (140/28) =

MCA-Semester-IV

Sr. No.	Course	Credits	Letter Grade	Marks Obtain.	Grade Value	Credit value	Grade Points
4.1	Computer Network	4	B-	46	4	4*4	16
4.2	Java Programming	4	C+	39	3	4*3	12
4.3	Software Project Management	4	A-	75	7	4*7	28
4.4	IT Elective I- 4.4.1- Linux Operating System 4.4.2-Enterprise Resource Planning 4.4.3- Distributed Database Management	4	A+	90	9	4*9	36
4.5	BM Elective II- 4.5.1-Business Innovation 4.5.2-Management Support System 4.5.3- Information System Audit	4	B+	65	6	4*6	24
4.6	Practical – IV (Based on paper no.4.2)	4	B	55	5	4*5	20
4.7	Project & Viva	4	C	27	2	4*2	08
	Total	28				Total	144

$$GPA = \frac{\text{Total no. of Grade Points}}{\text{Total no. of Credit points}} = \frac{144}{28} = 5.14$$

CGPA = (132/28) + (108/28) + (140/28) + (144/28) =

MCA-Semester-V

Sr. No.	Course	Credits	Letter Grade	Marks Obtain.	Grade Value	Credit value	Grade Points
5.1	Data Warehousing and data mining	4	C+	35	3	4*3	12
5.2	Advanced Java programming	4	A-	77	7	4*7	28
5.3	Artificial Intelligence and It's Application	4	A+	94	9	4*9	36
5.4	IT Elective II- 5.4.1-Dot Net 5.4.2-Mobile Computing 5.4.3-XML and Web Services	4	B+	68	6	4*6	24
5.5	BM Elective II- 5.5.1-Knowledge Management 5.5.2-E-Commerce and Its Application 5.5.3-Cyber Law	4	B-	46	4	4*4	16
5.6	Practical – V (Based on paper no. 5.2 and 5.3)	4	B	55	5	4*5	20
5.7	Project And Viva	4	B-	42	4	4*4	16
	Total	28				Total	152

$$GPA = \frac{\text{Total no. of Grade Points}}{\text{Total no. of Credit points}} = \frac{152}{28} = 5.428$$

CGPA = (132/28) + (108/28) + (140/28) + (144/28) + (152/28) =

MCA-Semester-VI

Total marks 250

Total credits - 10

(internal mark + external examiner mark)

= (50 + 200)

Grade for Semester-VI

Final Grade Point Average is calculated by using the formula

{n/(c1*g1)} / {n/ci}

Where

c = Credit of the i^{th} course (paper)

g = Grade point secured in each paper

n = No. of Courses (No. of papers offered)

ci = Total number of the credits for whole examination

Instructions for candidate opting subjects in Commerce departments

MCA (Under Commerce)

1) Semester-I - Procedure Oriented Programming With C++

2) Semester-II - Object-Oriented Programming With C++

3) Semester-III -RDBMS using ORACLE/Organizational Behavior & Business communication

4) Semester-IV - IT-Elective-I / BM-Elective-I/ Enterprise Resource Management

5) Semester-V - IT-Elective-I / BM-Elective-II/ IT Management

- Projects and practical cannot be opted.
- Students have to pay some extra fee for each subject.

The rules for taking admissions for second year and third year of MCA (Commerce) under credit system as per follows:-

- **Admission to second year MCA (Commerce) Part – II :-**

1) If a student of MCA (Commerce) Part – I is failed in Sem. – I and Sem. – II, he will be allow to take admission to second year MCA (Commerce) Part – II.

- **Admission to third year MCA (Commerce) Part – III :-**

1) Before taking admission to third year MCA (Commerce) Part – III, a student has to clear all subjects, Practical's and Project of MCA (Commerce) Part – I .

2) If a student has cleared all subjects, Practical's and Project of MCA (Commerce) Part – I but he is failed at Sem. – III and Sem. – IV of MCA (Commerce) Part – II, he is able to take admission to third year of MCA (Commerce) Part – III

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -III
Paper-XII - (MCA-3.1): Operating System

Unit – I **(15 hrs)**

Introduction : Evaluation of operating systems, types of operating systems, different views of operating system concepts and structure. Processes: The process concept system programmer's view of processes. The operating system view of processes. Operating system service for process management, schedule algorithms, performance evaluation.

Unit-II **(15 hrs)**

Memory Management: Memory management without swapping of aging, actual memory base of replacement algorithms design issues of paging of paging.
Inter process communication and synchronization: The need for inter process synchronization, mutual exclusion, Semaphores, classical problems in concurrent programming, deadlocks
.

Unit-III **(15 hrs)**

File systems: File systems, directories file systems implementation, security protection mechanisms. Input/output: Principles of I/O hardware, I/O devices, drive controllers, direct memory
access, interrupt handlers, device drivers, device independent I/O software. User space I/O software.

