

## **BOARD OF STUDIES MEETING**

### **Master of Computer Applications (M.C.A) Degree Program**



### **THIAGARAJAR COLLEGE OF ENGINEERING**

(A Government Aided ISO 9001-2000 certified  
Autonomous Institution affiliated to Anna University)

MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41

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Web: [www.tce.edu](http://www.tce.edu)

**CURRICULUM**

**FOR**

**Master of Computer Applications (M.C.A) Degree Program**

**I – VI SEMESTER**

**and**

**Detailed Syllabus for**

**I & II SEMESTER**

**FOR THE STUDENTS ADMITTED FROM THE**

**ACADEMIC YEAR 2011-2012 ONWARDS**

**THIAGARAJAR COLLEGE OF ENGINEERING**

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## **Department of Computer Applications**

Graduating Students of Master of Computer Applications (M.C.A) will be able to:

1. Design, develop, test and maintain customer centric applications that will enable the implementing organization to enhance its performance effortlessly.
2. Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
3. Demonstrate a knowledge and understanding of management and business practices and design software solutions accordingly.

Thiagarajar College of Engineering, Madurai – 625 015  
Department of Computer Applications  
Scheduling of Courses

Sem- ester	Theory					Laboratory/Project		
6 <sup>th</sup> (12)						Y61 Project & Viva Voce 0:12		
5 <sup>th</sup> (21)	Y51 Mobile Applications 4:0	Y52 Business Processes 4:0	Y53 Software Quality and Testing 3:1	Y5X Elective IV 3:0	Y5Y Elective V 3:0	Y56 COBOL Programming Laboratory 1:1	Y57 Applications Development Laboratory 0:1	
4 <sup>th</sup> (20)	Y41 Electronic Commerce and Electronic Business 4:0	Y42 Object Oriented Analysis and Design 3:1	Y4X Elective I 3:0	Y4Y Elective II 3:0	Y4Z Elective III 3:0	Y46 Web Technologies Laboratory 1:1	Y47 Software Engineering Laboratory 0:1	
3 <sup>rd</sup> (22)	Y31 Organizational Behaviour 4:0	Y32 Internet and Java Programming 4:0	Y33 Computer Networks 3:1	Y34 Software Engineering 3:1	Y35 Data Warehousing and Data Mining 3:1	Y36 Internet and Java Programming Laboratory 0:1	Y37 Data Warehousing and Data Mining Laboratory 0:1	
2 <sup>nd</sup> (25)	Y21 Operations Research 3:1	Y22 Object Oriented Programming using C++ 3:1	Y23 Design and Analysis of Algorithms 3:1	Y24 Operating Systems 4:0	Y25 Accounting and Financial Management 3:1	Y26 C++ Programming Laboratory 0:1	Y27 Client/Server Applications Laboratory 1:1	Y28 Professional Commu- nication 1:1
1 <sup>st</sup> (24)	Y11 Mathematical Foundations of Computer Science 3:1	Y12 Programming in C 3:1	Y13 Computer Organization and Architecture 4:0	Y14 Data Structures 3:1	Y15 Database Management Systems 4:0	Y16 Data Structures using C Programming Laboratory 0:2	Y17 RDBMS Laboratory 0:2	

**THIAGARAJAR COLLEGE OF ENGINEERING : MADURAI – 625 015****Master of Computer Applications (M.C.A) Degree Program****SUBJECTS OF STUDY****(For the candidates admitted from 2011-2012 onwards)****FIRST SEMESTER**

FIRST SEMESTER						
Subject code	Name of the subject	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
Y11	Mathematical Foundations of Computer Science	BS	3	1	-	4
Y12	Programming in C	DC	3	1	-	4
Y13	Computer Organization and Architecture	DC	4	-	-	4
Y14	Data Structures	DC	3	1	-	4
Y15	Database Management Systems	DC	4	-	-	4
PRACTICAL						
Y16	Data Structures using C Programming Laboratory	DC	-	-	6	2
Y17	RDBMS Laboratory	DC	-	-	6	2
Total			17	3	12	24

**SECOND SEMESTER**

SECOND SEMESTER							
Subject code	Name of the subject	Category	No. of Hours / Week			credits	
			L	T	P		
THEORY							
Y21	Operations Research	BS	3	1	-	4	
Y22	Object Oriented Programming using C++	DC	3	1	-	4	
Y23	Design and Analysis of Algorithms	DC	3	1	-	4	
Y24	Operating Systems	DC	4	-	-	4	
Y25	Accounting and Financial Management	HSS	3	1	-	4	
PRACTICAL							
Y26	C++ Programming Laboratory	DC	-	-	3	1	
Y27	Client/Server Applications Laboratory	DC	1	-	3	2	
Y28	Professional Communication	HSS	1	1	-	2	
Total			18	5	6	25	

**THIRD SEMESTER**

THIRD SEMESTER						
Subject code	Name of the subject	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
Y31	Organizational Behaviour	HSS	4	-	-	4
Y32	Internet and Java Programming	DC	4	-	-	4
Y33	Computer Networks	DC	3	1	-	4
Y34	Software Engineering	DC	3	1	-	4
Y35	Data Warehousing and Data Mining	DC	3	1	-	4
PRACTICAL						
Y36	Internet and Java Programming Laboratory	DC	-	-	3	1
Y37	Data warehousing and Data Mining Laboratory	DC	-	-	3	1
Total			17	3	6	22

**FOURTH SEMESTER**

FOURTH SEMESTER						
Subject code	Name of the subject	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
Y41	Electronic Commerce and Electronic Business	DC	4	-	-	4
Y42	Object Oriented Analysis and Design	DC	3	1	-	4
Y4X	Elective I	DC	3	-	-	3
Y4Y	Elective II	DC	3	-	-	3
Y4Z	Elective III	DC	3	-	-	3
PRACTICAL						
Y46	Web Technologies Laboratory	DC	1	-	3	2
Y47	Software Engineering Laboratory	DC	-	-	3	1
Total			17	1	6	20

**FIFTH SEMESTER**

FIFTH SEMESTER						
Subject code	Name of the subject	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
Y51	Mobile Applications	DC	4	-	-	4
Y52	Business Processes	DC	4	-	-	4
Y53	Software Quality and Testing	DC	3	1	-	4
Y5X	Elective IV	DC	3	-	-	3
Y5Y	Elective V	DC	3	-	-	3
PRACTICAL						
Y56	COBOL Programming Laboratory	DC	1	-	3	2
Y57	Applications Development Laboratory	DC	-	-	3	1
Total			18	1	6	21

**SIXTH SEMESTER**

SIXTH SEMESTER						
Subject code	Name of the subject	Category	No. of Hours / Week			credits
			L	T	P	
PRACTICAL						
Y61	Project & Viva Voce	DC	-	-	36	12
Total			36			12

BS : Basic Science  
 DC : Department Core  
 HSS : Humanities and Social Science

L : Lecture  
 T : Tutorial  
 P : Practical

**Note:**

1 Hour Lecture/Tutorial is equivalent to 1 credit

2/3 Hours Practical is equivalent to 1 credit

**Total credits to be earned for the award of degree: 124**

**THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI – 625 015****Master of Computer Applications (M.C.A) Degree Program****SCHEME OF EXAMINATIONS****(For the candidates admitted from 2011-2012 onwards)****FIRST SEMESTER**

S.No.	Sub. Code	Name of the subject	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	Marks for Total
				Continuous Assessment *	Termi-nal Exam **	Max. Marks	Terminal Exam	
THEORY								
1	Y11	Mathematical Foundations of Computer Science	3	50	50	100	25	50
2	Y12	Programming in C	3	50	50	100	25	50
3	Y13	Computer Organization and Architecture	3	50	50	100	25	50
4	Y14	Data Structures	3	50	50	100	25	50
5	Y15	Database Management Systems	3	50	50	100	25	50
PRACTICAL								
6	Y16	Data Structures using C Programming Laboratory	3	50	50	100	25	50
7	Y17	RDBMS Laboratory	3	50	50	100	25	50



**SECOND SEMESTER**

S.No.	Sub. Code	Name of the subject	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	Total
				Continuous Assessment *	Termi-nal Exam **	Max. Marks	Terminal Exam	
THEORY								
1	Y21	Operations Research	3	50	50	100	25	50
2	Y22	Object Oriented Programming using C++	3	50	50	100	25	50
3	Y23	Design and Analysis of Algorithms	3	50	50	100	25	50
4	Y24	Operating Systems	3	50	50	100	25	50
5	Y25	Accounting and Financial Management	3	50	50	100	25	50
PRACTICAL								
6	Y26	C++ Programming Laboratory	3	50	50	100	25	50
7	Y27	Client/Server Applications Laboratory	3	50	50	100	25	50
8	Y28	Professional Communication	3	50	50	100	25	50

**THIRD SEMESTER**

S.No.	Sub. code	Name of the subject	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	Marks for
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	Y31	Organizational Behaviour	3	50	50	100	25	50
2	Y32	Internet and Java Programming	3	50	50	100	25	50
3	Y33	Computer Networks	3	50	50	100	25	50
4	Y34	Software Engineering	3	50	50	100	25	50
5	Y35	Data Warehousing and Data Mining	3	50	50	100	25	50
PRACTICAL								
6	Y36	Internet and Java Programming Laboratory	3	50	50	100	25	50
7	Y37	Data Warehousing and Data Mining Laboratory	3	50	50	100	25	50

**FOURTH SEMESTER**

S.No.	Sub. code	Name of the subject	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	Marks for
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	Y41	Electronic Commerce and Electronic Business	3	50	50	100	25	50
2	Y42	Object Oriented Analysis and Design	3	50	50	100	25	50
3	Y4X	Elective I	3	50	50	100	25	50
4	Y4Y	Elective II	3	50	50	100	25	50
5	Y4Z	Elective III	3	50	50	100	25	50
PRACTICAL								
6	Y46	Web Technologies Laboratory	3	50	50	100	25	50
7	Y47	Software Engineering Laboratory	3	50	50	100	25	50

**FIFTH SEMESTER**

S.No.	Sub. code	Name of the subject	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	Marks for
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	Y51	Mobile Applications	3	50	50	100	25	50
2	Y52	Business Processes	3	50	50	100	25	50
3	Y53	Software Quality and Testing	3	50	50	100	25	50
4	Y5X	Elective IV	3	50	50	100	25	50
5	Y5Y	Elective V	3	50	50	100	25	50
PRACTICAL								
6	Y56	COBOL Programming Laboratory	3	50	50	100	25	50
7	Y57	Applications Development Laboratory	3	50	50	100	25	50

**SIXTH SEMESTER**

S.No.	Sub. code	Name of the subject	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
PRACTICAL								
1	Y61	Project & Viva Voce	3	150	150	300	75	150

\* Continuous Assessment (CA) evaluation pattern will differ from subject to subject and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

\*\* Terminal Examination will be conducted for maximum marks of 100/300 and subsequently be reduced to 50/150 marks for the award of terminal examination marks

Sub code	Lectures	Tutorial	Practical	Credit
Y11	3	1	-	4

## **Y11 Mathematical Foundations of Computer Science 3:1**

### **Preamble:**

A Computer Application student needs to have some basic mathematical tools and techniques to understand various designing concepts, storage methods, concepts in digital principles, managing databases etc . The main objective of this course is to introduce the basic terminology used in advanced courses in Computer application. This emphasizes the development of rigorous logical thinking for solving different kinds of problems that occur in computer applications. Based on this the course aims at giving adequate exposure in the theory and applications of Set theory, Propositional logic, Predicate logic, Lattices and Boolean Algebra, Automata theory which helps the learner to use them eventually in practical applications of computer science These topics supports the advanced courses in computer science such as digital principles, artificial intelligence, compiler and design, DBMS, Design of Software etc.

### **Competencies**

At the end of the course the student should be able to

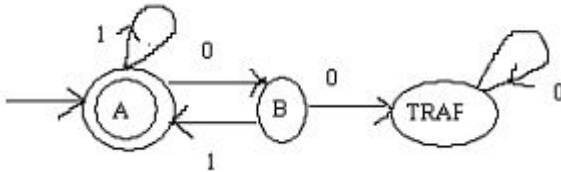
1. Model the English sentences into symbolic form without predicates
2. Check the validity of the arguments.
3. Understand how to construct correct Mathematical arguments with predicates.
4. Design of computers and electrical circuit.
5. Check whether a particular combination of words(with and without predicates) is a valid sentence or not .
6. Design Karnaugh map to get simplified form of a Boolean function.
7. Check whether the given grammar is regular or not using pumping lemma..

**Assessment Pattern**

	Bloom's category	Test 1	Test 2	Test 3 / End Semester Examinations
1	Remember	10	10	10
2	Understand	30	30	20
3	Apply	60	60	70
4	Analyze	0	0	0
5	Evaluate	0	0	0
6	Create	0	0	0

**Course level learning objectives****Remember**

1. Define a biconditional statement and draw its truth table
2. Show that  $(P \wedge Q) \rightarrow (P \vee Q)$  is a tautology without constructing truth table.
3. Define term NAND
4. Show that following implication  $[P \rightarrow (Q \rightarrow R)] \Rightarrow [(P \rightarrow Q) \rightarrow (P \rightarrow R)]$
5. Define minterm and maxterm.
6. Define Distributive lattice.
7. Define Boolean Algebra.
8. List the steps in conversion a Boolean function as a product of maxterm form.
9. Find the language generated by the following automata and also write the grammar



10. Specify the language generated by the grammar  $S \rightarrow aSb/ab$
11. Define context free grammar and ambiguous grammar.

**Understand**

1. Estimate the PCNF and PDNF of the formula given by  $(\neg P \rightarrow R) \wedge (Q \rightarrow P)$

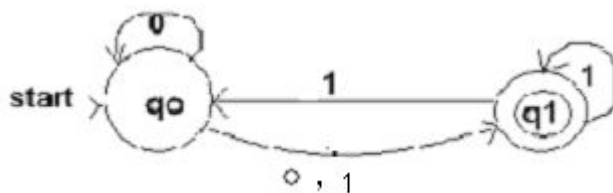
2. Discuss this  $(\neg Q), P \rightarrow Q, P \vee R \Rightarrow R$  by indirect method
3. Let  $R$  denote a relation on the set of ordered pairs of integers such that  
 $\langle x, y \rangle R \langle u, v \rangle$  iff  $xv = yu$ . Show that  $R$  is an equivalence relation
6. Let  $f(x) = x+2, g(x) = x-2, h(x) = 3x$ , for  $x \in R$ , where  $R$  is the set of real numbers.  
 Find  $f \circ g, g \circ f, f \circ f, g \circ g$  and  $f \circ g \circ h$ . And also write the corresponding matrix.
7. Discuss the properties of the Lattices
8. Discuss algebraically the equality  $\overline{ab} + \overline{bc} + \overline{ca} = \overline{ab} + \overline{bc} + \overline{ca}$  using basic laws of Boolean algebra.
9. Construct a DFA that accepts all the strings on  $\{0,1\}$  except those containing the substring 101.

### Apply

1. Show that  $\neg(p \wedge (\neg q \wedge r) \vee (q \wedge r) \vee (p \wedge r)) \Leftrightarrow r$
2. Define NAND and NOR. Prove that the connectives NAND and NOR are commutative.
3. Show that  $(\forall x)(P(x) \vee Q(x)) \Rightarrow (\forall x)P(x) \vee (\exists x)Q(x)$ , Using indirect method.
4. Prove that  $D_{70}$  is a Lattice and also verify  $D_{70}$  as Distributive Lattice.
5. Simplify the Boolean function  $f(a,b,c,d) = \sum(0,2,6,7,8,9,13,15)$  using Karnaugh map.
6. Find whether the following languages are regular or not using pumping lemma:

$$(i) L = \{ w \in \{a,b\}^* / w = w^R \} \quad (ii) L = \{ 1^n / n \geq 1 \}$$

7. Convert the following NFA to DFA:



**Course content and lecture schedule**

<b>Sl.No</b>	<b>Topics</b>	<b>No.of Lectures</b>
	<b>Module 1: Propositional and Predicate Calculus</b>	
1.1	Introduction – statements and notation, connectives	3
1.2	Normal forms: Conjunctive Normal Forms - Disjunctive Normal Form	2
1.3	Principal Conjunctive Normal Forms - Principal Disjunctive Normal Form	2
1.4	The theory of inference for the statement calculus	2
1.5	Free and bound variables	2
1.6	Inference theory of the predicate calculus	3
	<b>Module II- Set Theory</b>	
2.1	An Overview of set theory	1
2.2	Relations	2
2.3	Functions	2
	<b>Module III :Lattices and Boolean Algebra</b>	
3.1	Lattice as PO	1
3.2	Properties of lattices	1
3.3	Special Lattice	2
3.4	Boolean Algebra and its properties	1
3.5	Boolean Function	1
3.6	Value of Boolean Expression	1
3.7	Minimization of Boolean functions	2
	<b>Module IV : Automata Theory</b>	
4.1	Deterministic and Non-Deterministic finite Automaton	2
4.2	Finite Automata $\epsilon$ -moves	1
4.3	Regular expressions	1
4.4	Finite Automata and Regular Expressions	1
4.5	Pumping Lemma (without proof) and its applications	2



4.6	Grammars and Languages, Ambiguity in grammar	1
4.7	Regular Grammar and Finite Automaton	1
4.8	Context free Grammar -Parse Tree	2
4.9	Application of Context free grammar	1
	Total	40

## Syllabus

### Mathematical logic:

Introduction – statements and notation, connectives, Normal forms: Conjunctive Normal Forms - Disjunctive Normal Form - Principal Conjunctive Normal Forms - Principal Disjunctive Normal Form, The theory of inference for the statement calculus the predicate calculus, free and bound variables inference theory of the predicate calculus.

### Set theory:

Overview of set theory, Relations, Functions.

### Lattices and Boolean algebra:

Lattices as partially ordered sets, properties of lattices – some special lattice – Boolean algebra – definition and examples – Boolean functions – value of Boolean expression – minimization of Boolean functions.

### Automata Theory:

Deterministic and Non-Deterministic finite Automaton, Finite Automata  $\epsilon$ -moves, Regular Expression, Finite Automata and Regular Expressions, Pumping Lemma (without proof) and its applications, Grammars and Languages, Ambiguity in grammar, Regular Grammar and Finite Automaton, Context free Grammar -Parse Tree, Application of Context free grammar.

### References:

1. Trembly and Manohar, "Discrete mathematical structures with applications to Computer Science", Tata McGrawHill, 2002.
2. Kenneth H. Rosen, "Discrete mathematics and its applications", McGrawHill International Editions 1999.
3. Dr. M.K.Venkataraman., Dr.N.Sridharan and N.Chandrasekaran, Discrete Mathematics, National Publishing Company, Chennai. of India (2004)

4. John E.Hopcraft,Rajeev Motwani,Jeffery D.Ullman, `` Introduction to Automata Theory, Languages and Computation `, Pearson Education, Asia,2001.
5. John C.Martin, `` Introduction to Languages and the theory of Computation`, Tata McGraw-Hill Publishing Company Limited,New Delhi.

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Sub code	Lectures	Tutorial	Practical	Credit
Y12	3	1	-	4

## Y12 Programming in C

**3:1**

### Preamble:

This is a course offered in first semester for the students of Computer Applications. This course has four credits dedicated to provide the students a strong foundation on programming concepts and its application. It also enables the students to solve problems using programmable logic.

### Competencies

1. Select computers for different applications.
2. Comprehend the nature of problems that a computer can solve extremely well - be able to list 5 non-trivial, interesting problems (unique in their own way) which are difficult to solve for a human being but can be solved easily by a computer.
3. Comprehend the following terms in the context of problem solving by a computer: Problem specification, input-output analysis, algorithm, flowchart, pseudo-program, programming language, assembly language, machine language, compiler, assembler, program correctness.
4. Explain the difference between arrays and linked lists, and create two examples where arrays are better than linked lists and two examples where linked lists are better than arrays.
5. Explain the difference between iteration and recursion, and create two examples where iteration is better than recursion and two examples where recursion is better than iteration.
6. Design the flowchart and write efficient code for problems like  
Recursive and iterative programs for binary search  
Recursive and iterative programs for Fibonacci numbers  
Recursive and iterative programs for finding the GCD of two numbers  
Reverse a linked list while traversing it only once
7. Explain the role of pointers in implementing singly linked lists, doubly linked lists, binary trees, and general trees.
8. Explain the reason why different constructs are available for iteration, such as "for" loops, "do...while" loops.

**Assessment Pattern**

S.No	Bloom's Category	Test 1	Test 2	Test3/ End-semester examination
1.	Remember	20	10	0
2.	Understand	20	20	10
3.	Apply	50	40	50
4.	Analyze	10	20	20
5.	Evaluate	0	10	20
6.	Create	0	0	0

**Course Level Learning Objectives:****Remember**

- 1 What is a Computer?
- 2 Name the different I/O devices used with a computer?
- 3 What is the difference between system software and application software?
4. List five programming languages commonly used
5. What is the role of operating system in a computer?
6. What is structured programming?
7. What are the various data types?
8. What are the I/O functions in C?
9. What are format specifiers?
10. What are the components of compilers?

**Understand:**

1. Compare while loop with do – while Loop?
2. Explain the advantages of using Macro definition?
3. Explain how recursive functions affect the run time efficiency?
4. Differentiate between Structure and Union in C.
5. Explain how dynamic arrays are efficient compared to Static with example?
6. How is memory managed in C?
7. What are the advantages of using Command line Arguments?
8. How garbage collection is done in C?
9. Describe the operations of linked list with an example
10. Explain how interrupts can work in Hardware programming

**Apply**

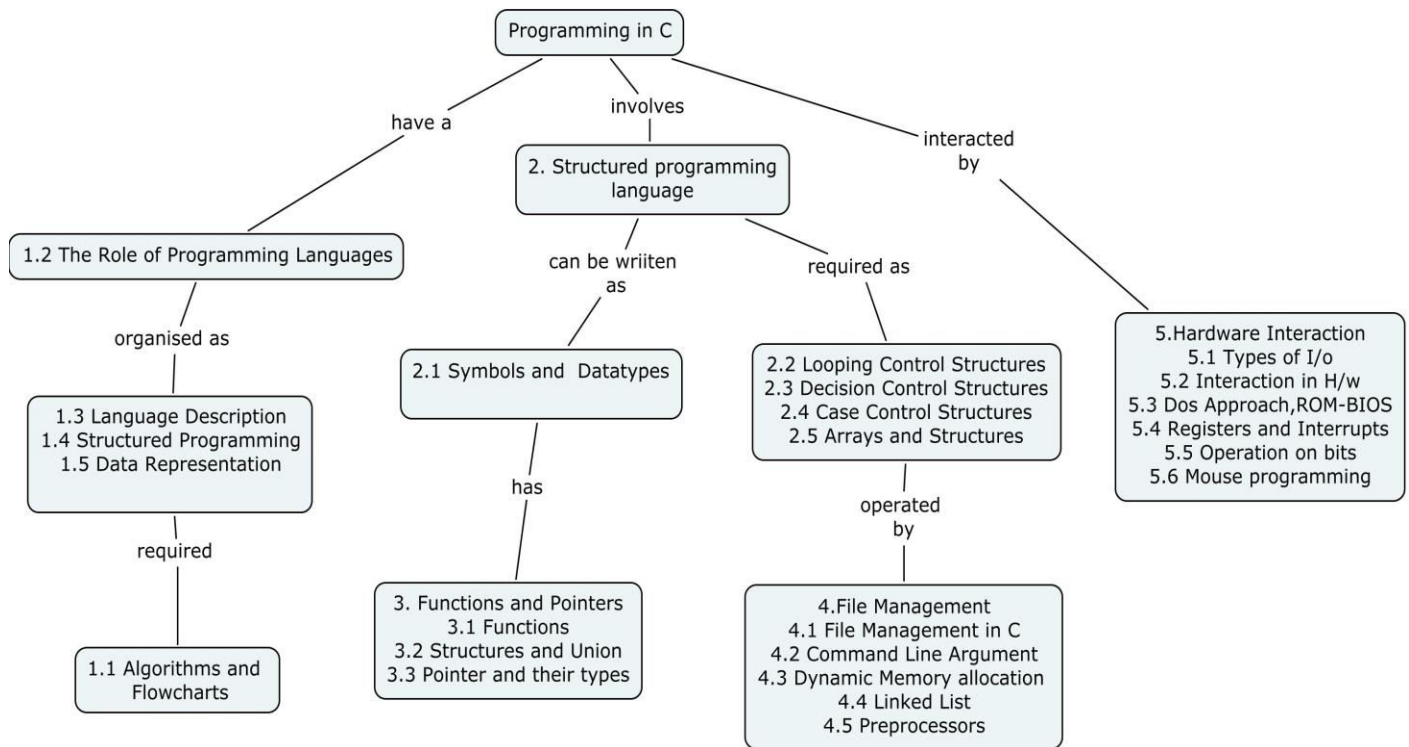
1. Write a Macro program to find the Armstrong number between 1 and 1000?
2. Write a recursive function to calculate the Combinatory of a nCr?
3. Write a program to perform stack operation using pointers?
4. Write a program to perform linked list operation using pointers?
5. Write a program to generate the pay slip of an employee using dangling if – else statement?
6. Write a program to compute Matrix Multiplication using Pointers?
7. Write a program to read the content of the file and copy it to another file?
8. Write a program to check if the given word is available in the file or not?
9. Write a program to check whether the string is palindrome or not using stack
10. Write a program for reversed string without using library functions

**Analysis**

1. Why are pointers so powerful? Analyze their efficiency giving an example?
2. Are the following statements valid? Justify your answer
  - (i) `k = (char*)&m`
  - (ii) `m = (float*)&p`
3. Is there any advantage of using recursion over looping control structures? Give a Suitable example?
4. Analyze the factors that influence the execution times of a program?
5. Illustrate the limitation of array of pointers to strings using a sample?
6. Differentiate keywords BREAK and CONTINUE with an example?

**Evaluate**

1. Execution time affects efficiency more than storage space. Justify?
2. Compare and contrast Structures with union?
3. Justify the need for Type Casting over Type Conversion?
4. Compare and contrast IO mapped IO with Memory mapped IO?
5. Evaluate the sorting procedure using arrays and pointers?
6. Given an Educational institution try to automate it acquiring the needed resources?

**Concept Map:****Course content and Lecture Schedule**

S.No	Topic	No of Lecturers
1	<b>Introduction to Programming Language</b>	
1.1	Algorithms, Flowcharts	1
1.2	The Role of Programming Languages	1
1.3	Language Description	2
1.4	Structured Programming	2
1.5	Data Representation	2
2	<b>Structured Programming Language</b>	
2.1	Symbols and data types	1
2.2	Looping control structures	2
2.3	Decision control structures	2
2.4	Case control structures	1

2.5	Arrays and Strings	2
3	<b>Functions and Pointers</b>	
3.1	Functions	3
3.2	Structures, Union	1
3.3	Pointers, Type of Pointer	3
4	<b>File Management</b>	
4.1	File Management in C	2
4.2	Command Line Argument	1
4.3	Dynamic Memory allocation	2
4.4	Linked List	2
4.5	Preprocessors	1
5	<b>Hardware Interface</b>	
5.1	Types of I/O	1
5.2	Interaction with H/W in C	1
5.3	DOS Approach, ROM – BIOS	1
5.4	Registers, Interrupts	1
5.5	Operation on bits	1
5.6	Mouse Programming	2
	Total	<b>38</b>

## Syllabus

**Introduction to Programming Language :** Algorithms, Flowcharts, The Role of Programming Languages, Language Description, Structured Programming, Data Representation, Procedure Activations **Structured Programming Language:** Symbols and data types, Looping control structures, Decision control structures, Case control structures, Arrays and Strings **Functions and Pointers:** Functions, Structures, Union, Pointers, Type of Pointer **File Management:** File Management in C, Command Line Argument, Dynamic Memory allocation, Linked List and Preprocessors **Hardware Interface :** Types of I/O, Interaction with H/W in C, CPU Registers, Interrupts, DOS Function Requests, Interaction with HW using Port I/O, Operation on bits, Mouse Programming.

**References**

1. Yashavant Kanetkar, "Let us C", BPB Publications 8<sup>th</sup> Edition, 2007
2. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, 2004
3. Darnell and Margolis, "ANSI C- A Systematic programming Approach", Narosa publications, 2000.
4. Ravi Sethi, Viswanatha. K.V "Programming Languages – Concepts & Constructs", Pearson Education, Second Edition

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Sub Code	Lectures	Tutorial	Practical	Credit
Y13	4	-	-	4

## Y13 Computer Organization and Architecture

**4:0**

**Preamble:** This is a course offered in first semester for the students of Computer Applications. This course has four credits dedicated to number system, logic design, and memory and processing. This is the only course that is concerned with the hardware of a computer, its logic design and organization. It aims at making the student familiar with digital logic and functional design of arithmetic and logic unit that is capable of performing floating point arithmetic operations. The CPU and the organization of memory are explored by tracing the execution of assembly language instructions. Data needs to be transferred between I/O devices and CPU and between computers.

### Competencies

1. Design simple combinational and sequential digital functions.
2. Perform simple arithmetic operations.
3. Design an instruction set of a simple computer capable of performing a specified set of operations.
4. Design a memory system for a given set of specifications.
5. Specify architectures using pipelining and paralleling features to improve the performance of computers.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	Test 3/ End-Semester Examination
1	Remember	30	10	10
2	Understand	30	20	20
3	Apply	20	30	30
4	Analyze	20	40	40
5	Evaluate	0	0	0
6	Create	0	0	0

**Course Level Learning Objectives****Remember**

1. What are the different units in a computer system?
2. What is an addressing mode?
3. What is an assembly language instruction?
4. List the advantages and disadvantage of different types of memories?
5. What is Parallel Processor?

**Understand**

1. What is the reason we view a computer system as consisting of different units?
2. What is the difference between machine language and assembly language
3. What do you understand by the term 'upward compatibility'? Why is it important?
4. IBM 370 has no indirect addressing. Explain how one would get the effect of indirect addressing on this machine?
5. Explain in detail the advantages of PC being an addressable register in the CPU?
6. In some computers there are instructions to LOAD specified registers from memory and to STORE a register into memory. In the case of Pentium this is achieved with the MOVE instruction. What are the advantages and disadvantages of these?
7. Explain about working mechanism of VLIW?

**Apply**

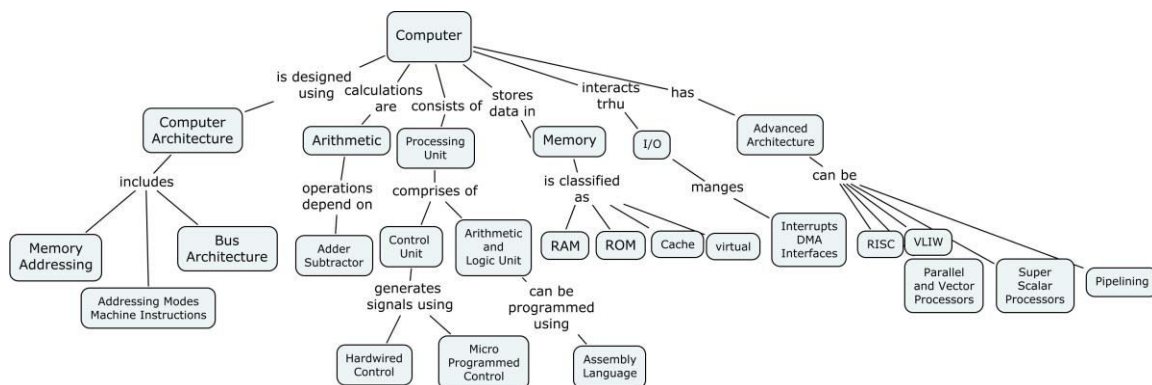
1. Convert the decimal number 92.00625 into a binary number?
2. Convert the binary number 1101.001101 into decimal and octal forms?
3. Obtain an algorithm to find all allowable weights for a weighted BCD code? Assume that all weights are positive integers.
4. Using the postulates of Boolean algebra prove that  $x.y + x'.z + y.z = x.y + x'.z$
5. Multiply the binary numbers 1010 x 0111 using any algorithm you know? Show all steps in calculation
6. Give a combinational circuit to multiply two numbers each of which is 3 bits long and has 1 bit sign? The output should have the right sign and magnitude.

**Analyze**

1. A byte addressed machine has 256 MB memory. It has 160 instructions and 16 general purpose registers.
  - What is the instruction format if an instruction and 3 GPRs can be addressed?

- What is the word length of the machine?
  - Is the word size sufficient to represent floating point numbers? If yes, pick appropriate number of bits for the mantissa and exponent. Justify your choice.
2. In what ways do the two features 'macros' and 'subroutines' resemble each other and in what ways do they differ from each other?
  3. Distinguish between traps and external interrupts? What are the major differences in handling these in a computer system?

### Concept Map



### Course content and Lecture Schedule

Sl.No	Topics	No. of Periods
	<b>Functional Units</b>	
1	Basic structure of Computers: Functional Units, Operational Concepts	2
2	Bus Structures	1
3	Machine instructions and programs	1
4	Memory locations and Addresses, Memory operations	1
5	Instructions and instruction sequencing	1
6	Addressing Modes	1
7	Assembly Language	1
	<b>Arithmetic</b>	
8	Number Representation	2
9	Addition and Subtraction of signed numbers	1
10	Design of Fast Adders	1
11	Multiplication of numbers	1
14	Operand multiplication	1

15	Fast multiplication	1
16	Integer division	1
17	Floating point numbers and operations	1
	<b>Processing Unit</b>	
18	Processing Unit: Fundamental Concepts(Seminar)	1
19	Execution of complete Instruction	1
20	Multiple bus organization	1
21	Hardwired Control	1
22	Micro programmed control	1
23	Sequencing (Seminar)	1
24	Micro instructions with next address field	1
25	Pre-fetching, Emulations (Seminar)	1
	<b>Memory</b>	
26	Main memory: Concepts	1
27	Semiconductor RAM memories	1
28	Read Only Memory	1
29	Cache Memories	1
30	Virtual Memories	1
31	Memory Management Requirements(Seminar)	1
	<b>Input and output organization</b>	
32	Input – Output organization	
33	Accessing I/O devices	1
34	Interrupts	1
35	Direct Memory Access	1
36	Interface circuits	1
	<b>Advanced Processor Architecture</b>	
37	RISC	1
38	Pipelining	1
39	Super Scalar Processors	1
40	Parallel and Vector Processors	1
41	VLIW	1
	Total	40

**Syllabus**

**Functional Units:** Basic operational concepts, Bus structures, Machine instructions, memory locations, addressing modes, assembly language **Arithmetic:** Number representations, addition and subtraction of signed numbers, Design of fast adders, Multiplication of signed numbers, Fast multiplication and Integer division **Processing Unit:** Concepts, Execution of complete instruction, Multi bus organization, ALU; Control Unit: Hardwired Control, Micro programmed Control; Micro Instructions, Micro program sequencing, Micro instructions with next address field and pre-fetching **Memory:** RAM, ROM, Cache Memories, and Virtual memory **Input and output organization:** Accessing I/O devices, Interrupts, DMA, and Interface circuits **Advanced Processor Architecture:** RISC, Pipelining, Super Scalar Processors, VLIW, Parallel and Vector Processors.

**References**

1. Carl Hamacher, Zvonko Vranesic, safwat Zaky, " Computer Organization", Fifth Edition, Tata McGraw Hill, 2002.
2. William Stallings, "Computer Organization and Architecture", Sixth Edition, Pearson Education, 2004.
3. David A. Patterson, John L.Hennessy, "Computer Organization and Design", Third Edition, Morgan Kauffmann Publishers, 2005.
4. David E.Culler,Jaswinder Paul Singh,Anoop Gupta:Parallel Computer Architecture:Hardware/Software Approach,Elsevier Science,2008.

**Course Designer**

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y14	3	1	-	4

## Y14 DATA STRUCTURES

**3:1**

**Preamble:** This course aims at facilitating the student to understand the various data structures, their operations and apply them in real world problems.

### Competencies

1. Ability to identify and implement appropriate data structure for a given application
2. Identify all the trade-offs involved in choosing static versus dynamic data structures
3. In the context of searching, identify the trade-offs involved in selecting the most efficient data structure.
4. In the context of sorting, identify the trade-offs involved in selecting: (a) bubble-sort (b) insertion sort (c) selection sort (d) quick sort (e) merge sort (f) heap sort.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	End-semester examination
1	Remember	30	20	10
2	Understand	30	20	10
3	Apply	20	30	30
4	Analyze	10	20	20
5	Evaluate	10	10	30
6	Create	0	0	0

### Course Level Learning Objectives:

#### Remember

1. What is data structure?
2. List out the areas in which data structures are applied extensively?
3. What are the major data structures used in the following areas: RDBMS, Network data model and Hierarchical data model?

4. What are the notations used in Evaluation of Arithmetic Expressions using prefix and postfix forms?
5. List out few of the applications of tree data-structure?
6. List out few of the applications that make use of Multilinked Structures?
7. What is the bucket size, when the overlapping and collision occur at same time?
8. What are the Collision Resolution Techniques and the methods used in each of the type?
9. Draw a hash table with open addressing and a size of 9. Use the hash function " $k\%9$ ". Insert the keys: 5, 29, 20, 0, 27 and 18 into your table (in that order).

### Understand

1. If you are using C language to implement the heterogeneous linked list, what pointer type will you use?
2. What is the minimum number of queues needed to implement the priority queue?
3. How many null branches are there in a binary tree with 20 nodes?
4. How many different trees are possible with 10 nodes?
5. What is the condition for balancing to be done in an AVL tree?
6. How do you traverse a given tree using Inorder, Preorder and Postorder traversals.
7. What is the suitable efficient data structure for constructing a tree?
8. Sort the given values using Quick Sort?

65	70	75	80	85	60	55	50	45
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9. Classify the Hashing Functions based on the methods by which the key value is found.
10. What are the steps to inserting a new item at the head of a linked list? Use one short English sentence for each step.
11. Suppose that p is a reference to an IntNode in a linked list, and it is not the tail node. What are the steps to removing the node after p? Use one short English sentence for each step.

12. Write a class definition that could be used to define a node in a doubly linked list. Include only the instance variables, not the methods. Also write one sentence to describe a situation when a doubly linked list is appropriate.
13. Describe a situation where storing items in an array is clearly better than storing items on a linked list.
14. Describe why it is a bad idea to implement a linked list version a queue which uses the head of the list as the rear of the queue.

### **Apply**

1. Convert the expression  $((A + B) * C - (D - E) ^ (F + G))$  to equivalent Prefix and Postfix notations.
2. Draw the B-tree of order 3 created by inserting the following data arriving in sequence - 92 24 6 7 11 8 22 4 5 16 19 20 78
3. Draw a binary Tree for the expression :  $A * B - (C + D) * (P / Q)$
4. Is a Linked List a linear or non-linear data structure?
5. Suppose we are using the usual IntNode class (with instance variables called data and link). Your program is using an IntNode variable called head to refer to the first node of a linked list (or head is null for the empty list). Write a few lines of C++ code that will print all the double numbers on the list?
6. Suppose we are using the usual IntNode class (with instance variables called data and link), and that locate is referring to a node in a linked list. Write an assignment statement that will make locate refer to the next node in the list (if there is one). If there is no next node, then your assignment statement should set locate to null.
7. Suppose that p, q, and r are all references to nodes in a linked list with 15 nodes. The variable p refers to the first node, q refers to the 8th node, and r refers to the last node. Write a few lines of code that will make a new copy of the list. Your code should set THREE new variables called x, y, and z so that: x refers to the first node of the copy, y refers to the 8th node of the copy, and z refers to the last node of the copy. Your code may NOT contain any loops, but it can use the other IntNode methods.