Unit-IV **(15 hrs)**

Disk - scheduling algorithms, processes and processors in distributed systems, Threads, processors allocations. Distributed file system: Design implementations.
case studies, DOS, WINDOWS, UNIX and Linux operating systems.

Reference:

1. H.M. "An Introduction to Operating Systems", Addition Wesley publishing Co.,1984
2. nkpvie M., "Operating System concepts and Design" McGraw Hill, 1990 person I.L.
3. Abranam Silbrschat, "Operating System Concepts", Addition Wesley publishing Co.,1989.
4. Tenenbaum A.S., "Modern Operating Systems"

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -III
Paper-XIII - (MCA-3.2): Object Oriented Programming C++

Unit - I **(15 hrs)**

Introduction Procedure Oriented and object oriented programming, Input/Output, Variables, Data Types in C++, Concept of function, Overloading, Default arguments, inline functions, structure.
Classes and objects: Structures in C and C++, Access Specifiers, Classes and Objects in C++, Characteristics of Access Specifiers, Arrow operator, This Pointer, Member Functions and Data Members, Friend Function and Friend Class, Array of Class Objects, Passing Class Objects to functions and returning objects from functions, nested classes.

Unit - II **(15 hrs)**

Dynamic Memory Management: Dynamic Memory allocation using new, Dynamic memory deallocation, constructor and destructor, concept of constructor and destructor, types of constructors.

Inheritance: Concept and advantages of inheritance, The protected access specifier, inheritance using different access specifiers, initialization of base class members through derived class objects, different forms of inheritance, function overloading.

Unit - III **(15 hrs)**

Virtual Functions and Inheritance: Pointers to Derived class, rules for virtual functions, internals of virtual functions, pure virtual function, virtual base class, virtual destructor, abstract classes, limitations of virtual functions, early binding v/s late binding.

Operator Overloading: Concept, operators that can be overloaded, overloading unary operators using member and friend function, overloading binary operators using member and friend functions, rules for operator overloading.

Unit - IV **(15 hrs)**

Templates: Introduction, function templates, function templates with multiple parameters, overloading function templates, class templates, class templates with multiple parameters, nested class templates, advantages of using templates

Exception Handling: Introduction, concept of exception handling, throwing exception from functions, exception handling involving classes and objects, rethrowing an exception.

References :

1 Object Oriented Programming with C++ -- Subhash K U, (Pearson Edition)
2 C++ Primer -- Lippman
3 C++ How to program -- Deitrl and Deitel (Pearson Edition)
4 Master in C++ -- K. R. Venugopal, Rajkumar, T. Rani Shankar (TMG)
5 Effective C++ -- Scott Meyers (Pearson Edition)
6 Object Oriented Programming in C++ -- R. Shubburagh (Vikas Publication)
7 C++ Programming Language -- Bjarne Stroustrup (Addison Wesley)

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -III
Paper-XI V- (MCA-3.3): Computer Oriented Optimization Techniques

Unit-I **(15 hrs)**

(a) Linear Programming, Description of model, Examples leading to LPP formulation. Graphical solution, simplex algorithm duality problems. Big-mc method, dual simplex method, revised simplex method. sensitivity analysis and application.

(b) Transportation problem, assignment problem, algorithm to find optional solution. Traveling salesman problem.

Unit -II **(15 hrs)**

(a) Integer programming problem : Branch and bound technique and Gomerian cutting plane method application to assignment problem.
(b) sequencing problem : job sequencing with deadlines. Processing of in jobs through 2 machines, 3 machines and in machines and n jobs.

Unit -III **(15 hrs)**

(a) Decision theory : decision under certainty, decision under uncertainty, decision under risk concept of minimax, maxi min, principles, expected gain principle, expected loss principle, EVPI, EPPI,

(b) Network analysis : Terminology of network, CPM and PERT analysis

Unit -IV **(15 hrs)**

(a) Finite differences, Newton Gregory interpolation formula for forward and back word in interpolation LaGrange's formula, numerical differential .

(b) Numerical integration : Trapezoidal rule, Simpson's Third rule Simpson's $3/8^{th}$ rule

References :

(1) Operation Research – Taha H. A.
(2) Operations research theory and applications : J. K. Sharma
(3) Operation Research – Kanti swarup P. U. Qupta
(4) Introduction to operation research – Billy E. Gilett.
(5) Operation Research – R. Pannerseloan
(6) Computer oriented numerical methods – V. Rajaraman
(7) Computer oriented statistical and numerical methods _ E. Balguruswamy

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -III
Paper-XV- (MCA-3.4): Visual Programming with VB

Unit-I **(15 hrs)**

Introduction of Visual Basic - Concept of GUI, Difference between Procedure oriented programming and event driven programming, understanding VB environment, Windows development, strength and weaknesses of VB, project explorer, properties window, Toolbox, form, layout window, code window, property pages, getting help, saving project, printing projects, connectivity to access.