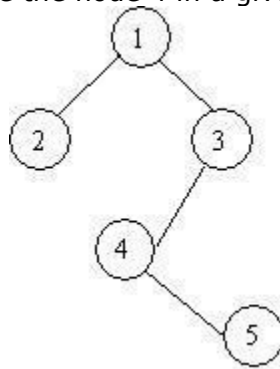
8. If you have one million named objects and you want to store them in a data structure that lets you insert new objects quickly and search for an object by name quickly, what data structure should you use?
9. The way a card game player arranges his cards as he picks them up one by one, is an example of 1. bubble sort 2. selection sort 3. insertion sort 4. merge sort

### Analyze

1. Suppose that an open-address hash table has a capacity of 811 and it contains 81 elements. Analyze the table's load factor? (An approximation is fine.)
2. A hash table with hash function  $H_1(k) = k \bmod 13$  is shown below.  

0	1	2	3	4	5	6	7
8	9	10	11	12	26	38	17
33	48	35	25	Collision is resolved using the hash function $H_2(k) = (k \bmod 11) + 1$			

 (a) Analyze how many key comparisons occur in searching for key 35 in the given hash table? (b) If a new key 67 is inserted into the given hash table, what will be its address?
3. At what location can you store the node 4 in a given binary tree using array?



4. There are 8, 15, 13, 14 nodes were there in 4 different trees. Which of them could have formed a full binary tree?
5. What happens when you push a new node onto a stack implemented using linked list?
6. To represent hierarchical relationship between elements, which data structure is not suitable?
7. Given a string of characters (let us say there are about 100 characters or more in the string), what is the most efficient method to use for finding out the character that repeats itself the most?

### Evaluate

1. Evaluate the given arithmetic expression in a postfix form using stack.

ab+cd\*/

2. The following code is going to be execute with THREE pushes and ONE pop:

```
IntStack s = new IntStack( );
s.push(1);
s.push(2);
s.push(3);
System.out.println(s.pop( ));
```

Suppose that s is represented by a linked list. Draw the state of the private member variables of s after the above code:

```

      _____
head |   |   |
    |___|___|
```

3. Implement the following method. You may use the IntStack class and the Stack operations of push, pop, peek, isEmpty, and size. The parameter, in, is an object of the class EasyReader which is a collection of characters represented as text. You may use the methods:

```
in.isEOLN() -- returns true when the end of line is reached.
in.peek() -- returns the next input character without actually reading it.
in.ignore() -- reads and throws away the next input character.
in.intInput() -- reads and returns an integer value from the
EasyReader.
```

This should be used only if you know that the next input characters form a valid integer value.

The method specification is:

```
public static int evaluatePostfix(EasyReader in)
```

Precondition (Which is not checked): The next input line of in is a properly formed postfix expression consisting of integers, the binary operations + and -, and spaces.

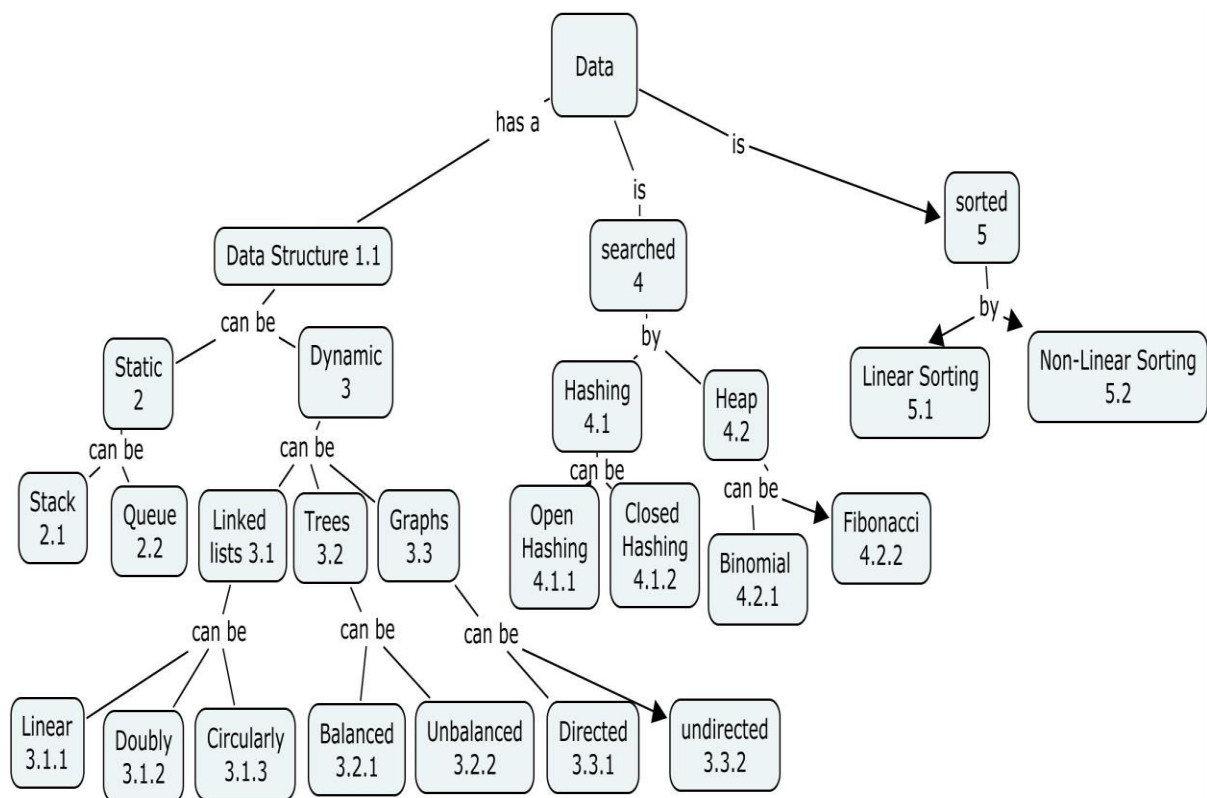
Postcondition: The method has read the next input line (including the newline) and returned the value of the postfix expression.

4. Consider the usual algorithm to convert an infix expression to a postfix expression. Suppose that you have read 10 input characters during a conversion and that the

stack now contains these symbols: +(top), (, \*(bottom) Now, suppose that you read and process the 11th symbol of the input. Draw the stack for the case where the 11th symbol is:

- A. A number:
- B. A left parenthesis:
- C. A right parenthesis:
- D. A minus sign:
- E. A division sign:

### Concept Map



### Course content and Lecture Schedule

No.	Topic	No. of Lectures
1	<b>Data</b>	
1.1	Data Structure	1

No.	Topic	No. of Lectures
2	<b>Static Data Structures</b>	
2.1	Stacks	3
2.2	Queues	2
3	<b>Dynamic Data Structures</b>	
3.1	Linked Lists	1
3.1.1	Linear Linked Lists	2
3.1.2	Doubly Linked Lists	2
3.1.3	Circular Linked Lists	2
3.2	Trees	2
3.2.1	Unbalanced Trees	3
3.2.2	Balanced Trees	6
4	<b>Data Search</b>	
4.1	Hashing	1
4.1.1	Open Hashing	1
4.1.2	Closed Hashing	2
4.2	Heap - Max and Min Heap	2
4.2.2	Fibonacci Heap	2
4.2.3	Binomial Heap	1
5	<b>Data Sorting</b>	
5.1	Internal Sorting	
5.1.1	Insertion sorting	1
5.1.2	Shell sorting	1
5.1.3	Quick sorting	1

No.	Topic	No. of Lectures
5.1.4	Merge sorting	1
5.1.5	Heap sorting	2
5.2	External Sorting	2
5.3	Graphs – Strongly Connected Components	2
5.4	Minimal Spanning Trees	2
	Total	45

### Syllabus

Data Structure, Stacks and Queues, Linked Lists, Hash Tables, **Trees:** Binary Search Tress, Red-Black Trees, B-Trees. **Non Linear Sorting:** Insertion Sort, Bubble sort, Selection Sort, Heap sort, Priority queues, Quick sort ,**Linear Sorting:** Counting sort, Radix sort, Bucket sort. **Binomial Heaps:** Binomial tress and binomial heaps, Fibonacci Heaps, **Searching:** Breadth-first search, Depth-first search, **Graphs:** Topological sort, strongly connected components, Minimum Spanning Trees

### References:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Prentice Hall of India, 2002.
2. Mark Allen Weiss, "Data Structures and Algorithms in C", Addison-Wesley, 1997
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education Asia, 2002.
4. Robert Sedgewick, " Algorithms in C++", Pearson Education Asia, 2002.

### Course Designers:

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Sub code	Lectures	Tutorial	Practical	Credit
Y15	4	-	-	4

## Y15 – DATABASE MANAGEMENT SYSTEMS

**4:0**

**Preamble:** This course aims at facilitating the student to understand the various functionalities of DBMS software and perform many operations related to creating, manipulating and maintaining databases for Real-world applications and student to understand the various designing concepts, storage methods, querying and managing databases.

### Competencies

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

1. Understand the structure and model of the relational database system.
2. Create and modify the database with constraints.
3. Retrieve data from Databases including selecting rows, limiting the selection, and single-row functions.
4. Display data from multiple tables, and using group functions, sub queries.
5. Design a database based on a data model appropriate to the need.
6. Normalize a given database to a specified level
7. Determine the structure of the storage system and retrieval methods.
8. Estimate the storage size of the database and design appropriate storage techniques.
9. Compute the performance of a given query
10. Select the best query that meets the specified performance requirements of an application.
11. Identify the requirements of transaction processing and concurrency control.
12. Solve the concurrency control issues.
13. Perform backup and recovery of the database.
14. Design and develop a simple database application working in a team using common tools and environment.

**Assessment Pattern**

	Bloom's Category	Test 1	Test 2	Test 3/End-semester examination
1	Remember	30	30	20
2	Understand	30	20	20
3	Apply	30	30	20
4	Analyze	10	20	40
5	Evaluate	0	0	0
6	Create	0	0	0

**Remember**

1. What is database management system?
2. What is a schema?
3. Explain the structure of a DBMS.
4. Mention the types of constraint with an example for each type.
5. What is the use of having clause?
6. Mention the use of Commit and Rollback commands.
7. Define strong entity set with an example.
8. Define the term ACID properties.
9. How the database system is advantageous than file system?
10. Write a note on join dependency.
11. Outline the desirable properties of decomposition.
12. Explain the addition and deletion operations by making use of B+ tree.

**Understand**

1. Differentiate between Union and Intersect operation.
2. Compare the Unique and Primary keys.
3. Distinguish Classification from Prediction.
4. How will you check whether the given relation can undergo 5NF?
5. Describe the join dependency with an example
6. In what way can you implement atomicity in transactions?
7. Outline the desirable properties of decomposition.
8. Stable storage can't be implemented. Explain why.

9. For the query

```
select T.branch_name from branch T, branch S where T.assests >
S.assests and S.branch_city='madurai'
```

write an efficient relational\_algebra expression for this query.

### Apply

1. For the following employee database

```
employee(employee-name, street, city)
works(employee-name, company-name, salary)
company(company-name, city)
manages(employee-name, manager-name)
```

Construct the appropriate tables along with the required constraints.

2. If you want to remove the primary constraints that you have created for the employee table, how will you do that?
3. If you want to change the city name of the company "TCS", what will you do?
4. Find those companies whose employees earn a higher salary, on average than the average salary at TCS.
5. Delete all the employees in TCS who earn less than Rs.10,000 .
6. If you want to get back the employees in TCS who earn less than Rs.10,000, what will you do?
7. You allow the user "A" to access the information regarding the employee's address along with the company in which they are working.
8. Create a procedure to display the employee's company details along with their manager information.
9. Restrict the number of employees under each manager to three. How will do this?
10. Write a Java program to list the name of the employees whose living city is same as that of their company's city.

11. Consider the following transactions

T1: read(A); read(B); if A=0 then B:=B+1; write(B)	T2: read(B); read(A); if B=0 then A:=A+1; write(A)
---	---

Add lock and unlock instructions to the above transactions and show that they observe two-phase locking protocol.



12. Compute the closure of the following set F of functional dependencies for relation schema  $R=(A,B,C,D,E)$ .

$A \rightarrow BC$  ,  $CD \rightarrow E$ ,  $B \rightarrow D$ ,  $E \rightarrow A$

List the candidate keys for R.

13. Using the functional dependencies given  $A \rightarrow BC$  ,  $CD \rightarrow E$ ,  $B \rightarrow D$ ,  $E \rightarrow A$  Compute  $B^+$ .

14. Let relations  $r1(A,B,C)$  and  $r2(C,D,E)$  have the following properties:  $r1$  has 20,000 tuples,  $r2$  has 45,000 tuples, 25 tuples of  $r1$  fit on one block, and 30 tuples of  $r2$  fit on one block. Estimate the number of block transfers and seeks required using Hash join strategy for  $r1$  natural joined with  $r2$ .

15. List out all the functional dependencies satisfied by the relation. Explain how they are satisfied.

A	B	C
a1	b1	c2
a1	b1	c2
a2	b4	c1
a3	b2	c3

16. Consider the following two transactios:

T1: read(A); read(B); if A=0 then B:=B+1; write(B)	T2: read(B); read(A); if B=0 then A:=A+1; write(A)
---	---

Let the consistency requirement be  $A=0$  or  $B=0$ , with  $A=B=0$  the initial values.

Show that every serial execution involving these two transactions preserve the consistency of the database.

### Analyze

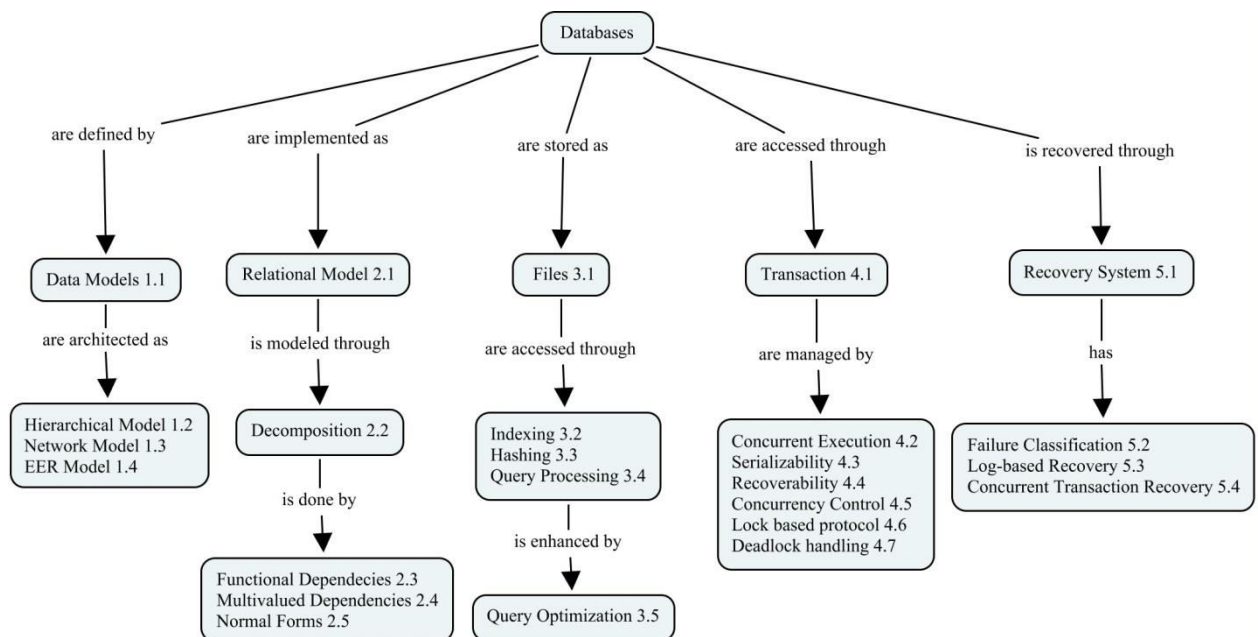
1. Design a database for the Banking environment by following the various design phases including normalization.
2. Construct a B+ tree for the following set of key values { 2,3,5,7,11,17,19,23,29,31 }
3. Consider a relational database with two relations  
 Course(course\_name,room,instructor)  
 Entrollment(course\_name, student\_name, grade)

Create the instances of these relations for three courses, each of which enrolls five students.

4. Consider the following account relation and construct a bitmap index on the attributes branch\_name and balance, dividing balance values into 4 ranges – < 250, 250 ..<500, 500..<750 and >750.

Account_No	Branch_Name	Balance
A-217	Madurai	200
A-219	Chennai	600
A-117	Coimbatore	350
A-207	Madurai	800
A-317	Chennai	700

### Concept Map



**Course content and Lecture Schedule**

No.	Topic	No. of Lectures
<b>1</b>	<b>Introduction</b>	
1.1	Concepts	1
1.2	Relationships	1
1.3	System Architecture	1
1.4	Data Models	2
1.5	Relational languages	1
<b>2.</b>	<b>Data Definition Language</b>	
2.1	Tables creation	1
2.2	Constraints	1
2.3	Displaying table information	1
2.4	Altering and Renaming an existing table	1
2.5	Truncating and dropping the table	1
<b>3.</b>	<b>Data management and Retrieval</b>	
3.1	DML operations – Insert , Delete & Update	1
3.2	Basic queries – select	1
3.2.1	Arithmetic operations , where clause , Sorting	1
3.2.2	CASE structure , DEFINE command	1
3.3	Complex queries – Functions and Grouping	1
3.3.1	Multiple tables : JOINS and SET operators	1
3.3.2	Sub queries : Nested queries	1
<b>4.</b>	<b>Database Design</b>	
4.1	Relational model	1

No.	Topic	No. of Lectures
4.2	Decomposition	1
4.3	Functional dependencies	2
4.4	Multi valued dependencies	2
4.5	Normal Forms	2
<b>5.</b>	<b>Data Storage and Querying</b>	
5.1	File Structure	2
5.2	Query Processing – Measures of query cost	2
5.3	Evaluation of Expressions	2
5.4	Query Optimization – Estimation statistics of Expression Results	2
5.5	Evaluation Plans	2
<b>6</b>	<b>Transaction and Concurrency control</b>	
6.1	Transactions - concepts	1
6.2	Concurrent Execution	1
6.3	Serializability	2
6.4	Recoverability	2
6.5	Concurrency Control	2
6.6	Lock based protocol	1
6.7	Deadlock handling	1
	Total	45

## Syllabus

**Introduction** - Concepts, Relationships, System Architecture, Data Models, Relational languages **Data Definition Language:** Tables creation, Constraints, Displaying table information, Altering and Renaming an existing table, Truncating and dropping the table. **Data management and Retrieval** - DML operations –

Insert, Delete & Update, Basic queries – select, Arithmetic operations, where clause, Sorting, CASE structure, DEFINE command, Complex queries – Functions and Grouping. **Database Design** – Relational Model , Decomposition, Functional Dependencies, Multivalued Dependencies, Normal forms, **Storage Structure** - File Structure, Query Processing – Measures of query cost, Evaluation of Expressions, Query Optimization – Estimation statistics of Expression Results, Evaluation Plans, **Transaction and Concurrency control** - Transaction concepts, Concurrent Execution, Serializability, Recoverability, Concurrency Control, Lock based protocol, Deadlock handling.