Unit-II **(15 hrs)**

Naming Conventions, Variables & Data types , User defined data types, **scope of variables** – Global, Local, Constant declaration, **functions** - String functions, intrinsic functions, Mathematical function, Date functions. Looping control statements. Arrays

Controls - Label and Textbox Controls, Command Button, control, Frame, Checkbox and Option button controls, List box and Combo box controls, Drive list box, directory list box, File list box, Msg. Box, Input box,

Unit-III **(15 hrs)**

Data controls – Dynaset, snapshot, tables. Methods of data controls, **Data access technologies** – DAO, RDO, ADO, Common Dialog box controls, Formatting controls. Introduction to activeX controls.

Unit-IV **(15 hrs)**

MDI , Menu and Report - creating MDI forms and menus, adding code to menus, Report – Data Report, Crystal Report.

Reference:

1. Visual Baisc 6.0 – Peter Wright
2. Peter Norton's Guide to Visual Basic – 6.0 – Peter Norton
3. Visual Basic – 6.0 Programming – Hotzner Steven
4. Visual Basic – P.K. Macbride.

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -III
Paper-XVI- (MCA-3.5): Organizational Behavior

Unit-I **(15 hrs)**

Introduction to O.B.- Meaning ,nature, scope, Approaches to O.B.- scientific management, Behavioral Approach, contingency approach, System Approach, Cognitive approach ,social learning approach, Disciplines influencing O.B.-psychology, sociology, social psychology, Anthropology, political science, Economics and Engineering.

Unit -II **(15 hrs)**

Micro perspectives of O.B.- Personality- meaning, determinants of personality, development of personality; Perception- Meaning ,perception process; Attitude- components of attitude ,types of attitude, Attitude formation; Values:- Types of values; Ethics –Meaning, Ethical issues of work, contemporary ethical issues in organizations. Motivation- Nature, theories of motivation.

Unit -III **(15 hrs)**

Interpersonal and Group Behavior-Conflict-levels of conflict; types of conflict - Interpersonal and Intergroup conflicts;
Strategies to resolve conflict; organizational power-sources of power;
Leadership- styles of leadership, functions of leader;
Job stress- sources of stress, Effects of stress, coping strategies of stress.

Unit IV **(15 hrs)**

Managing Change-forces for change in organizations forms of change, Resistance to Change Organization Development: OD techniques.
Global approach to O.B. - Issue of culture, managing diversity within and across the culture.

References:

1. Organization Behavior- Text, cases, Games- Ashwathappa
2. Organization Behavior –Concepts and controversies and Application –Stefen Robins.
3. Organization Behavior – Text, cases- Uma Shekaran
4. Organization Behavior- P. Acquins
5. Organization Behavior -Fred. Luthnas.
6. Organization Behavior- Jit Chandan.

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -IV
Paper-XVII- (MCA-4.1): Computer Network

Unit-I **(15 hrs)**

The telephone network fundamental of communication theory. Asynchronous and synchronous transmission. Transmission Media: Guided media - twisted-pair cable, coaxial cable, fiber-optic cable. Unguided media (wireless) - radio waves, microwaves, infrared. Transmission impairment - attenuation, distortion, noise. Connection-oriented and connectionless Services, service primitives.

Unit-I **(15 hrs)**

Goals of layered protocols, network design problems, OSI model and its all layer's services.
Token passing – Token ring, Token bus, Token passing(priority systems).
ANSI Fiber Distributed Data Interface(FDDI), Switching - Circuit , switching , Message Switching, Packet Switching. **Routing** – characteristics, routing algorithms(strategies) – optimality principle, shortest path routing, flooding, distance vector routing, link-state routing, hierarchical routing, broadcast routing, multicast routing. Congestion control. And its prevention policies.

Unit-III **(15 hrs)**

Broadband and base band LANs, LLC and MAC protocol data units. Metropolitan area networks (MANs).
Cryptography - Introduction to cryptography, substitution ciphers, transposition ciphers, two fundamental cryptographic principles.
Symmetric-Key algorithms – 1) DES – Data Encryption standard, AES – Advanced encryption standard. **Public-key algorithms** – RSA,
Digital signature – symmetric key signature, public key signature, and message digests,

Unit-IV **(15 hrs)**

Switching and routing in network: Message switching, packet switching, packet routing.
TCP/IP : Introduction to TCP/IP and internetworking , operations related protocols and sockets, **the IP -** IP address structure major features of IP. IP data gram, major IP service, TCP major features of TCP, passive and active operant the transmission control block (TCB).

Reference:

1. Black C "Computer networks protocols, standards and Interface", prentice hall of India, 1996

2. stlling W, "Computer communication network" (4th Edition), prentice hall of India, 1993

3. Tanenbaum A.S. "Computer Network", prentice hall of India, 1981

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -IV
Paper-XVIII- (MCA-4.2): Java Programming

Unit-I **(15 hrs)**

Features of Java, the Java Virtual Machines, Difference between Java and C++, Parts of Java, setting path, simple Java program, creating strings, string class methods, string comparison, immutability of strings, object creation, initializing the insurance variables, access specifiers, constructors, understanding methods, static methods, static block, the keyword 'this', instance methods, passing primitive data types to methods, passing objects to methods, passing arrays to methods, factory methods

Unit-II **(15 hrs)**

Relating objects using references, inner class, anonymous inner class, inheritance, the keyword 'super', the protected specifier, types of inheritance, dynamic polymorphism, static polymorphism, final class, abstract method and abstract class, interface, multiple inheritance using interfaces abstract classes vs. interfaces, package, different types of packages, built-in package, user-defined packages, the JAR files, interface in a package

Unit-III **(15 hrs)**

Exceptions, exception handling, handling multiple exceptions, throws clause, throw clause, types of exceptions, built-in exceptions, user-defined exceptions, re-throwing an exception, wrapper classes, overview of java collection framework, using an array to store a group of objects, networking in java, sockets, knowing IP address, creating a server that sends data, creating a client that receives data, two-way communication between server and client

Unit-IV **(15 hrs)**

Threads, single tasking, multi tasking, uses of threads, creating a thread and running it, terminating the thread, single tasking using a thread, multi tasking using threads, multiple threads acting on single object, thread class methods, deadlock of threads, avoiding deadlocks in a program, thread communication, thread priorities, thread group, daemon thread, application of threads, thread life cycle, graphics programming using AWT, AWT, components, window and frame, creating a frame, event delegation model, closing the frame, uses of a frame, component class methods, push buttons, listeners and listeners methods, check boxes, radio buttons, TextField, TextArea, Label, List class, layout managers, FlowLayout, Borderlayout, CardLayout, using a layout inside another layout, GridLayout, BoxLayout, creating an applet, a simple applet, an applet with Swing Components, applet parameters

References:

1) Core Java- An Integrated Approach , Dr. R Nageswara Rao & Kogent Solutions Inc. , Dreamtech Press Publication
2) Learning Java- Rich Raposa- Willey, dreamTech Publication
3) Java in a nutshell desktop quick reference – Flanagan-SPD, O'reilly
4) The complete Reference Java- 7th edition – Herbert Schildt- Tata McGraw Hill

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Master of Computer Application (Commerce)
Semester -IV
Paper-XIX- (MCA-4.3): Software Project Management

Unit-I **(15 hrs)**

The nature of software production, Key Objectives of Effective management-Quality, Productivity, Risk reduction, The Role of the software Project manager, Planning the Requirements analysis, Legal Issues (Patent, Copyright, liability, Warranty)

Unit-II **(15 hrs)**

Technical Planning-Life- Cycle models, Types of plans-program master plan, management Plan, Development Plan configuration management Plan, Quality assurance Plan, Maintenance Plan ,Test Plan integration plan, Documentation plan , Transition Plan, firmware development plan , plan documentation methods – work breakdown structures, PERT and CPM, Gantt charts, Standards

Unit-III **(15 hrs)**

Planning for risk management and control – Entry and exit criteria, Intermediate checkpoints , Performance prediction and analysis, prototyping and modeling, inspections and reviews, Process and process assessment, development methods, metrics, configuration management, testing and quality assurance,
Estimating – cost (direct and Indirect), Resources, Time, Size and complexity of the product, Risk determination.

Unit-IV **(15 hrs)**

Quality control and quality assurance – standard for software quality Assurance plans (IEEE84), CMM, ISO, Configuration management, Testing phases
Team organizations – Recruiting and staffing, Technical leadership, Product support and maintenance

References:

1. IEEE Tutorial on software Engineering project management (Thayer88)
2. Albrecht, Allan J, and john E. Gaffney , Jr. “software function source Lines of Code, and Development Effort prediction : A software science validation. ”IEEE Trans. Software Eng.SE-9,6
3. Anderson, Dr.D.J.Sweeney, and T.A. Williams. “An introduction to management science ,”4th Ed. St Paul :West Publishing Company
4. Bersoff, E.H., V.D. Henderson, and S.G.Siegel .Software configuration Management. Englewood Cliffs, N.J.: prentice – Hall,
5. Roger pressman “software engineering : A Practitioners approach”,