### Reference Books:

1. Henry F. Korth, Abraham Silberchatz, S.Sudarshan , Database System Concepts, McGraw-Hill – 2007
2. Ramez Elmasri, Shamkant B. Navathe - Fundamentals of Database Systems – Fifth Edition - Addison Wesley Higher Education – 2007
3. Raghu Ramakrishnan, Johannes Gehrke - Database Management Systems - Third Edition - McGraw-Hill - 2006
4. C.J.Date, Longman, Dr.S.Swamynathan, Introduction to Database Systems, Pearson Education - 2007
5. Hoffer, Prescott & McFadden - Modern Database Management – Eighth Edition - Prentice Hall – 2007
6. Kifer, Bernstein & Lewis - Database Systems: An Application Oriented Approach, Complete Version – Second Edition - Addison Wesley Higher Education - 2006

### Course Designer:

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Sub Code	Lectures	Tutorial	Practical	Credit
Y16	--	--	6	2

## **Y16 Data Structures using C Programming Laboratory      0:2**

**Preamble:** This course enables the students to use programming concepts to solve problem.

### **List of Experiments:**

1. Base Conversion
2. String Manipulation using pointers
3. Sorting using array and pointers
4. Reverse a file
5. Read the lines from the keyboard and write it into a specified file
6. Illustrate stack and queue using pointer
7. Linked list with all the operations.
8. Binary Search Tree with all the operations.
9. Elementary Graph Operations
- 10 Finding Memory size,
- 11 Deleting a file & creating Directories.
- 12 Reading Disk sector
13. Mouse Programming
- 14. Mini Project**

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Sub Code	Lectures	Tutorial	Practical	Credit
Y17	--	--	6	2

**Y17 RDBMS Laboratory****0:2****Preamble:**

This Lab aims at giving adequate exposure to the SQL and programming language extension to SQL within the RDBMS environment with usage of Oracle 10G and DB2.

**List of Experiments:**

1. Simple SQL Queries in Oracle
2. Simple SQL Queries in DB2
3. Exercises using PL/SQL
4. Cursor management
5. Procedures, functions and packages
6. Creation of triggers
7. Declaration of PL/SQL tables
8. Nested Tables
9. Declaration of v-arrays
10. Database application using ODBC.
11. DB2 API
12. DB2 Triggers
13. UDF's and Stored Procedure
14. Table Space Back up & Recovery
15. Mini Project

**Course Designer**

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Sub Code	Lectures	Tutorial	Practical	Credit
Y21	3	1	--	4

## Y21 OPERATIONS RESEARCH

**3:1**

### Preamble

The course aims at exploring the various problems like linear programming, Integer programming, Transportation, assignment problem and the project network analysis. It covers the various inventory and queuing models.

### Competencies

At the end of the course the student should be able to:

1. Apply linear programming techniques to optimization problems arising in all Computer fields.
2. Understand the Transportation and Assignment problems and to optimize in engineering fields.
3. Apply Integer linear programming techniques to optimization problems arising in all Engineering fields.
4. Understand the concept of Bellman's principle of optimality and apply them in engineering problems.
5. Evaluate the inventory and queuing models

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	End-Semester Examination
I	Recall	20	20	10
II	Understand	20	20	20
III	Application	20	20	20
IV	Analysis	20	20	30
V	Evaluation	10	10	10
VI	Creation	10	10	10



**REMEMBER:**

1. What is Operation Research and Application of OR?
2. List the advantage of linear programming problem?
3. What is mean by "Degeneracy"?
4. Define non existing feasible solution?
5. State all the constraints in a transportation problem and how they are different from linear programming problem?
6. What are assignment problems?
7. What are state, stage, state variable and decision variable in dynamic programming?
8. What is queueing theory?

**UNDERSTAND**

1. Describe the method of solving a transportation problem.
2. Describe the method of solving unbalanced transportation problem.
3. How the problem of degeneracy arises in a transportation problem. Explain how this helps us to identify whether the current solution is optimal or not.
4. Write down the dual of a transportation problem. Explain how this helps us identifying whether the current solution is optimal or not.
5. Distinguish transportation model and assignment model.
6. Describe the queueing models M/M/1 and M/M.1/1c.
7. Discuss the application of queueing theory in industrial management.

**APPLY**

1. Solve by simplex method  
Max  $Z = X_1 + 2X_2 + 3X_3 - X_4$   
Subject to,  
 $X_1 + 2X_2 + 3X_3 = 15$   
 $2X_1 + X_2 + 5X_3 = 20$   
 $X_1 + 2X_2 + X_3 + X_4 = 10$  and  
 $X_1, X_2, X_3, X_4 \geq 0$
2. Solve the LPP.  
Min  $Z = X_1 + X_2 + X_3$   
Subject to,

$$X_1 - 3X_2 + 4X_3 = 5$$

$$X_1 - 2X_2 \leq 3$$

$$2X_2 - X_3 \geq 4$$

$X_1, X_2 \geq 0$  and  $X_3$  is unrestricted.

3. At the end of a cycle of schedules, a transport company has a surplus of one truck in each of the cities 1,2,3,4,5 and a deficit of one truck in each of the cities A,B,C,D,E and F. the distance between the cities with a surplus and cities with a deficit are given below.

		To city					
		A	B	C	D	E	F
From city	1	80	140	80	100	56	98
	2	48	64	94	126	170	100
	3	56	80	120	100	70	64
	4	99	100	100	104	80	90
	5	64	80	90	60	60	70

how should the truck be dispatched so as to minimize the total distance traveled ?  
which city will not receive a truck?

4. Calculate the total float, free float and independent float for the project whose activities are given below.

Activity	1-2	1-3	1-5	2-3	2-4	3-4	3-5	3-6	4-6	5-6
Duration	8	7	12	4	10	3	5	10	7	4

5. A branch of a National bank has only one typist. Since the typing work varies in length. The typing rate is randomly distributed. Approximating Poisson distribution with mean rate of 8 letters per hour, the letters arrive at the rate of 5 per hour. During the entire 8 hour work day if the PC is valued at Rs. 15.0/- per hour.

Determine

- Equipment utilization.
- The percent time an arriving letters has to wait.
- Average system time.
- Average idle time cost of the type writer per day.

6. Solve by Big-M method.

$$\text{Max } Z = 6X_1 + 4X_2$$

Subject to,

$$2X_1 + 3X_2 \leq 30$$

$$3X_1 + 2X_2 \leq 24$$

$$X_1 + X_2 \geq 3 \text{ and}$$

$$X_1, X_2 \geq 0$$

7. Solve the assignment problem for maximization given the profit matrix,

		P	Q	R	S
A		51	53	54	50
B	47	50	48	50	
C	49	50	60	61	
D	63	64	60	60	

8. Solve the following mixed integer problem.

$$\text{Max } Z = -3X_1 + X_2 + 3X_3$$

Subject to,

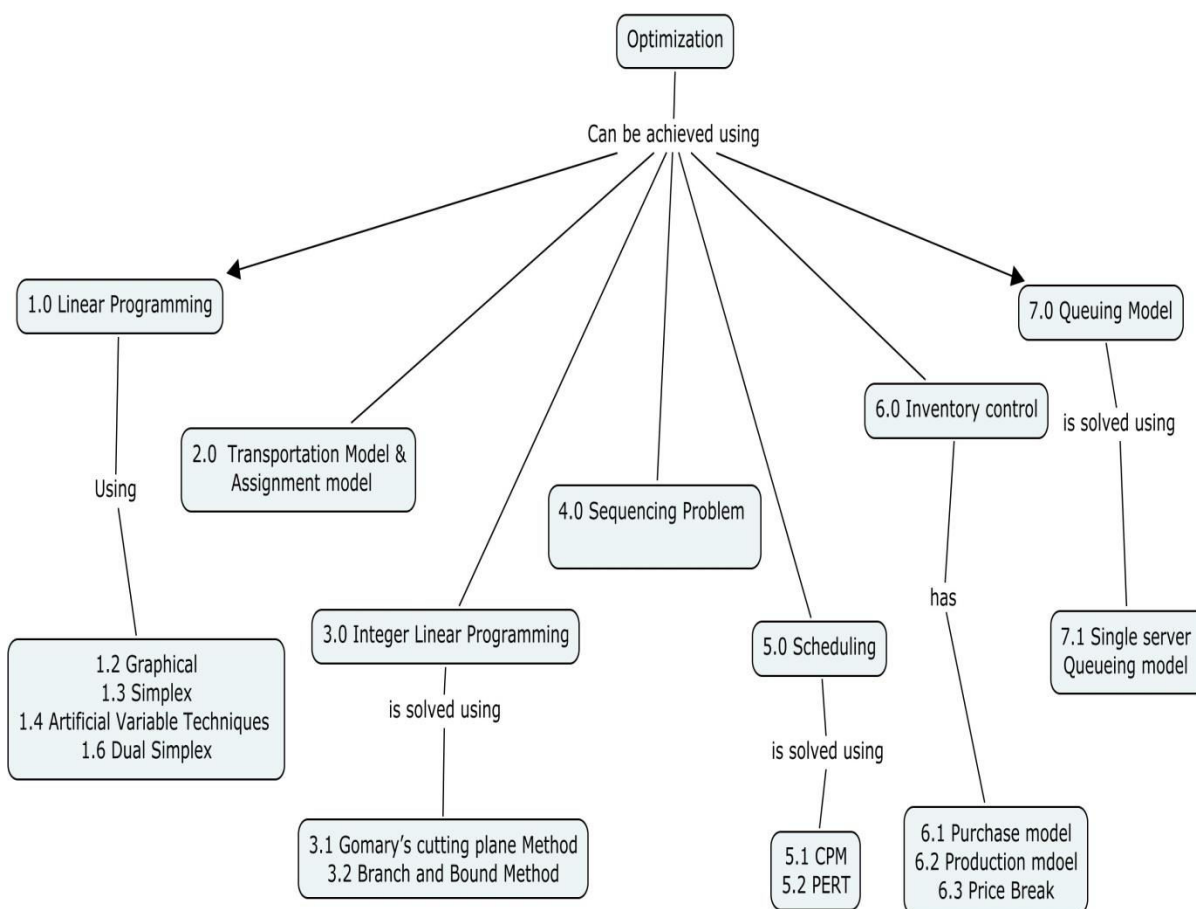
$$-X_1 + 2X_2 + X_3 \leq 4$$

$$2X_2 - \frac{3}{2}X_3 \leq 1$$

$$-X_1 - 3X_2 + 2X_3 \leq 3$$

$X_1, X_2 \geq 0$  and  $X_3$  is non negative integer.

## Concept Map



## Course Contents and Lectures schedule

Sl.No	Lecture Topics	No. of Periods
1.0	<b>Linear Programming</b>	
1.1	Formulation	1
1.2	Graphical Solution	1
1.3	The Simplex algorithm	2
1.4	Artificial Variable Techniques	2
1.5	Variants of the simplex methods	1
1.6	Duality-Dual Simplex	2
2.0	<b>Transportation Model</b>	
2.1	Initial Basic Feasible Solution methods	2

2.2	Test for optimality-Variants of the Transportation problem	2
	<b>Assignment Model</b>	
2.3	Hungarian Algorithm	1
2.4	Variants of the Assignment Problem	2
2.5	Travelling Salesman problem	1
3.0	<b>Integer Linear Programming</b>	
3.1	Gomary's cutting plane method	3
3.2	Branch and Bound method	2
4.0	<b>Sequencing Problem</b>	
4.1	N jobs through 2 machines, N Jobs through 3 machines, N jobs through m machines	2
4.2	Processing Two jobs through m machines	2
5.0	<b>Scheduling</b>	
5.1	Critical path Method	2
5.2	Project Evaluation and Review Techniques	2
6.0	<b>Inventory control</b>	
6.1	Purchase model with and without shortage	1
6.2	Production model with and without shortage	1
6.3	Price Break	1
7.0	<b>Queuing Model</b>	
7.1	Single server Queueing model	2
	TOTAL	35

**Syllabus:**

**Linear Programming**-Graphical Solution- The Simplex algorithm, Artificial Variable Technique -Duality-Dual Simplex - Variants of the Simplex Method **Transportation Model**- Initial Basic Feasible Solution methods Test for optimality-Variants of the Transportation problem **Assignment Model**- Hungarian algorithm Variants of the Assignment problem, Travelling Salesman Problem **Integer Linear Programming**- Gomary's cutting plane method Branch and Bound method **Sequencing Problem** - N jobs through 2 machines, N Jobs through 3 machines, N jobs through m machines **Scheduling** - Critical path Method, Project Evaluation and Review Techniques

**Inventory control** - Purchase and production model with and without shortage , price break **Queuing Model**- single channel model

**References:**

1. Sharma J.K.: "Operations Research Theory and applications", Macmillan India Ltd., 2003.
2. Hamdy A. Taha: Operations Research – An Introduction", Prentice Hall of India Pvt Ltd., 2002.
3. Don T. Phillips, Ravindran A. and James Solberg, "Operation Research: Principles and Practice", John Willey and sons, 1986.
4. Chandrasekara Rao, K. Shanti Lata Misra "Operation Research", Alpha science international Ltd-2005.

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Sub.Code	Lectures	Tutorial	Practical	Credit
Y22	3	1	-	4

## Y22 OBJECT ORIENTED PROGRAMMING USING C++ 3:1

**Preamble:** To provide sound knowledge on basic and advanced concepts of Object Oriented programming and apply them in developing industrial strength software applications.

### Competencies

1. Ability to identify and implement appropriate programming paradigm for a given application
2. Identify all the trade-offs involved in choosing structured or procedural paradigm and Object Oriented Programming Paradigm
3. In the context of programming, identify the trade-offs involved in selecting the most efficient programming mechanism.
4. In the context of error handling, identify the trade-offs involved in selecting: (a) Exception Handling (b) Run Time Type Identification (RTTI).

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	End-semester examination
1	Remember	20	20	10
2	Understand	20	20	20
3	Apply	40	40	40
4	Analyze	20	20	30
5	Evaluate	0	0	0
6	Create	0	0	0

## **Course Level Learning Objectives:**

### **Remember**

1. Define: Class and Object.
2. What is a constructor? What are its types?
3. Write the purpose of a destructor?
4. Differentiate between procedural paradigm and OO paradigm.
5. What is an unnamed namespace?
6. What is a helper function?
7. Which operators in C++ cannot be overloaded?
8. List the various access controls in C++.
9. Write the purpose of Friends in C++.
10. What is an exception?

### **Understand**

1. What is the need for an explicit constructor in C++?
2. How namespaces reduces complexity? Explain.
3. How member and nonmember operators can be overloaded?
4. How C++ resolves the same method with different implementations in inheritance hierarchy?
5. Show how an abstract class is different from an interface?
6. Differentiate static and dynamic binding?
7. Differentiate Error and an exception?

### **Apply**

1. Apply namespaces to achieve modularization in developing a complex application.
2. Develop a program in C++ for calculating areas of different shapes by applying method overriding.
3. Apply method overloading to calculate incentives for different types of employees in an organization.
4. Suppose we have similar structured classes but with varying data types, how will you apply class templates to achieve the same.
5. Apply inheritance to calculate the discount amount after a purchase using different types of items and quantity of purchase.
6. Consider a Client-Server application development – Banking Transaction System. Apply multiple inheritance to achieve the transaction and update the file for the same.

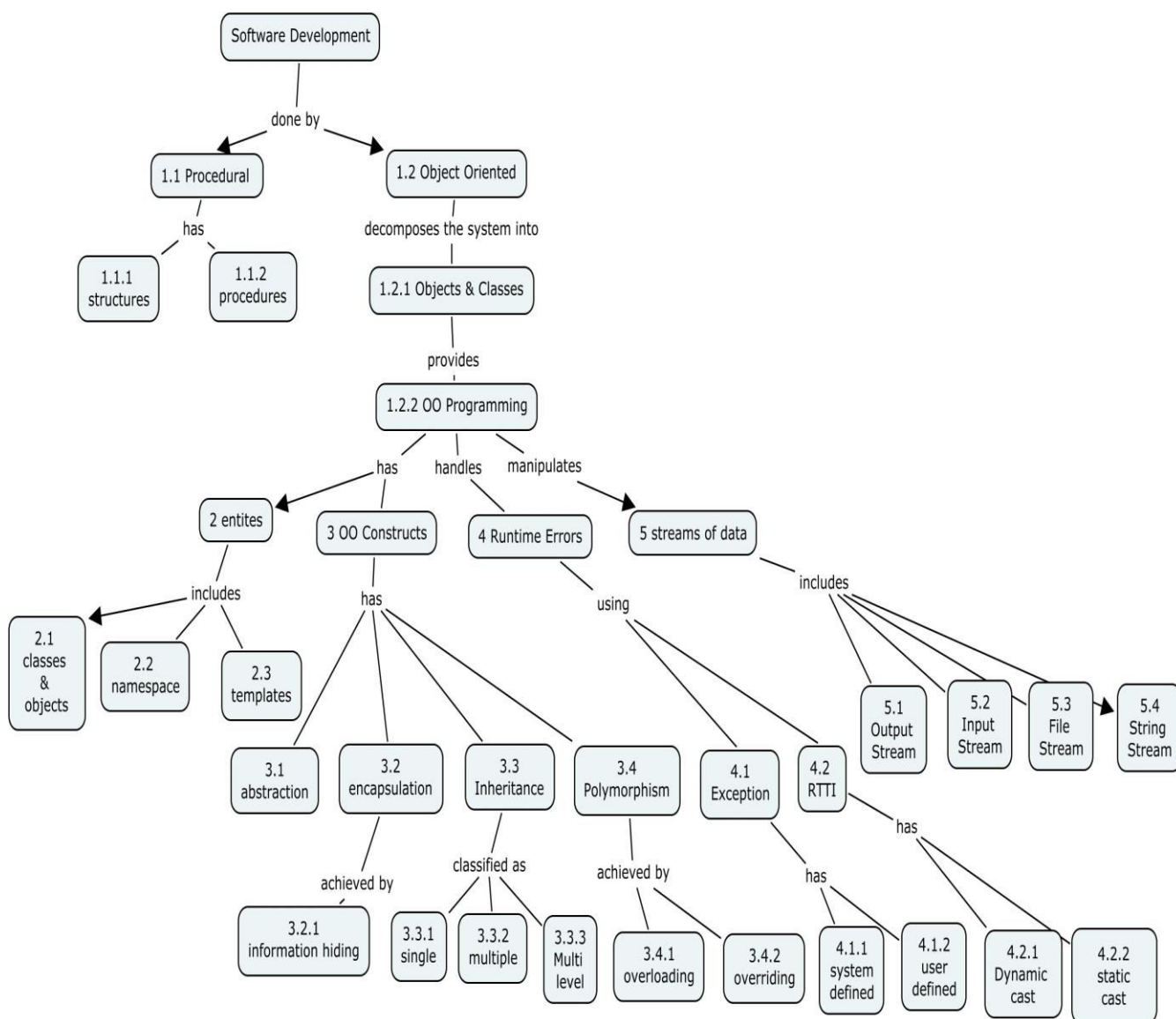


7. Consider a Stock Maintenance System. Do coding for Purchase and Sales and stock updating by applying virtual.
8. Apply file stream classes to manage an Address Book.
9. Consider a Blood Bank Management System. Apply exception handling to raise up an exception before storing the person's details if he/she donates blood for more than five times in the same month.
10. Consider an Employee payroll system. Apply multiple inheritance to calculate the payroll and also apply RTTI to find out the current active object in the calculation.

**Analyze**

1. Suppose that you have applied OO principle for your application. Analyze the drawbacks when compared to structured approach.
2. Analyze the impact of using template methods instead of normal methods using a suitable example.
3. How exception handling avoids runtime errors in program execution? Explain it with an example.
4. Suppose that, a method doesn't have the ability to handle an exception, which may be the suitable way of handling it? Give an example.
5. Distinguish between static and dynamic casts and analyze the advantage of having dynamic cast over static cast.
6. Analyze the usage of RTTI?