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -IV
Paper-XX- (MCA-4.4): IT Elective I-4.4.1- Linux Operating System

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Unit-I **(15 hrs)**

Functions and types of an Operating System, Overview of the Linux system, Architecture of Linux OS Single and compound Linux commands, Use Of C-programs, Study and use of Bourne shell - Shell variables, shell met characters, shell commands.
process: process sates, process table, data structure of process buffer cache ,buffer header, buffer pool, reading and writing buffer

Unit-II **(15 hrs)**

Shell scripts: Looping and making choices - for, case, while, until, if, test, shell script examples, use of expressions, countdown loop, printing of files, multiple options, passing arguments to scripts, shell commands. Frep and egrep, pattern processing using awk and sed

Unit-III **(15 hrs)**

Internal representation of files - INODE - structure of a path name to an regular file - conversion of
a path name to an INODE - superblock - allocation of disk blocks – file system calls - open - read -
write - close - create - pipe - mount – un-mount - link - unlink.

Unit-IV **(15 hrs)**

The structure of processes - Process state and - transitions - process context - sleep - weakup - process control - fork - signals - exit - invoking other programs - the shell - system boot and INIT
process - process scheduling and time clock. Study of Linux installation and System administration.

References:

1. Professional Red Hat Linux: Naba Barkakati : Wiely dreamtech pub.
2. The design of the UNIX operating system- By Maurice J.Bach.
3 Red hat LINUX unleashed By Bill Ball.
4 Linux Operating system by NIIT
5 Using Linux By Jack Tackett, jr.and Steven Burnett –PHI (5th edi.)
6 Install configure and customize (Red Hat Linux 7) By Brian Proffitt-PHI
7 The complete Reference Linux –Peterson Richard-TMH.

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -IV
Paper-XX- (MCA-4.4): IT Elective I-4.4.2- Enterprise Resource Planning

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Unit-I **(15 hrs)**

Enterprise Resource planning Introduction: - What is ERP? Need for ERP, evaluation, growth o ERP, advantages of ERP, various models in ERP, opportunities and problems in ERP selection and implementation.**ERP implementation: -** identifications of ERP benefits, Integrated management information, business modeling, business modules of ERP packages, hardware environment and its selection in ERP implementation.

Unit-II **(15 hrs)**

ERP and Related technology:- Business process Re-engineering (BPR), Management Information System(MIS), Executive Information System(EIS), Decision Support System(DSS), Supply Chain management(SCM), Human Resource Management(HRM),Data mining, Data warehousing **ERP implementation Life cycle: -** ERP life cycle, implementation of ERP packages ,project planning phase, pre-evaluation, gap analysis, re-engineering, configuration, implementation, team training, testing, end user training, post implementation vendor, consultant and user, pros and cons of in-house implementation, vendor selection, consultant, end user.

Unit-III **(15 hrs)**

ERP modules: - Introduction, Finance, Production planning control and maintenance, Human resource management, Inventory control Management, Quality management. **Future directive in ERP : -** new markets, new channels, faster implementation, methodologies, business modules and BAPIs, new business segment, more features, web enabling, market snapshot, industrial presentation.

Unit IV **(15 hrs)**

Introduction to ERP software: - ERP market, SAP, BAAn ,oracle people soft, JD Edward world solution, System software association inc(SSA), comparative assessment, selection of ERP. **ERP present and future: -** Turbo change the ERP system, EIA, ERP and commerce, ERP and internet, Future directions.

References:

1. Enterprise Resource Planning- Alexis Leon.
2. ERP ware: ERP Implementation Framework- V.K. Garg and N.K. Venkitakrishnan.
3. ERP a managerial perspective – Sadagopan.
4. Reengineering the corporation –Michel Hammer and James Chamby.

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -IV
Paper-XX- (MCA-4.4): IT Elective I-4.4.3- Distributed Database Management

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Unit-I **(15 hrs)**

Introductory concepts and design of Distributed Database Systems (DDBMS):
Features of Distributed versus Centralized Databases, Principles Of Distributed Databases: Levels Of Distribution Transparency, Reference Architecture for Distributed Databases(Architectures for DDBMS e.g. cluster, federated, parallel databases and client server architecture.), Data Fragmentation, Replication, and allocation techniques for DDBMS, Integrity Constraints in Distributed Databases. Methods for designing and implementing DDBMS e.g. designing a distributed relational database.

Unit-II : **(15 hrs)**

Distributed Query Processing and Optimization
Objectives of query processing, Characterization of query processors, Layers of query processing, Query decomposition, Localization of distributed data, Optimizing Distributed Queries, Factors governing query optimization, Centralized, query optimization, Ordering of fragment queries, Distributed query optimization algorithms.

Unit-III **(15 hrs)**

Transaction Management and Concurrency Control
The Management of Distributed Transactions, A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions. Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control. Reliability: Basic Concepts, Non blocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration.

Unit-IV **(15 hrs)**

Distributed Object/component-based DBMS
Object model features, Fundamental object management issues, DOM architectures, Object caching, Object clustering, Object migration, Distributed object base systems Query Processing In Distributed Object base Systems Problems in accessing distributed objects, Distributed object assembly problem, Strategies for distributed object assembly , Object Orientation And Interoperability Object Management Architecture CORBA and Database Interoperability Distributed Component Model COM/OLE and Database Interoperability.

References:

1. Distributed Database Principles & Systems, Stefano Ceri, Giuseppe Pelagatti -McGraw-Hill
2. Principles of Distributed Database Systems, M.Tamer Ozsu, Patrick Valduriez – Pearson Education.
3. Distributed Object Management, M.T. Özsu, U. Dayal and P. Valduriez - Morgan-Kaufmann
4. Modern Database Systems - The Object Model, Interoperability and Beyond, W. Kim -.ACM Press

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -IV
Paper-XXI- (MCA-4.5): BM Elective I-4.5.1- Business Innovation

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Unit-I **(15 hrs)**

Business Process fundamentals: Definition of business processes, business processes and functional processes, importance of focusing on business processes. Understanding business processes, customer focused analysis of business processes, identifying value adding activities. Reengineering concepts: The emergence of re-engineering concept, concept of business process, rethinking of process, identification of re-engineering need, preparing for reengineering implementing change.

Unit-II **(15 hrs)**

Types of reengineering, process improvement with cost reductions, achieving best-in class with competitive focuses, radical change by re-writing the rules. Organizing for process improvements - setting up teams, choosing team leaders, training teams for process improvements.

Unit-III **(15 hrs)**

Organizing for Re-engineering: Obtaining top management commitment, creating cross functional teams, supporting teams with resources. Re-engineering Focus phase identification of key processes, identification of key people and getting their support, identification of benefits possible and resources required. Re-engineering Design phase –selection of processes to be re-engineered, setting time frames, targets. Re-engineering Implementation phase – Communicating benefits for the organization, communicating the benefits for the individuals, monitoring progress, consolidating the gains.

Unit-IV **(15 hrs)**

Benchmarking: Origin of benchmarking- Xerox approach, definition of benchmarking. Internal benchmarking - benchmarking against the best in Unit, benchmarking against the best in group. External benchmarking - benchmarking the best in the industry, benchmarking the best in any industry. E-Business : Introduction to net technologies, E-Commerce, EDI and E-Business, Business opport Unities, basic and advanced business models on internet, internet banking and related technologies, security and privacy issues, technologies for E-Business future and growth and E-Business.

References:

1. Re-engineering Corporation - Hammer Michael and James Chamby 1997
2. Beyond Re-engineering - Hammer Michael
3. Business Process Benchmarking – Robert C. Camp
4. Process Re-engineering – Lon Roberts
5. Countdown 2000 - Loan, Alexix Tata McGraw.
6. ERP - Plak, Carol, A., Eli Schragenheim, St.Lucie Press, NY, 2000
7. Business Process Orientation – Kevin Mc Cormack, William C. Johnson

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -IV
Paper-XXI- (MCA-4.5): BM Elective I-4.5.2- Management Support System

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Unit-I **(15 hrs)**

Introduction to EDP & MIS: What is Data & Information, Data Life Cycle.
EDP- Evolution of Electronic Data Processing (EDP), Characteristics, MIS- Definition, Meaning, need, Advantages, features information system, Management Function,
MIS Design- aspects MIS design Life-Cycle Approach and other approaches.

Unit-II **(15 hrs)**

Other Applications like Executive Information System (EIS) and its features, Difference between Operational & Informational Data.
Decision making concepts, decision situations - Structured, Semi-structured and Unstructured decision situations. Definition of DSS (Decision Support System), Characteristics, role of decision support systems in business, modeling in decision support.

Unit-III **(15 hrs)**

What is DSS?, Hardware, DSS Generator, The User and overview, Components of DSS, Architecture of DSS (Block-diagram), The Data Management Subsystem (DBMS) and functionality, The Model-base Management Subsystems (MBMS) & functionality, The Knowledge-based Management Subsystem (KB), The User-Interface Management (Dialogue) Subsystem (UIMS) & functionality Classification of DSS & its features .

Unit-IV **(15 hrs)**

Introduction Artificial Intelligence, difference between natural and Artificial Intelligence, What Intelligence, Knowledge, Wisdom? Knowledge Pyramid, Introduction to an expert system (ES), a brief overview of an ES, Introduction to GIS, MSS based on GIS.