## Concept Map



## Lecture Schedule

No.	Topic	No. of Lectures
1	<b>Software Development</b>	
1.1	Introduction to Programming Paradigms – Procedural Vs. Object Orientation	1
1.1.1	Structures	1
1.1.2	Procedures	1
1.2	Introduction to OO	1
1.2.1	Objects and Classes	1

No.	Topic	No. of Lectures
1.2.2	OO Programming	1
2	<b>Entities</b>	
2.1	Classes, objects, templates	2
2.2	Modularization and Interfaces	2
2.3	Namespaces	2
3	<b>OO Constructs</b>	
3.1	Abstraction and Encapsulation	3
3.1.1	Information hiding	1
3.2	Inheritance	2
3.2.1	Single level inheritance	1
3.2.2	Multi level inheritance	1
3.2.3	Multiple inheritance	2
3.3	Polymorphism	2
3.3.1	Overloading	2
3.3.2	Overriding	2
4	<b>Runtime Error Handling</b>	
4.1	Exception handling	3
4.1.1	System Defined Exception	1
4.1.2	User Defined Exception	1
4.2	Runtime Type Identification (RTTI)	3
4.2.1	Dynamic Cast	1
4.2.2	Static Cast	1
5	<b>Handling Streams of Data</b>	
5.1	Input Streams	2
5.2	Output Streams	2
5.3	File Streams	2
5.4	String Streams	2
	Total	42

## Syllabus

**Introduction to Programming Paradigms** - Procedural Programming Vs. Object-Oriented Programming - Introduction to OO - **Classes and Objects** - Construction and Destruction - Default Constructors - Explicit Constructors - Destructors - Class Objects as Members - **Namespaces** - Modularization and Interfaces - Namespaces - Unnamed Namespaces - **Overloading** : Operator Overloading : Introduction - Binary and Unary Operators - Predefined and User-Defined operator Types - Member and Nonmember Operators - Mixed-Mode Arithmetic - **Method Overloading** : Introduction - Constructors overloading and Method overloading - Conversions - Additional Member Functions - Helper Functions - Conversion Operators- **Templates** **Overloading**: Function Templates - Function Template Overloading - Class Templates - **Inheritance and Polymorphism** : Introduction and Overview - Multiple Inheritance - **Method Overriding** - Virtual Base Classes - Derived Classes - Virtual Functions - Overriding Virtual Base Functions - Pointers to Members - Base and Derived Classes - Virtual Constructors- Access Control - Friends - Abstract Classes - **Streams**: Introduction - Output - Output Streams - Input - Input Streams-Input of Built-In Types - Standard I/O Manipulators -User-Defined Manipulators - File Streams and String Streams -File Streams - Closing of Streams - String Streams - **Exception Handling**: Introduction - Derived Exceptions - Catching Exceptions - Re-Throw - Exceptions in Constructors and in Destructors - Exception Specifications - Unexpected Exceptions - Mapping Exceptions - User Mapping of Exceptions - Uncaught Exceptions - **Run-Time Type Information (RTTI)** : Introduction to RTTI - Dynamic Cast - Dynamic Cast of References - Static and Dynamic Casts - Class Object Construction and Destruction - typeid and Extended Type Information - Uses and Misuses of RTTI .

## References:

1. Bjarne Stroustrup, "The C++ Programming Language", 3<sup>rd</sup> Edition and Special Edition, Addison Wesley, 2000 .
2. Robert Laffore, "Object Oriented Programming using C++", 4<sup>th</sup> Edition, Sams Publishing, 2002.
3. Stanley Lippman, "C++ Primer", 4th Edition, Pearson Education, 2007.
4. Yashavant P. Kanetkar, "Let Us C++", BPB Publications, 2007.

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Sub Code	Lectures	Tutorial	Practical	Credit
Y23	3	1	-	4

## Y23 Design and Analysis of Algorithms

**3:1**

**Preamble:** This subject will enable students to identify, formulate and solve real world engineering problems that require usage of algorithms.

### Competencies

1. Determine the time and space complexity of algorithms for sorting (insertion, selection, merge, quick sort and heap sort), dynamic programming, searching (binary search tree and red black tree) and graphs (directed and undirected) applied to average, worst and best cases.
2. Apply algorithms for shortest path, knapsack, divide and conquer, minimum spanning tree, and traveling salesman problems
3. Apply algorithms for NP hard and NP complete graph coloring problem.
4. Evaluate the appropriateness of algorithms for given problems.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	End-semester examination
I	Remember	20	10	10
II	Understand	30	20	20
III	Apply	40	40	40
IV	Analyze	10	10	10
V	Evaluate	0	20	20
VI	Create	0	0	0

**Course Level Learning Objectives****Remember**

1. Prove  $T(m) = 27 \left( \left\lfloor \frac{n}{2} \right\rfloor + \left\lceil \frac{n}{7} \right\rceil \right) + n$  is  $O(n \log n)$
2. Prove the recurrence relationship  $T(n) = 2T(\sqrt{n}) + 1$  by making a change of variables. Your solution should be asymptotically tight. Do not worry about whether values are integral.
3. What are the fundamental steps involved in algorithmic problem solving?
4. Mention the two summation formulas?
5. What is the recurrence relation to find out the number of multiplications and the initial condition for finding the n-th factorial number?

**Understand**

1. Describe the potential advantage of Notation  $\Omega$ ,  $\theta$ ,  $O$
2. Establish the worst-case running time of heap sort is  $\Omega(n \log n)$ ?
3. Verify the truth of the following statements
  - a)  $n^2 \in O(n^3)$
  - b)  $n^3 \in O(n^2)$
  - c)  $2^{n+1} \in O(2^n)$
4. Verify  $t_n = \sum t_{n-1} + n + 2^n$   $n \geq 1$ ;  $t_0 = 0$
5. Prove the Following
  - i)  $n^2 \in O(n^3)$
  - ii)  $n^3 \in O(n^2)$
  - iii)  $2^{n+1} \in O(2^n)$
6. Determine the optimal parenthesization of a matrix-chain produce whose sequence of dimension is  $\{5, 10, 3, 12, 5, 50, 6\}$

**Apply**

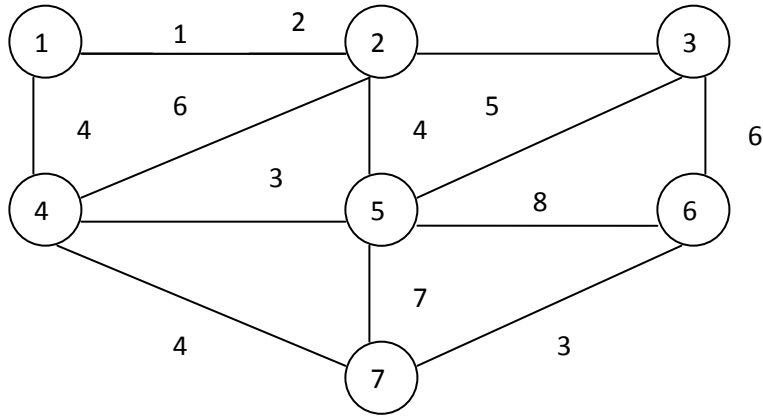
1. Determine the tight Asymptotic bounds for the following recurrence
  - i.  $T(n) = 4T(n/2) + n$
  - ii.  $T(n) = 4T(n/2) + n^2$
  - iii.  $T(n) = 4T(n/2) + n^3$
2. Apply Heap sort on the array  $A = \{5, 13, 2, 23, 7, 17, 20, 8, 11\}$ ?
3. Apply a recursive algorithm for solving Tower of Hanoi problem.
4. Determine the optimal parenthesization of a matrix-chain produce whose sequence of dimensions is  $\{5, 10, 3, 12, 5, 50, 6\}$

5. Apply the rules of recurrence to the following function

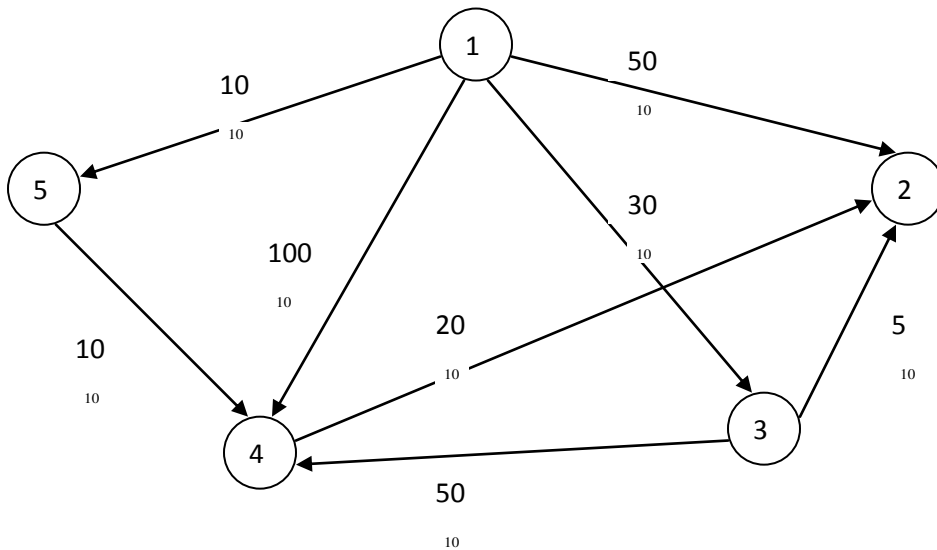
$t: \mathbb{N}^+ \rightarrow \mathbb{R}^+$

$$t(n) = \begin{cases} a & \text{if } n = 1 \\ bn^2 + nt(n-1) & \text{otherwise} \end{cases} \quad \text{when } a, b \text{ are arbitrary +ve constant}$$

6. Apply the Kruskal's algorithm for following minimum spanning tree.



7. Apply the dijkstra algorithm for the graph



8. Calculate the product ABCD of four matrixes applying chained matrix multiplication

A is  $13 * 5$

C is  $89 * 3$

B is  $5 * 89$

D is  $3 * 34$

9. Find out the tight asymptotic bounds for the following recurrence

i)  $T(n) = 4T(n/2) + n$

ii)  $T(n) = 4T(n/2) + n^2$

iii)  $T(n) = 4T(n/2) + n^3$

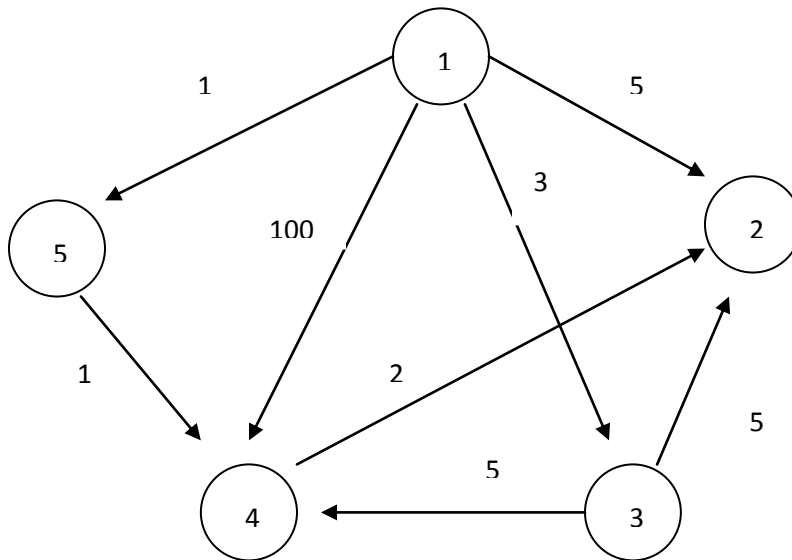
10. Apply the rules of recurrence to the following function

$t: N \rightarrow R^+$

$$t(n) = \begin{cases} a & \text{if } n=1 \\ b n^2 + n t(n-1) & \text{otherwise} \end{cases}$$

### Analyze

1. Analyze the dijkstra algorithm for the graph



2. Calculate the product MNOP of four matrixes applying chained matrix multiplication

M is  $13 * 5$

N is  $89 * 3$

O is  $5 * 89$

P is  $3 * 34$

3. Analyze the greedy strategy to the traveling salesman problem yields the following



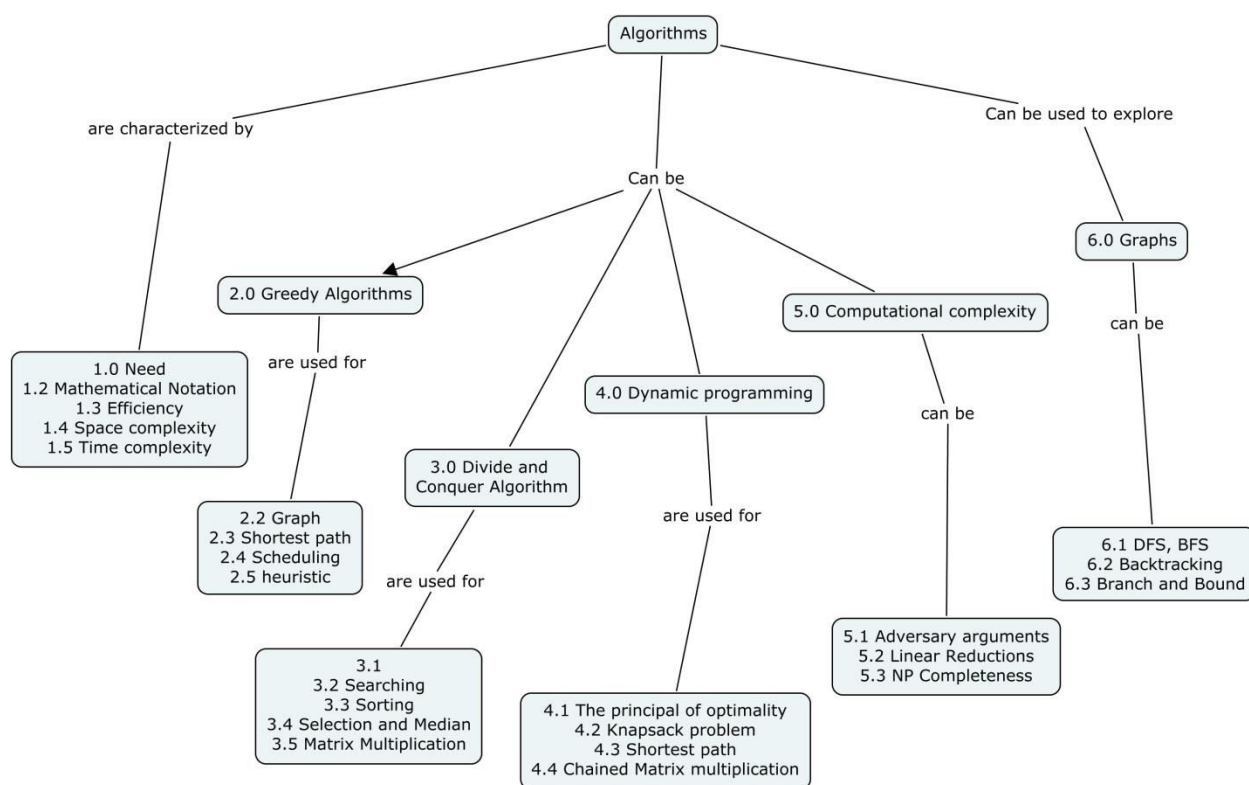
algorithm: "At each stage visit the unvisited city nearest to the current city".

4. Give the formula used to find the upper bound for knapsack problem.
5. What is the method used to find the solution in n-queen problem by symmetry?

### Evaluate

1. Evaluate the Reduction theorem  $MT \leq MQ$
2. Evaluate NP-complete problems, indicating the reductions typically used to prove their NP-completeness.
3. Give a template for a generic backtracking algorithm.
4. Evaluate the solution for the 4-queen problem.
5. Give the Kruskal's algorithm.

### Concept Map



### Course Contents and Lecture Schedule

S.No	Topics	Periods
1.	Algorithms	
1.1	Need for an Algorithm	1
1.2	Mathematical Notation	1
1.2	Efficiency of Algorithm	1
1.3	Space Complexity	1
1.4	Time complexity (asymptotic notations)	2
1.5	Data structures: solving Recurrences	1
2.	Greedy Algorithms	
2.1	General Characteristics of Greedy Algorithms	1
2.2	Graphs :Minimum spanning trees Kruskal's algorithm, prims's algorithm	2
2.3	Shortest path	1
2.4	Scheduling – Scheduling with deadlines	1
2.5	Heuristics- Coloring a Graph – TSP	2
3.	Divide and Conquer Approach	
3.1	Introduction to divide and conquer approach	1
3.2	Binary searching Sorting by Merging	1
3.3	Quick sort	1
3.3.1	Heap sort	1
3.3.2	Merge sort	1
3.3.3	Selection sort	1
3.4	Selection and the median	1
3.5	Arithmetic with large integers -Matrix Multiplication	1
4.	Dynamic programming	

4.1	The principal of optimality	1
4.2	Knapsack problem	1
4.3	Shortest Paths(optimal search path)	1
4.4	Chained Matrix Multiplication	1
5.	Computational complexity	
5.1	Adversary arguments	1
5.2	Linear Reductions	1
5.3	Introduction to NP – Completeness	1
6.	Exploring Graphs	
6.1	Graphs: Traversing Trees, Depth-First Search:, Breadth-First Search (Undirected and Directed)	2
6.2	Backtracking : knapsack problem, eight queens problem	2
6.3	Branch and Bound : Assignment problem, Knapsack problem	2
	Total	35

### Syllabus

**Algorithms:** Need for an Algorithm, efficiency of algorithms, space complexity, time complexity, data structures: solving recurrences. **Greedy Algorithms:** General Characteristics, Graphs, Shortest path, scheduling, greedy heuristics **Divide and Conquer:** binary searching, sorting by merging, quick sort, selection and the median, arithmetic with large integers, matrix multiplication **Dynamic Programming:** The principal of optimality , knapsack problem, shortest paths, chained matrix multiplication. **Computational complexity:** Adversary arguments, Linear reduction, class P and NP, NP complete problems. Graphs: Traversing trees, depth-first search graphs, Breadth-First Search, Backtracking , Branch and Bound.

### References:

1. Fundamentals of Algorithmics, Gilles Brassard and Paul Bratley, Printice hall International, 2002.
2. Introduction to Algorithms, T.H.Cormen , C.E.Leiseerson, R.L.Rivest, C. Stein, Prentice hall of India, second Edition, 2002.
3. Computer algorithms :Introduction to Design and Analysis –Sara Baase Addison wesley publication. 1998.

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Sub Code	Lectures	Tutorial	Practical	Credit
Y24	4	-	-	4

## Y24 Operating Systems

**4:0**

**Preamble:** This course is offered in the second semester for the students of Master of Computer Applications. As prerequisites, the courses such as Y13: Computer Organization and Architecture, Y14: Data Structures has been offered in the previous semester. A course on operating systems is an essential part of any computer-science education. Although this field is undergoing rapid change, as computers are now prevalent in virtually every application, the fundamental concepts remain fairly clear. Based on this, the 'Operating Systems' course is offered. It provides a clear description of the *concepts* that underlie operating systems. The fundamental concepts and algorithms are based on those used in existing commercial operating systems.

### Competencies

1. Explain what operating systems are, what they do and how they are designed and constructed.
2. Describe the process concept, process scheduling, interprocess communication, process synchronization, threads and deadlock handling.
3. Describe the various approaches to memory management while several processes coexist in memory.
4. Explain how the file system, mass storage and I/O are handled in a modern computer system.
5. Discuss the design issues of 2 modern, most popular, drastically different operating systems, GNU/Linux and Windows.

**Assessment Pattern**

	Bloom's Category	Test 1	Test 2	End-semester examination
1	Remember	30	20	20
2	Understand	30	30	20
3	Apply	40	50	60
4	Analyze	0	0	0
5	Evaluate	0	0	0
6	Create	0	0	0

**Course Level Learning Objectives:****Remember**

1. What is an operating system?
2. What is a time sharing system?
3. Give several definitions of a process
4. What is critical section?
5. What is storage compaction?
6. What is a) Demand paging b) Pure demand paging?
7. What is rotational latency?
8. List out the file access methods.
9. Explain inode structure in Linux.
10. What are the file access permissions in Linux?

**Understand**

1. What are the three major activities of an operating system in regard to memory management?
2. What is the purpose of system calls?
3. In which of the following operations, the scheduler is not called into play?
  - a. Process requests for I/O.
  - b. Process finishes execution.
  - c. Process finishes its time allotted.
  - d. All of the above through c
  - e. None of the options a through c above.
4. List three examples of deadlock that are not related to a computer system.
5. Why are segmentation and paging sometimes combined into one scheme?

6. Why page sizes are always power of 2?
7. How is the information organized along sectors on a disk?
8. Explain the concept of buffering? How is the double buffering scheme organized?
9. How does Kernel help resolve system calls?
10. The NT VM manager uses a two-stage process to allocate memory. Why is this approach beneficial?