References:

1. Efrain Turbain, Jay E, Aronson. Decision Support & Intelligent Systems, Estern Economy Edition
(PHI) Sixth Edition, India 2003.
2. Davis, Michael W. Decision support, Englewood cliffs, New Jersey, Prentice Hall, India, 1990
3. Murdick Thomas , Management Information Systems, New Delhi, Tata McGraw Hill.
4. Peterson J.F. Artificial Intelligence & expert systems 2nd TMC, 20005.
1990
5. Bhatnagar, S.C. and Ramani K.V. “Computers and Information system”, Prentice Hall of India, New Delhi – 1992
6.Lucas, H.C. “Information system concepts for Management”, 5th Edition, McGraw Hill, New York 199

Credit System Syllabus
Master of Computer Application (Commerce)
Semester -IV
Paper-XXI- (MCA-4.5): BM Elective I-4.5.3- Information System Audit

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Unit 1— IS Audit Process – (15 hrs)

1.1 IS Audit Function Knowledge - Laws and regulations: audit charter
Nature of IS audit: need for control and audit of computer-based information systems
Types of audit and auditors: external, internal, government/public sector,
Classifications of audits: information systems, operational, integrated, financial, specialized (SAS 70)
IS auditor responsibility, authority and accountability: audit charter, outsourcing of IS audit activities
Regulation and control of IS audit: ISACA standards, guidelines, Code of Professional Ethics; laws; regulations

1.2 Fundamental Auditing Concepts Materiality: application of materiality for IS audit compared to materiality for financial statement audit Evidence: types of evidence; meaning of sufficient, reliable, relevant evidence Independence: need for independence in attitude and appearance, situations that may impair independence Risk Analysis, Audit risk: inherent risk, control risk, detection risk IS and general
audit responsibilities for fraud Assurance

1.3 Standards and Guidelines for IS Auditing – Knowledge of ISACA Code of Professional Ethics
Review of current ISACA IS Auditing Standards and Guidelines Standards and guidelines specific to region/country: ACM, AGA, AICPA, AITP, IFAC, IIA, ISO, NIA (See appendix 5, Acronyms, for full names.) IS audit practices and techniques

1.4 Internal Controls Concepts and Knowledge Relevance, structure and indicators of effective IT governance for organizations and IS auditors; IT governance structure
Internal control objectives; internal control and documentation of IS, COCO, COSO, King, Sarbanes-Oxley Act of 2002, SAS94, COBIT Control classifications: preventive, detective, compensating/corrective General controls: organizational, security, general operating and disaster recovery, development, documentation Application controls: control objectives; classifications of application controls, e.g., computerize/manual, input/processing/output, preventive/detective/corrective, audit trails

1.5 Audit Planning Process - Strategic/tactical audit planning Engagement letter: purpose and content
Risk assessment: risk-based auditing; risk assessment methods; standards such as ASNZ 4360, CRAMM Preliminary evaluation of internal controls: information gathering and control evaluation techniques Audit plan, program and scope: compliance vs. substantive testing, application of risk assessment to audit plan Classification, scope of audits: e.g., financial, operational, general, application, OS, physical, logical

1.6 Audit Evidence Process Evidence: sufficient, reliable, relevant, useful Evidence-gathering techniques, e.g., observation, inquiry, interview, testing Compliance vs. substantive testing: nature of and difference between compliance and substantive testing, types of compliance tests, types of substantive tests Sampling: sampling concepts, statistical and non statistical approaches, design and selection of samples, evaluation of sample results
Computer-assisted audit techniques (CAATs): need for, types of, planning for and using CAATs; continuous online auditing approach Documentation: relationship with audit evidence; uses of documentation; minimum content; custody, retention, retrieval Analysis: judge the materiality of findings, identify reportable conditions, reach conclusions
Review: provide reasonable assurance that objectives have been achieved

Unit 2 —Systems and Infrastructure Lifecycle Management – (15 Hours)

2.1 IS Planning - IS managing components (e.g., data processes, technologies, organization), understanding stakeholders and their requirements IS planning methods: system investigation, process integration/reengineering Oporto Unities, risk evaluation, cost-benefit analysis, risk assessment, object-oriented systems analysis and design
Enterprise resource planning (ERP) software enterprise applications integration

2.2 Information Management and Usage - Monitoring service-level performance against service level agreements (SLAs), quality of service, availability, response time, security and controls, processing integrity, privacy, remedies, amending SLAs
Data and information: analyze, evaluate and design information architecture (i.e., the role of databases and database management systems, including knowledge management systems and data warehouses)
Data and application architecture (e.g., IS modeling, business models, processes and solutions); analysis, evaluations and design of an enterprise's business processes and business models
Information management (data administration, database functions and administration, database administrator roles and responsibilities)Database technology as tools for the auditor
Data structures and basic SQL language

2.3 Acquisition and Maintenance of Information Systems – Information systems project management: planning, organization, human resource deployment, project control, monitoring, execution
Traditional methods for the system development life cycle (SDLC); analysis, evaluation and design of an enterprise's SDLC phases and tasks
Approaches for system development: software packages, prototyping, business process reengineering, computer-aided software engineering (CASE) tools System maintenance and change control procedures for system changes Development, Risk and control issues, analysis and evaluation of project characteristics and risks

2.4 Impact of IT on the Business Processes and Solutions - Business process outsourcing (BPO)
Applications of e-business issues and trends

2.5 Software Development –
Separation of specification and implementation in programming, Requirements specification methodology ,Algorithm design, sorting and searching algorithms, File handling, Linked lists and binary trees, Database creation and manipulation, Principles of good screen and report design Program language alignment

2.6 Audit and Development of Application Controls – Input/origination controls, Processing control procedures, Output controls, Application system documentation Audit trail

Unit 3 —IT Service Delivery and Support Domain – (15 Hours)

3.1 Technical Infrastructure - IT architecture/standards Hardware: all IT equipment, including mainframe, minicomputers, client-servers, routers, switches, communications, PCs, etc.
Software: operating systems, utility software, database systems, etc. Network: communications equipment and services rendered to provide networks, network-related hardware, network-related software; use of service providers that provide communication services, etc. Baseline controls
Security/testing and validation Performance monitoring and evaluation tools IT control monitoring and evaluation tools, such as access control systems monitoring or intrusion detection systems monitoring
Managing information resources and information infrastructure: enterprise management software

3.2 Service Center Management – Service center management and operations standards/guidelines: COBIT, ITIL, ISO/IEC27002 Issues and considerations of service center vs. proprietary technical infrastructures ,Open systems Change management/implementation of new and changed systems: organization of the tools used to control the introduction of new and changed products into the service center environment, Security management ,Resource/configuration management: compliance with organization/IT operating standards, policies and procedures (e.g., proper use of computer languages)

Contingency/backup and recovery management, Call center management, Management of operations of the infrastructure (central and distributed),Network management, Risk management, Key management principles

Unit 4 – 15 Hours comprising of three parts 4.1, 4.2 & 4.3
(15 hrs)

Unit 4.1 IT Governance Domain 4.1.1 IS/IT Management –IS Organisational Structure and Responsibilities**,** IT project management**,** Risk management: economic, social, cultural, technology risk management**,** Software quality control management
Management of IT infrastructure, alternative IT architectures, configuration**,**
Management of IT delivery (operations) and support (maintenance)
Performance measurement and reporting: IT balanced scorecard, Outsourcing Quality assurance Sociotechnical and cultural approach to management

4.1.2 IS/IT Strategic Planning - IS/IT strategic planning: competitive strategies and business intelligence, link to corporate strategy, Strategic information systems frameworks and applications: types of IS, knowledge management, decision support systems; classification of information systems
Management of IT human resources, employee policies, agreements, contracts
Segregation of duties
IS/IT training and education

4.1.3 IS/IT Management Issues - Legal issues relating to the introduction of IT to the enterprise (international and country-specific) Intellectual property issues in cyberspace: trademarks, copyrights, patents, Ethical issues, Privacy, Data protection rules and laws ,IT governance, IS/IT housekeeping

Unit 4.2 - Protection of Information Assets Domain –

4.2.1 Assets Security Management – Information technology and security basics, concept of IT security, need for securing IT resources, policy framework on IT assets security, management of IT security, training Information Standards, compliance and assurance on IT security, Computer Forensic, Data
Protection rules / role in HR

4.2.2 Logical IT Security – Components of logical IT security, logical access control issues and exposures, access control software Logical security risks, controls and audit considerations (audit of logical access, security, testing) Logical security features, tools, procedures

4.2.3 Applied IT Security: High technology Resources -Communications and network security: principles of network security, client-server, Internet and web-based services, firewall security systems and other connectivity protection resources (e.g., cryptography, digital signatures, key management policies),intrusion detections systems, COBIT, system reviews. Mainframe security facilities
Basic database application and system security. Security in the system development and maintenance processes

4.2.4 Environmental Security

Environmental issues and exposures: concepts of physical IT security Physical and Physical access exposures and controls

Unit 4.3 —Business Continuity and Disaster Recovery Domain –

4.3.1 Disaster Recovery Planning –

Management support and commitment to the process. Plan preparation and documentation Management approval and distribution of the plan. Testing, maintenance and revision of the plan; training. Audit's role ,Backup provisions, Business continuity planning, Protection of the IT Architecture and Assets: Business impact analysis

4.3.2 Types of insurance coverage Insurance –

Description of insurance
Items that can be insured
Valuation of assets: equipment, people, information process, technology