**Apply**

1. Write a program in either C that reads data from one file and copies it to another file.
2. Assume you have the following jobs to execute with one processor, with the jobs arriving in the order listed here:  
i T(pi)  
0 80  
1 20  
2 10  
3 20  
4 50
  - a. Suppose a system uses FCFS scheduling. Create a Gantt chart illustrating the execution of these processes?
  - b. What is the turnaround time for process p3?
  - c. What is the average wait time for the processes?
3. Give a solution to the readers-writers problem after explaining its nature?
4. Consider the following page reference string  
7,0,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,2. How many page faults would occur in the case?
  - a. LRU
  - b. FIFO
  - c. Optimal algorithmsassuming three, five or six frames. Note that initially all frames are empty.
5. Assume that we have a paging system with page table stored in memory
  - a. If a memory reference takes 200 nanoseconds how long does a paged memory reference take?
  - b. If we add associative registers and 75% of all page table references are found

in the associative registers, what is the effective memory reference time? Assume that finding a page table entry in the associative registers takes zero time, if the entry is there.

6. Suppose that a disk drive has 5000 cylinders, numbered from 0 to 4999. the drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the disk scheduling algorithms. a. FCFS b. SSTF c. SCAN d. LOOK e. C-SCAN f. C-LOOK.
7. Put the following disk scheduling policies in the order that will result in minimum amount of head movement. a. FCFS b. Circular scan c. Elevator algorithm
8. Given memory partitions of 100K, 500K, 200K, 300K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212K, 417K, 112K, and 426K (in order)? Which algorithm makes the most efficient use of memory?
9. Suppose the following jobs arrive for processing at the times indicated, each job will run the listed amount of time.

Jobs    Arrival time    Burst time  
(in secs.)

1	0.0	8
2	0.4	4
3	1.0	1

Give Gantt charts illustrating the execution of these jobs using the non preemptive FCFS and SJF scheduling algorithms. Compute the average turn around time and average waiting time of each job for the above algorithms and find the best alternative.

10. Consider a demand-paging system with the following time-measured utilizations

CPU utilization	20%
Paging disk	97.7%
Other I/O devices	5%

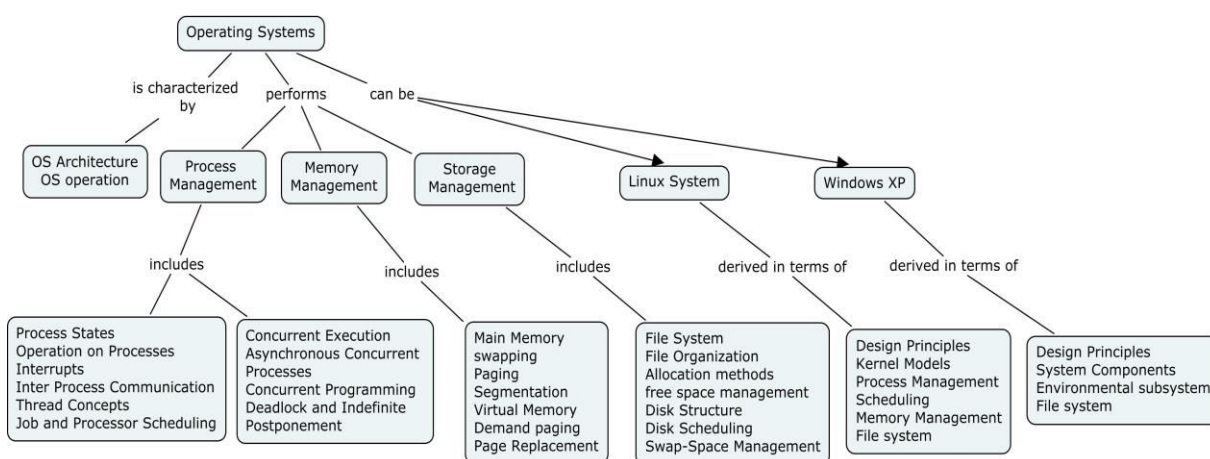
Which (if any) of the following will (probably) improve CPU utilization? Explain your answer.

- a. Install a faster CPU.



- b. Install a bigger paging disk.
- c. Increase the degree of multiprogramming.
- d. Decrease the degree of multiprogramming.
- e. Install more main memory.
- f. Install a faster hard disk or multiple controllers with multiple hard disks.
- g. Add prepaging to the page fetch algorithms.
- h. Increase the page size.

### Concept Map:



### Course contents and Lecture Schedule:

No	Topic	No. of Lectures
1	<b>Operating System Introduction &amp; Structure</b>	
1.1	Basics, OS Architecture	1
1.2	OS Operations	1
2	<b>Process Management</b>	
2.1	Process states	1
2.2	Operations on Process	1

2.3	Interrupts	1
2.4	Inter process Communication	1
2.5	Thread concepts	3
2.6	Job and processor Scheduling	2
3	<b>Concurrent Execution</b>	
3.1	Asynchronous Concurrent Processes	2
3.2	Concurrent Programming	3
3.3	Deadlock and indefinite postponement	3
4	<b>Memory Management</b>	
4.1	Main Memory – swapping	1
4.2	Paging	2
4.3	Segmentation	1
4.4	Virtual Memory – Demand paging	2
4.5	Page Replacement	1
5	<b>Storage Management</b>	
5.1	File System	1
5.2	File Organization	1
5.3	Allocation methods and free space management	1
5.4	Disk Structure	1
5.5	Disk Scheduling	2
5.6	Swap-Space Management	1

	<b>Case Studies</b>	
6	<b>Linux</b>	
6.1	Linux System – Design Principles	1
6.2	Kernel Models	1
6.3	Process Management	1
6.4	Scheduling	1
	Memory Management	1
7	<b>Windows</b>	
7.1	File system	1
7.2	System Components	1
7.3	Environmental Subsystem	1
7.4	File System	1
7.5	Mobile Operating System – Windows Phone	3
	Total No of Hours	45

**Syllabus:**

**Operating System Introduction :** Basics, OS Architecture, OS Operations.

**Process Management:** Process states – Operations on process–Interrupts–Interprocess communication–Thread concepts –Job and processor Scheduling

**Concurrent Execution:** Asynchronous Concurrent Processes– Concurrent Programming–Deadlock and indefinite postponement. **Memory Management:** Main

Memory – swapping, Paging, Segmentation, Virtual Memory – Demand paging, Page

Replacement. **Storage Management:** File System, File Organization, Allocation methods, free space management, Disk Structure, Disk Scheduling, Swap-Space

Management. **Case Studies: Linux System** – Design Principles, Kernel Models, Process Management, Scheduling, Memory Management, File system. **Windows** -

Design Principles, System Components, Environmental subsystem, File system -

**Mobile Operating System** – Windows Phone.

**References:**

1. H.M. Deital, "Operating Systems", Pearson Education, Second Edition, 2003 .
2. Andrew S. Tanenbaum, " Modern Operating System ", Pearson Education, Third Edition, 2008
3. Avi Silberschatz, Peter Baer Galvin and Greg Gagne: Operating System Concepts, Seventh edition, John Wiley and Sons, 2006.
4. Gary Nutt, "Operating Systems", Addison-Wesley, Third edition, 2008

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Sub Code	Lectures	Tutorial	Practical	Credit
Y25	3	1	-	4

**Y25 ACCOUNTING AND FINANCIAL MANAGEMENT****3:1****Preamble:**

Accounting and Financial Management is a discipline that deals with managing the monetary transactions in an organization. The field is related with relying on accounting and enables an engineer in taking useful financial and costing related decisions by providing scientific tools and techniques.

**Competencies:**

At the end of the course the students will

1. Prepare ledgers, Trading account, Profit and Loss account and Balance Sheet
2. Analyze the financial status of an Organization with the help of Final Accounts
3. Develop an understanding about Financial Management and its importance in decision making.
4. Understand the concepts of Financial Statement Analysis.
5. Interpret the Financial Statements of an organization.
6. Understand the concepts of Financial Planning.
7. Carry out various Investment Decision making.
8. Understand the meaning of financing and its functions and objectives.
9. Understand the various sources of finance.
10. Get a brief idea about the various Financial Institutions and their role.

**Assessment Pattern**

	Bloom's Category	Test 1	Test 2	Test 3 / End-semester examination
1	Remember	10	10	10
2	Understand	10	10	10
3	Apply	80	80	80
4	Analyze	0	0	0
5	Evaluation	0	0	0
6	Create	0	0	0

**Course Level Learning Objectives****Remember**

1. What is the purpose of Balance Sheet?
2. What are the various types of Assets?
3. Define Working Capital?
4. What is Cost Volume Profit Analysis?
5. Define Risk.
6. Define capital Budgeting.
7. Define Cost of Capital.
8. Mention some financial institutions.
9. Define Working Capital.
10. Define Dividend.

**Understand**

1. Discuss how balance sheet is helping for corporate decision making.
2. Explain the factors influencing the working capital requirements.
3. What are the objectives of Capital Budgeting? Explain.
4. Discuss the non-traditional methods of investment decision making.
5. Explain the various sources of finance.
6. Discuss the legal and the procedural aspects of dividend policies

**Apply**

1. Journalize the following business transactions :
  - a). Rahul brings in cash Rs.10,000 as the capital and purchases land worth Rs.2000.
  - b). He purchases goods worth Rs.5000.
  - c). He sells goods for Rs.7000
  - d). He incurs travelling expenses for Rs.200
2. Prepare Trading and Profit and Loss Account and Balance Sheet on 31.12.96 from the following trial balance extracted from the books of Mr. Kumar as on 31.12.96

Debit Balances	Rs.	Credit Balances	Rs.
Buildings	30000	Capital	4000
Machinery	31400	Purchase Returns	2000
Furniture	2000	Sales	280000
Motor Car	16000	Sundry creditors	9600
Purchases	188000	Discounts received	1000

Sales return	1000	Provision for bad and doubtful debts	600
Sundry debtors	30000		
General expenses	1600		
Cash at bank	9400		
Rates and taxes	1200		
Bad debts	400		
Insurance premium	800		
Discount allowed	1400		
Opening stock	20000		
Total	333200	Total	333200

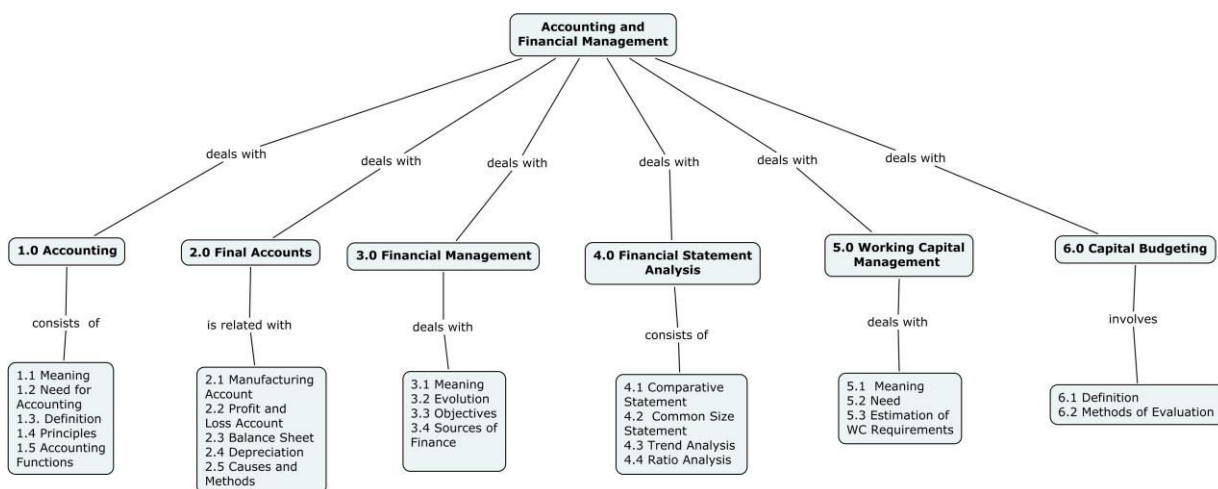
3. A chemical company is considering investing in a project that costs Rs.500000. The estimated salvage values is zero; tax rate is 55%. The company uses straight line depreciation and the proposed project has cash flows before tax (CFBT) as follows.

Year	CFBT (Rs.)
1	100000
2	100000
3	150000
4	150000
5	250000

Find the following

- a) Pay Back Period b) ARR

## Concept Map



## Course Contents and Lecture schedule

S.No	Topics	No. of Lectures
<b>1.0</b>	<b>Accounting</b>	
1.1	Meaning and Scope	2
1.2	Need for Accounting	2
1.3	Definition	1
1.4	Principles	1
1.5	Accounting Functions-Recording, Classifying, Summarizing, Analysis and Interpretations.	2
<b>2.0</b>	<b>Final Accounts</b>	
2.1	Manufacturing Account	1
2.2	Profit and Loss Account	2
2.3	Balance Sheet	2
2.4	Depreciation	1
2.5	Causes and Methods	2
<b>3.0</b>	<b>Financial Management</b>	
3.1	Meaning	1
3.2	Evolution	1
3.3	Objectives	1
3.4	Sources of Finance	2



S.No	Topics	No. of Lectures
<b>4.0</b>	<b>Financial Statement Analysis</b>	
4.1	Comparative Statement	2
4.2	Common Size Statement	2
4.3	Trend Analysis	2
4.4	Ratio Analysis	4
<b>5.0</b>	<b>Working Capital Management (WC)</b>	
5.1	Meaning	1
5.2	Need	1
5.3	Estimation of WC requirements	2
<b>6.0</b>	<b>Capital Budgeting</b>	
6.1	Definition	1
6.2	Methods of Evaluation	4
	<b>Total Hours</b>	<b>40</b>

### Syllabus

**Accounting** –Meaning and Scope, Need for Accounting, Definition, Principles, Accounting Functions-Recording, Classifying, Summarizing, Analysis and Interpretations.

**Final Accounts**- Manufacturing , Profit and Loss Accounts, Balance Sheet, Depreciation-causes and methods.

**Financial Management**-Meaning, Evolution, Objectives and Sources of Finance

**Financial Statement Analysis**- Comparative Statement, Common Size Statement, Trend Analysis, Ratio Analysis.

**Working Capital Management**-Meaning, need and requirements of Working Capital Estimation..

**Capital Budgeting**- Definition, Methods of Evaluation

### References

1. Prasanna Chandra, "**Fundamentals of Financial Management**", Tata McGraw Hill, 2002.
2. KY. Khan and P.K. Jain, "**Financial Management**", Tata McGraw Hill, 2003.
3. Khan and Jain, "**Theory and Problems of Financial Management**", Tata McGraw Hill Publishing Co, 1994

4. Pandey, "**Financial Management**", Vikas Publishing House Pvt. Ltd., 2003.
5. M.C.Sukhla, T.S.Grewal, "**Advanced Accounts Vol I**", S.Chand and Publications, New Delhi, 2006

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Sub Code	Lectures	Tutorial	Practical	Credit
Y26	--	--	3	1

**Y26 C++ Programming Laboratory****0:1**

**Preamble:** This course enables the students to use object oriented techniques to solve problem.

1. Write a Program to illustrate Static member and methods
2. Write a Program to illustrate Bit fields
3. Write a Program to illustrate Scope and Storage class
4. Write a Program to illustrate Enumeration and Function Overloading
5. Write a Program to implement Job Scheduling application using Priority Queue (Apply Inheritance techniques)
6. Write a Program to overload unary operator in Postfix and Prefix form as member and friend function.
7. Write a Program to overload as binary operator, friend and member function
8. Write a program to create a template function for Quicksort and demonstrate sorting of integers and doubles
9. Write a Program to Construct a search engine using linear and binary search (apply any of the sorting techniques & Method Overriding)
10. Write a Program to Construct Binomial Heaps (Apply Max-Heap Property & virtual base class)
11. Write a Program to Implement the tree traversal algorithms using both recursive and non-recursive ways.(Apply Exception handling mechanism).
12. Write a Program to illustrate Iterators and Containers.

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Sub Code	Lectures	Tutorial	Practical	Credit
Y27	1	--	3	2

**Y27 Client/Server Applications Laboratory****1:1**

**Preamble:** This Lab aims at giving adequate exposure to the Oracle and programming language to gain knowledge on using a front-end tool (VB) and connecting it to a back- end tool (ORACLE database).

**List of Experiments:**

1. Windows Programming
2. Simulating a calculator
3. Number System: Conversion
4. Online Quiz
5. MCA Course - Selection List
6. Students database maintenance
7. Income Tax Calculation
8. Railway Reservation
9. System Allocation
10. Library Management

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Sub.Code	Lectures	Tutorial	Practical	Credit
Y28	1	1	-	2

**Y28 PROFESSIONAL COMMUNICATION****2:0**

(Common to MCA, M.Sc Applied Mathematics and M.Sc Material Sciences)

**Preamble:** Professional Communication aims to develop Listening, Speaking, Reading and Writing skills in postgraduate students' professional development contexts such as projects, competitive exams, organizational communication and soft skills.

**Competencies:** At the end of the course the students should be able to

**Listening:**

1. Listen and understand the various presentations, Global English Language Test exercises and organizational communication activities

**Speaking:**

1. Present project reports, self introduction
2. Participate in GD and interview in work context.

**Reading:**

1. Read and collect information for technical /project report writing.
2. Read and understand the comprehension passages given in competitive examinations.

**Writing:**

1. Write a project report adhering to proper format
2. Create a paragraph and an essay using their own ideas
3. Design curriculum vitae

**Assessment Pattern:**

	Bloom's Category	Internal (50)	External (100)
I	Recall	10	10
II	Understand	10	20
III	Application	10	20
IV	Analysis	10	30
V	Evaluation	5	10
VI	Creation	5	10

**Course Content:**

**1. Listening:**

- 1.1 Attention, understanding and responding
- 1.2 English language testing exercises, organizational communication and soft skills practice

**2. Speaking:**

- 2.1 Planning, preparation and presentation
- 2.2 Project report, self introduction, GD and interview

**3. Reading:**

- 3.1 Rapid reading and reference skills
- 3.2 Project reports and competitive exam exercises

**4. Writing:**

**4.1. Structure**

- 4.1.1 Sentence structure
- 4.1.2 Project report writing
- 4.1.3 CV writing

**Syllabus:**

**Listening:** Listening to the extracts of various presentations, Asking Questions, Listening test as conducted in TOEFL ,IELTS and BEC

**Speaking:** Project presentation skill, Participation in Group Discussion and Interview, Speaking in the work Contexts : Speaking tests for TOEFL, IELTS, and BEC Exam, Self introduction, Mini Presentation

**Reading :** Reference skills for project report writing: topic selection, data collection, skimming, scanning, Reading comprehension passages from CAT, TOEFL, GRE and BEC,

**Writing :** Project Report Writing : Format, Abstract, Bibliography/References , Structure : Sentence structure, CV Writing.

**References:**

1. Tony Lynch: Study Listening. Cambridge, Cambridge University Press, 2007
2. Sangeeta Sharma and Binod Mishra: Communication Skills for Engineers and Scientists.New Delhi, PHI Learning Pvt. Ltd. 2009.
3. Hari Mohan Prasad and Uma Rani Sinha: Objective English for Competitive Examination.New Delhi, Tata McGraw – Hill, 2005
4. Bob Dignen, Steeve Flinders et. al.: Work and Life: English 365. Students Book 1,2 & 3.New Delhi, Cambridge, 2004.

**Lecture sessions:**

**Listening:**

1. Effective listening skills
2. Practice for Listening Tests of Global English Language Tests
3. Introduction of soft skills

**Speaking:**

1. Introduction of Presentation skills
2. Exposure for speaking tests in Global English Language Tests
3. How to participate in GD
4. Interview techniques

**Reading:**

1. Rapid reading techniques
2. Reference skills
3. Suggestions for reading tests in competitive exams

**Writing:**

1. Format of project report
2. Sentence structure
4. CV writing

**Practice Sessions:**

**Listening:**

1. Messages, descriptions, conversations and lectures

**Speaking:**

1. Self Introduction
2. Mini Presentation
3. GD
4. Interview

**Reading:**

1. Rapid reading practices
2. Comprehension exercises
3. Topic selection and data collection for project report

**Writing:**

1. Sentence structure
2. Abstract writing
3. Project report writing

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Sub Code	Lectures	Tutorial	Practical	Credit
Y31	4	--	--	4

## Y31 ORGANIZATIONAL BEHAVIOUR

**4 : 0**

### Preamble

To learn challenges and opportunities in organizations from a behavioral perspective.

### Competencies

At the end of the course the student should be able to

1. Develop an Organisational Behaviour model for any type of Organization.
2. Develop and improve the quality of Leadership.
3. Evaluate the Common biases and erridication in Decision Making Process.
4. Understand how to manage the Stress during a job.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	Test 3/ End-Semester Examination
1.	Remember	20	10	10
2.	Understand	30	20	20
3.	Apply	40	40	40
4.	Analyze	10	10	10
5.	Evaluate	0	20	20
6.	Create	0	0	0

### Course Level Learning Objectives:

#### Remember

1. Define Organizational Behavior.
2. What are the disciplines that contribute to the Organsiataional Behaviour field?
3. What is meant by Contingency variable.
4. What are the main components of attitudes?
5. Define Personality.
6. Define JCM.
7. What is knowledge management?



8. What is the use of Path Goal Theory in organisational behaviour?
9. What is a Positive Organizational Culture?
10. How does Globalization affect organizational structure?

### **Understand**

1. Explain in detail about the personality, its factors and model.
2. Explain the Common biases and Errors in Decision Making?
3. Describe briefly about Equity Theory
4. Explain the job characteristics model and how does it motivate employees?
5. Is socialization brainwashing? Explain.
6. Explain with reasons for organizational structures differ and how it differ between a mechanic structure and an organic structure?

### **Apply**

1. Develop and apply an OB model for Telecommunication Organization.
2. Compare and contrast downward, upward and lateral communication?
3. Identify a charismatic leader and a transformational leader. Compare the two leaders. Give reason to support your answer
4. Apply a Matrix Structure for a College of Business Administration.
5. Can you identify a set of characteristics that describes your institution's Culture? Compare them with those of several of your peers. How closely do they agree?

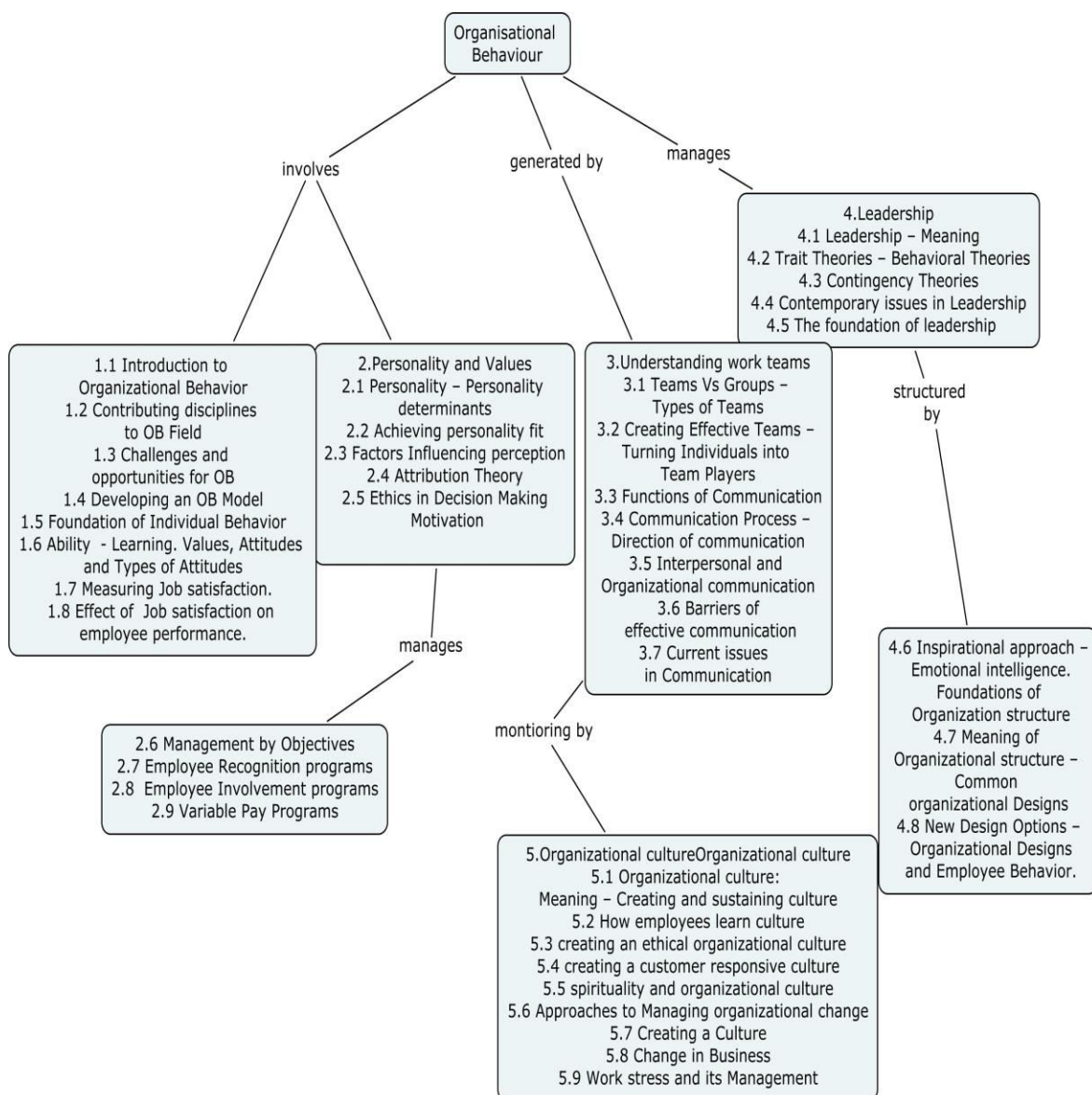
### **Analyze**

1. Analyze the challenges and opportunities for OB.
2. Analyze Maslow's hierarchy of needs theory.
3. Analyze how Fiedler's contingency model has been supported in research based activities.
4. Analyze how Organization Culture Form managed in organisational Behaviour.
5. Analyze the reasons for the growing interest in Spirituality
6. "Employees form implicit models of organizational structure, "Do you agree?

## Evaluate

1. Evaluate how Organizational Culture has an impact on Employee Performance and Satisfaction.
2. "King fisher Airlines and Air Deccan merge." "Corus accepts takeover bid by Tata steel." "Mittal capture Arcelor." "Vodafone acquires Essar." Each of these is a recent example of large companies combining with other large companies. Does this imply that small isn't necessarily beautiful? Are mechanical forms winning the "Survival of the fittest" battle? What are the implications of this consolidation trend to organizational behavior?

## Concept Map



**Course Content and Lecture Schedule**

<b>S.No</b>	<b>Topics</b>	<b>No. of Lectures</b>
<b>1</b>	<b>Organizational Behavior</b>	
1.1	Introduction to (OB)Organizational Behavior	1
1.2	Contributing disciplines to OB Field	1
1.3	Challenges and opportunities for OB	1
1.4	Developing an OB Model	1
1.5	Foundation of Individual Behavior	1
1.6	Ability - Learning. Values, Attitudes and Types of Attitudes	1
	<b>Job satisfaction</b>	
1.7	Measuring Job satisfaction.	1
1.8	Effect of Job satisfaction on employee performance.	1
<b>2</b>	<b>Personality and Values</b>	
2.1	Personality – Personality determinants	1
2.2	Achieving personality fit	1
2.3	Factors Influencing perception	1
2.4	Attribution Theory	1
	<b>Perception / Individual Decision Making</b>	
2.5	Ethics in Decision Making. Motivation	1
2.6	Management by Objectives	1
2.7	Employee Recognition programs	1
2.8	Employee Involvement programs	1
2.9	Variable Pay Programs	1

3	<b>Understanding work teams</b>	
3.1	Teams Vs Groups – Types of Teams	1
3.2	Creating Effective Teams – Turning Individuals into Team Players	1
	<b>Communication</b>	
3.3	Functions of Communication	1
3.4	Communication Process – Direction of communication	1
3.5	Interpersonal and Organizational communication	1
3.6	Barriers of effective communication	1
3.7	Current issues in Communication	1
4	<b>Leadership</b>	
4.1	Leadership – Meaning	1
4.2	Trait Theories – Behavioral Theories	1
4.3	Contingency Theories	1
4.4	Contemporary issues in Leadership	1
4.5	The foundation of leadership	1
	<b>Organizational structure</b>	
4.6	Inspirational approach – Emotional intelligence. Foundations of Organization structure	1
4.7	Meaning of Organizational structure – Common organizational Designs	1
4.8	New Design Options – Organizational Designs and Employee Behavior.	1
5	<b>Organizational culture</b>	
5.1	Organizational culture: Meaning – Creating and sustaining culture	1
5.2	How employees learn culture	1
5.3	creating an ethical organizational culture	1
5.4	creating a customer responsive culture	1
5.5	spirituality and organizational culture	1
	<b>Organizational change and Stress Management</b>	1
5.6	Approaches to Managing organizational change	1
5.7	Creating a Culture	1
5.8	Change in Business	1
5.9	Work stress and its Management	1
	Total	42

## Syllabus

**Organizational Behavior:** Introduction to Organizational Behavior(OB), Contributing disciplines to OB Field, challenges and opportunities for OB, Developing an OB Model, Foundation of Individual Behavior, Ability - Learning. Values, Attitudes and Types of Attitudes. **Job satisfaction-** Measuring Job satisfaction, Effect of Job satisfaction on employee performance. **Personality and Values:** Personality determinants, Achieving personality fit, Factors Influencing perception, Attribution Theory, **Perception / Individual Decision Making:** Ethics in Decision Making. Motivation, Management by Objectives, Employee Recognition programs, Employee Involvement programs, Variable Pay Programs. **Understanding work teams:** Teams Vs Groups – Types of Teams, Creating Effective Teams – Turning Individuals into Team Players. **Communication:** Functions of Communication, Communication Process – Direction of communication, Interpersonal and Organizational communication, Barriers of effective communication, Current issues in Communication. **Leadership:** Leadership – Meaning, Trait Theories – Behavioral Theories, Contingency Theories, Contemporary issues in Leadership, The foundation of leadership. **Organizational structure:** Inspirational approach – Emotional intelligence. Foundations of Organization structure, Meaning of Organizational structure – Common organizational Designs, New Design Options – Organizational Designs and Employee Behavior. **Organizational culture:** Organizational culture: Meaning – Creating and sustaining culture, How employees learn culture, creating an ethical organizational culture, creating a customer responsive culture, spirituality and organizational culture. **Organizational change and Stress Management:** Approaches to Managing organizational change, Creating a Culture, Change in Business, Work stress and its Management

### Reference Books:

1. Stephen P. Robbins, "Organisational Behaviour", 11/e, Pearson Education, 2009
2. Uma Sekaran, "Organisational Behaviour", 2/e, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2010.
3. Sharma, R.A, "Organisational Theory and Behaviour ", 2/e, Tata McGraw-Hill Ltd., New Delhi, 2007.

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Sub.Code	Lectures	Tutorial	Practical	Credit
Y32	4	-	-	4

## Y32 INTERNET AND JAVA PROGRAMMING

**4:0**

**Preamble:** This course aims at facilitating the student to understand the basic internet programming concepts and the programming concepts of JAVA towards developing Java based applications.

### Competencies:

**At the end of the course, the students will be able to**

1. Identify and implement appropriate constructs in JAVA for a given application
2. Identify the ways of connecting Java programs with structured applications written in C
3. Apply the advantage of using multithreaded programming aspect in the context of parallel operations.
4. Apply exception handling run time errors.
5. Apply socket based communication for networking problems.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	End-semester examination
1	Remember	30	30	30
2	Understand	30	30	30
3	Apply	40	40	40
4	Analyze	0	0	0
5	Evaluate	0	0	0
6	Create	0	0	0

### Course Level Learning Objectives:

#### Remember

1. What is an exception? List the keywords associated with handling an exception.
2. Write the syntax for creating an interface. Give an example.
3. What are the ways of creating a thread?
4. What is the use of final keyword?
5. What is the use of thread priority?
6. What is the role of JVM?

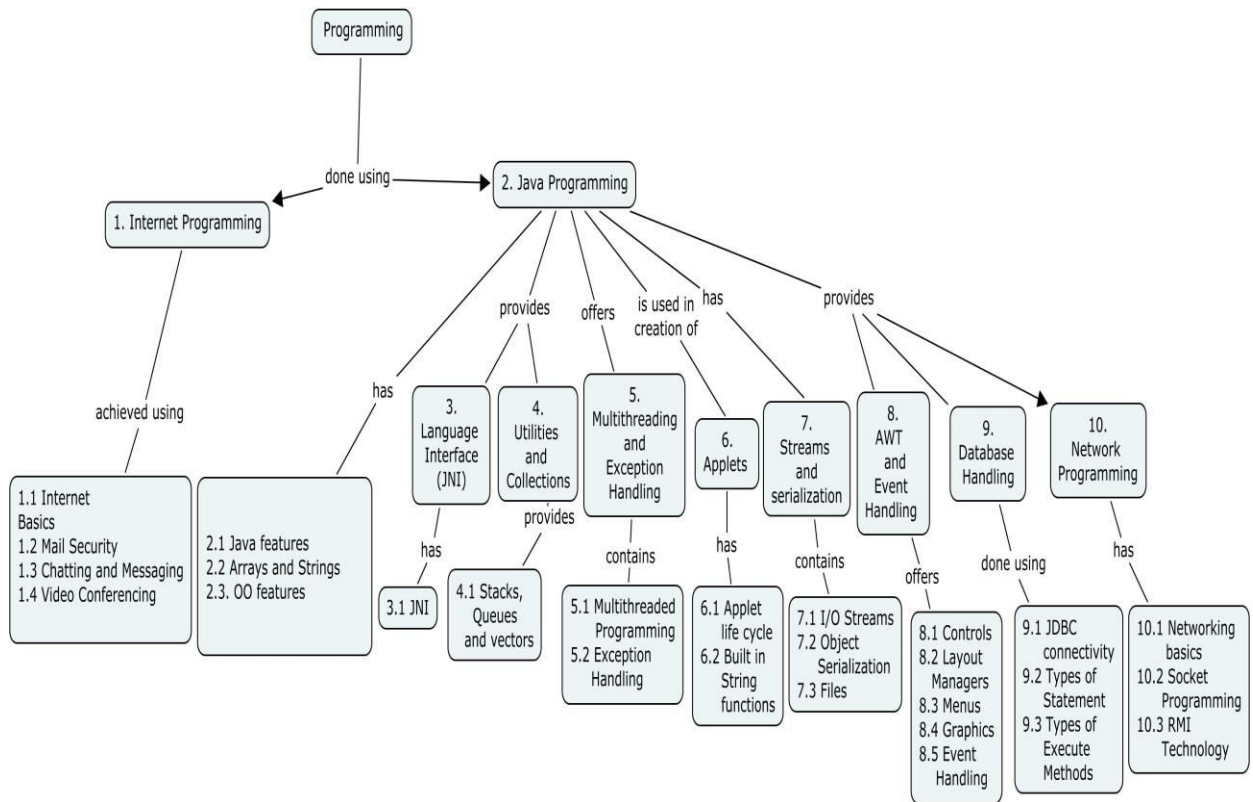
**Understand**

1. What is the purpose of inner classes in effective software development?
2. Explain the scenario with sample application where synchronize keyword is so important?
3. Why object serialization is so important for data communication, explain with sample code?
4. Why vector is better than array?
5. How callable statement is different from Statement? Explain with your own scenario?
6. When will you use Grid Bag layout in designing an applet?

**Apply**

1. Consider Area calculation of different shapes using the same area calculation by applying method overloading and method overriding in Java.
2. Develop a sample client/server application using sockets and datagram packets.
3. Develop an Applet for 'Online Job Portal' by applying the event handlers to handle the events.
4. Apply interfaces to achieve multiple inheritance in Java for your own example.
5. In an multi threading environment how inter thread communication will take place?
6. Develop a user defined exception for handling a negative number or zero during age validation in a Voter Management System using Exception base class.

## Concept Map



## Lecture Schedule

No.	Topic	No. of Lectures
1	<b>Internet Programming</b>	
1.1	Internet Basics	1
1.2	Mail Security	1
1.3	Chatting and Messaging	1
1.4	Video Conferencing	1
2	<b>Java Programming</b>	
2.1	Java features	2
2.2	Array and Strings	2
2.4	Object Oriented Features	2



No.	Topic	No. of Lectures
3	<b>Language Interface</b>	
3.1	JNI	2
4	<b>Utilities and Collections</b>	
4.1.	Stacks, Queues and vectors	3
5	<b>Multithreading and Exceptions</b>	
5.1	Multithreaded Programming	2
5.2	Exception Handling	2
6	<b>Applets</b>	
6.1	Applet life cycle	2
6.2	Built in String functions	2
7	<b>Streams and serialization</b>	
7.1	I/O Streams	2
7.2	Object Serialization	2
7.3	Files	1
8	<b>AWT Controls</b>	
8.1	Controls	1
8.2	Layout Managers	1
8.3	Menus	1
8.4	Graphics	1
8.5	Event Handling	2
9	<b>Database Handling</b>	
9.1	JDBC connectivity	1
9.1.1	Types of Statement	1
9.1.4	Types of Execute Methods	1

No.	Topic	No. of Lectures
10	<b>Java Network Programming</b>	
10.1	Networking basics	1
10.2	Socket Programming	2
10.3	RMI Technology	2
	Total	<b>42</b>

### Syllabus

**Internet Programming :** Internet Basics, Mail Security, Chatting and Messaging, Video Conferencing, **Java Programming:** Java features, Array and Strings, Object Oriented Features, **Language Interface:** JNI, Utilities and Collections, Stacks, Queues and vectors, **Multithreading and Exceptions:** Multithreaded Programming, Exception Handling, **Applets:** Applet life cycle, Built in String functions, **Streams and serialization:** I/O Streams, Object Serialization, Files, **AWT Controls:** Controls, Layout Managers, Menus, Graphics, Event Handling, **Database Handling:** JDBC connectivity, Types of Statement , Types of Execute Methods , **Java Network Programming:** Networking basics , Socket Programming, RMI Technology

### References:

1. Patric Naughton and Herbert Schildt, "Java the Complete Reference", 5<sup>th</sup> Edition, Tata McGraw Hill, 2002, (Reprint 2011).
2. Margaret Levine Young, "The Internet - Complete Reference" , 2<sup>nd</sup> Edition, Tata McGraw Hill, 2002, (Reprint 2010).
3. Harley Hahn, "Internet and WWW", 2<sup>nd</sup> Edition, Tata McGraw Hill, 2002.
4. Bob Bredlovetall, "Web Programming Unleashed" - Sams Net Publishing, 1<sup>st</sup> Edition, 1996.

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Sub Code	Lectures	Tutorial	Practical	Credit
Y 33	3	1	--	4

## Y33 COMPUTER NETWORKS

**3:1**

**Preamble:** Computer network is the discipline which studies the theoretical, practical and managerial aspects of designing and managing computer networks. The course will enable the students to familiarize the various aspects of computer networks such as what they are, how they work, how to design, build and configure them.

### Competencies

At the end of the course the students will be able to

1. Explain the role of different Layers of OSI Network model
2. Determine the performance of a given Computer network
3. Describe the components of Computer networks
4. Synthesize Addressing mechanisms for Computer networks
5. Design a network for a given set of specifications
6. Design services based on Computer networks

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	Test 3/End-semester examination
1	Remember	20	10	10
2	Understand	30	20	20
3	Apply	30	40	30
4	Analyze	20	30	20
5	Evaluate	0	0	0
6	Create	0	0	20

## Course Level Learning Objectives

### Remember:

1. What are the advantages of FDDI over a basic Token Ring?
2. Describe the encapsulation involved in the creation of an Ethernet frame.
3. Differentiate the basic operation of hubs over switches.
4. What is the difference between routable and non- routable protocols?
5. What is multicast routing?
6. What is a DNS resource record?

### Understand:

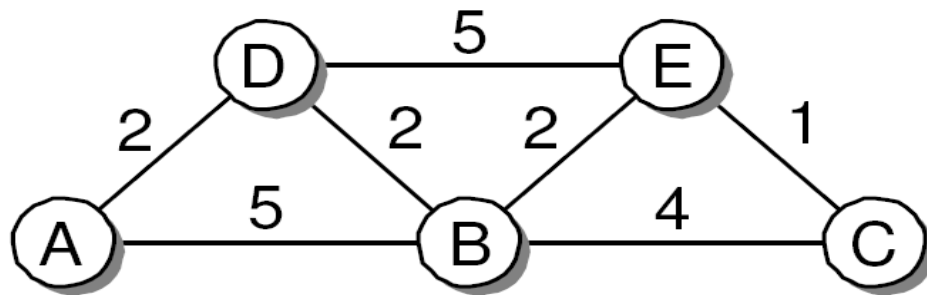
1. Identify the address class of 123.167.23.20 and 250.10.24.96.
2. Compare 10Base5, 10 Base2, 10BaseT, and 10Base F mediums used in IEEE 802.3.
3. Explain the data frame format of IEEE 802.5 Standard?
4. Write the subnet, broadcast address and valid host range for the following:

1. 172.16.10.5	255.255.255.128
2. 172.16.10.33	255.255.255.224
3. 172.16.10.65	255.255.255.192
4. 172.16.10.17	255.255.255.252
5. Identify a network as Class A, B, or C, given an IP address and a network mask.
6. The Network address is 192.168.10.0 and the Subnet mask is 255.255.255.252.  
Find out
  1. How many subnets?
  2. How many hosts?

### Apply

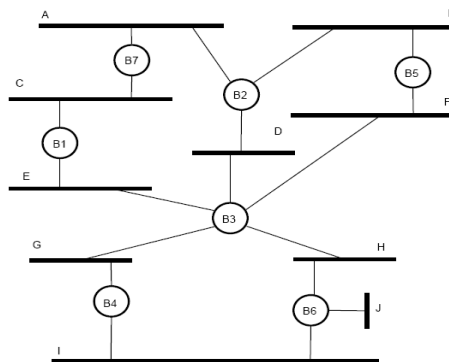
1. For the bit stream 100010100, draw the waveform for Manchester and Differential Manchester Coding and also discuss the advantages of the coding schemes
2. Calculate the latency of a packet transferred between two hosts A and B on a local network, where they are connected via a cable of length 6.21 m., the packet size is 2024 bytes, and the capacity of the cable is 56 bps. (Assume that queuing delays are not considered. Also recall that 1 byte = 8 bits, and the speed of light =  $3.0 \times 10^8$  m/s.)
3. A collection of five routers is to be connected in a point-to-point subnet. Between each pair of routers, the designers may put a high-speed line, a medium-speed line, or a low-speed line, or no line. If it takes 100 ms of computer time to generate and inspect each topology, compute the time required to inspect all of them.

4. An end system sends 50 packets per sec using UDP protocol over a full duplex 100Mbps Ethernet LAN connection. Each packet consists 1600 bytes of Ethernet frames payload data. Compute the throughput at UDP layer?
5. The Internet is roughly doubling in size every 18 months. Approximate estimates put the number of hosts on it at 7 million in January 1996. Use this data, compute the expected number of Internet users in the year 2008.
6. Compute the shortest paths from router A to any of the other routers in the figure by means of Dijkstra's shortest-path algorithm.

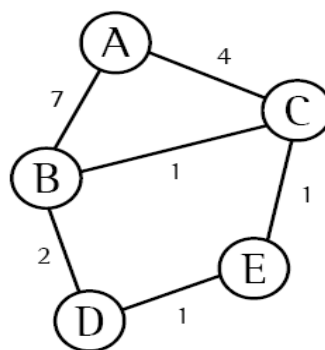


**Analyze:**

1. Identify whether circuit switching or a packet switching preferable for broadcasting a copy of a video presentation? Why?
2. Given the extended LAN shown in the figure below, indicate which ports are not selected by the spanning tree algorithm. The LAN's in the figure are labeled A-J and the bridges in the figure are labeled B1-B7. Hub B<sub>i</sub> has an ID of i which is used as the tie breaker.

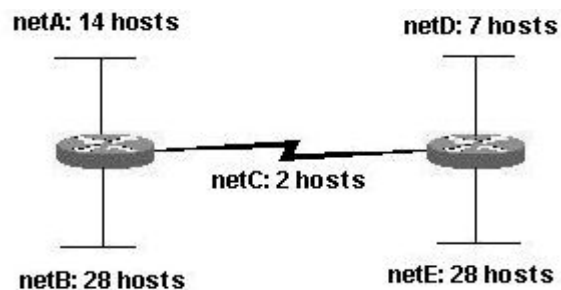


3. Switching can improve the efficiency of a network's link utilization, but may also cause problems. In a packet-switched network, two particular problems are *increased latency* and *data loss*.
- (i) Taking the IP packet-switching, explain how latency and loss might occur.
  - (ii) To what extent are the problems of latency and loss less significant in circuit-switched networks?
4. The switching process consists roughly of a *demultiplexing* stage, a *routing* stage and a *remultiplexing* stage. For each of the following examples of switching, explain what is being demultiplexed, what routing decisions are made, and how remultiplexing is performed:
- (i) packet switching in the postal network;
  - (ii) packet switching in an Ethernet switch;
  - (iii) packet switching in an IP router;
  - (iv) circuit switching in the telephone network;
5. Convert a classless (CIDR) network address (e.g. 192.168.0.0/24) to its IP address/mask equivalent (e.g. 192.168.0.0 255.255.255.0) and vice versa
6. Draw a simple topology of routers with multiple connections. The connections should be assigned costs. What is the state of the routing table for each node before any distance vectors were exchanged? Now, exchange a few distance vectors between the routers and determine the routing tables which have changed.

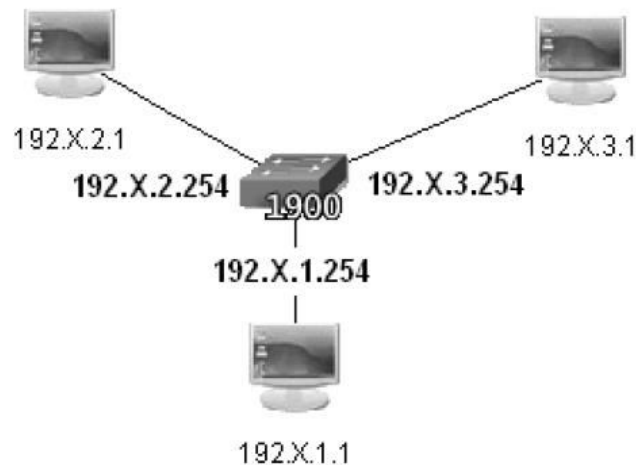


**Create:**

- Given the Class C network of 204.15.5.0/24, subnet the network in order to create the network in Figure with the host requirements.

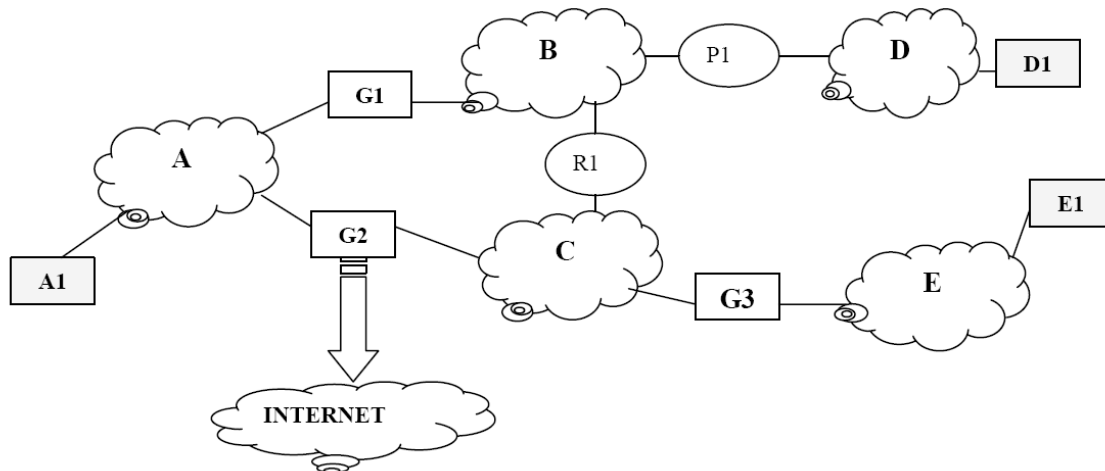


- You have 3 computers belonging to different networks. Configure them to be able to access each other. Note: Use at least three routers, one for each internal network. Change the IP Address to match the diagram below. Take note that you will need a fourth network (a new network address!) for all the routers so that they can communicate with one another. You can also use switches.

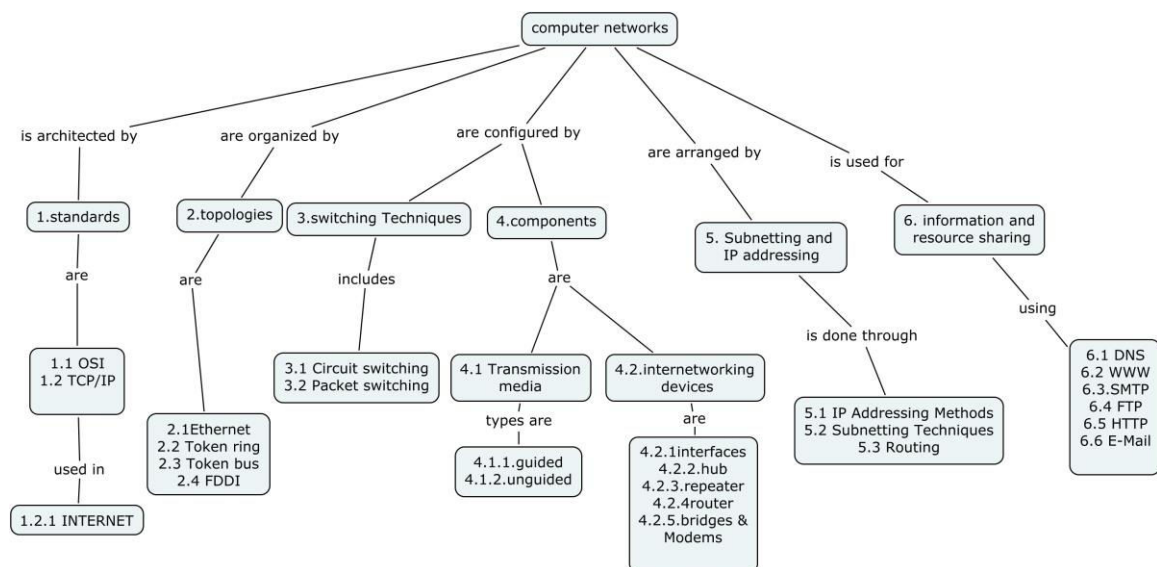


- A routing protocol is a system used by routers to automatically maintain their forwarding tables. Outline a simple routing protocol which might be used to maintain the table under a *shortest path* routing policy. Mention any additional information that you must store in the router, and any problems you notice.
- A company has two LANs, one in Chennai with 300 hosts and another one in Madurai with 150 hosts. Could it be possible to connect those networks to the Internet using only one Class C network addresses? Justify the answer. If the answer is positive, create a network layout, assign IP addresses to every router and to one host in the network, and specify the routing tables of all routers and the specified host.

5. Create a VPN to connect to branch office of the department. What would be the preliminary requirement?
6. In the figure below there is a set of Ethernet LANs (A,B,C,D and E) that conform to the Intranet policies of one company. The LANs are interconnected with three routers (G1, G2 y G3), a bridge (P1) and a hub (R1). The Internet connection is managed by router G2. The Company has only one class C network address for this Intranet. We highlight only three hosts - A1, D1 and E1. Assume that there are more hosts in each LAN. Assign IP addresses to every network element (network IDs, hosts, etc.). Specify the routing tables of all routers and the one corresponding to host D1.



### Concept Map





**Course Contents and Lectures schedule**

<b>No.</b>	<b>Topics</b>	<b>No of Lectures</b>
1.	<b>Introduction</b>	1
1.1	<b>Standards:</b> OSI Architecture	2
1.2	TCP/IP	2
1.2.1	Internet Architecture	2
2	<b>Topologies</b>	
2.1	LAN-Ethernet	2
2.2	Token Ring	2
2.3	Token Bus	2
2.4	FDDI	2
3	<b>Switching Techniques</b>	
3.1	Circuit switching	2
3.2	Packet switching	2
4	<b>Components</b>	
4.1	<b>Transmission Media</b>	
4.1.1	Guided Media	2
4.1.2	Unguided Media	2
4.2	<b>Internetworking Devices</b>	
4.2.1	Interfaces	1
4.2.2	Hub	1
4.2.3	Repeaters	1
4.2.4	Routers	1
4.2.5	Bridges and Modems	2

5	<b>Subnetting and IP Addressing</b>	
5.1	IP Addressing and Methods	1
5.2	Subnetting Techniques	2
5.3	Routing: Distance Vector Routing - Link State Routing	2
6	<b>Information and Resource Sharing</b>	
6.1	DNS	1
6.2	WWW	1
6.3	SMTP	1
6.4	FTP	1
6.5	HTTP	1
6.6	Email	1
6.7	Case Studies: Networking Applications	3
	Total	43

**Syllabus:**

**Introduction:** Data Communication Concepts, Data Encoding **Network Standards:** OSI Architecture, TCP/IP, Internet Architecture **Topologies:** Ethernet,Token Ring, Token Bus, FDDI **Switching Techniques:** Circuit Switching, Packet Switching **Components:** Transmission Media (Guided and Unguided media) Internetworking Devices: Interfaces, Hub, Repeaters, Routers, Bridges and Modems **Subnetting and IP Addressing:** IP Addressing Methods, Subnetting Techniques - Routing – Distance Vector Routing - Link State Routing **Information and Resource sharing:** DNS, WWW, SMTP, FTP,HTTP,E-Mail. **Case Studies: Networking Applications.**

**References:**

1. Behrouz A.Forouzan, "Data Communication and Networking", Tata McGraw-Hill, 2006 (reprint 2011), Fourth Edition.
2. L.Peterson and Peter S.Davie, "Computer Networks", Harcourt Asia Pvt.Ltd., 2008, Second Edition.
3. Andrew S.Tanenbaum,"Computer Networks",PHI,Fourth Edition,2003.
4. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann, 2012, 5<sup>th</sup> Edition.
5. Black U., "Computer Networks- Protocols, Standards and Interfaces", PHI, 2009.

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Sub.Code	Lectures	Tutorial	Practical	Credit
Y34	3	1	-	4

## Y34 SOFTWARE ENGINEERING

**3:1**

**Preamble:** This course aims at facilitating the student to learn the different life cycle models, requirement analysis, modeling and specification, architectural and detailed design methods, implementation and testing strategies, verification and validation techniques, Project planning and management and the use of CASE tools.

### Competencies:

**At the end of the course, the students will be able to**

1. Identify and implement appropriate software development life cycle model for a given application
2. Identify all the trade-offs involved in choosing the different life cycle models
3. Identify the trade-offs involved in selecting the most efficient design document.
4. Apply the techniques involved in selecting: (a) White Box testing (b) Block Box testing.
5. Estimate cost, problem complexity using various estimation techniques
6. Understand the advantages of configuration management and risk management activities and apply them for the given software development.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	End-semester examination
1	Remember	20	20	30
2	Understand	30	20	20
3	Apply	30	40	30
4	Analyze	10	10	10
5	Evaluate	5	5	5
6	Create	5	5	5

**Course Level Learning Objectives:****Remember**

1. Define: Software Engineering.
2. Define: Metric, Measure and Indicator
3. Who are called as Stakeholders?
4. What is White Box testing? Draw the notations of a CFG and derive independent paths and test cases for a given source code using it.
5. Explain the following testing techniques to derive test cases (a) Equivalence Partitioning (b) Boundary Value Analysis (c) Random testing for OO classes.
6. Explain the role, contents and features of SCM repository in detail.

**Understand**

1. How learning is performed in ASD process model?
2. How extreme programming helps in modern software product development scenario? Explain the various activities involved in it with neat diagram
3. How requirements elicitation process is carried out during requirements analysis using QFD? Explain it in detail.
4. How risk mitigation, monitoring and management is done in software development process with RMMM plan? Explain.
5. How version control and change control are done in SCM process.
6. How transaction mapping is done to convert a DFD into a structure chart? Explain it in detail with an example.

**Apply**

1. Consider a scenario of a customer's organization in need of a faster product development and the requirements are well understood. Apply RAD model helps in developing software product in this scenario? Explain it with a neat diagram.
2. Consider an 'Online Vehicle Purchase System'. Apply requirements analysis and design to draw primary use case diagram, swimlane activity diagram and State Diagram for it.
3. Apply flow-oriented modeling to develop a DFD with level 0 and 1 and state diagram for a University Admission System.
4. Apply Control Flow based testing in White box testing to generate the test cases and independent paths in a sample piece of code.

5. Apply the various scenarios based modeling techniques in building the analysis model. Also construct any one model for "DOC to PDF Converter" application development.
6. Write the steps involved in component-level design of Object Oriented Systems. Apply the same for an "Online Medical Insurance System". Also draw an activity diagram for it.

### **Analyze**

1. Consider a system that has aspects A01, A02, A03 and A04. The system has been analyzed and it has been identified that there are requirements R01, R02, R03, R04 and R05. During the analysis it has been identified that, Req. R01 covered A01 and A03; R02 covered A04; R03 covered A01, A02 and A04; R04 covered A03 and A04; R05 covered A02 and A03. Draw a Requirements Traceability Table for the above and identify which requirements are sufficient to construct the system.
2. Consider a system in which the developer has to add a new functionality based on changing customers' requirements. This has to be tested before and after by the tester. How Extreme Programming works in this situation? Explain it in detail.
3. Suppose a test group was testing a mission critical software system. The group has found 85 out of the 100 seeded defects. If you were the test manager, would you stop testing at this point?
4. Consider the "Withdraw" module in an ATM application. The module reads the amount the user wishes to withdraw from his/her account. The amount must be multiple of 100 and less than 10000. Develop black box test cases using Equivalence class partitioning and boundary value analysis. List out any assumptions that you make in deriving these test cases.
5. Analyze the effort calculated using COCOMO II model for semi detached and organic models for the same KLOC and provide your conclusion.
6. How 'regress all' option in regression testing posts both benefits and drawbacks during the testing process?

**Evaluate**

1. Evaluate the Cost estimate for a system having 10KLOC lines of code and is of 'Semi Detached Type' with average complexity metrics of all the attributes, using COCOMO II model.
2. Use the COCOMO-II model to estimate the effort required to build software for a simple E-Shopping application that provides 18 screens (simple), 15 reports (medium) and will require approximately 60 software components (difficult). Assume the developer's experience/capability is high and environment maturity/capability is very high. Use the application composition model with object points.
3. What is orthogonal array testing? Consider a temperature monitoring system that has three parameters P1, P2 and P3, each takes on 3 discrete values:  
  
p1=1 => show temperature  
  
p1=2 => Alarm  
  
p1=3 => Send temp to next module.

Construct an orthogonal array and evaluate the outcome of the set of test cases derived for the system.

4. Evaluate the Complexity measure using FP based estimation for a system in which the following data exists:

No.of User Inputs – 20

No.of User Outputs – 12

No.of Enquiries - 8

No.of Internal Logic Files – 4

No.of External Interfaces – 5

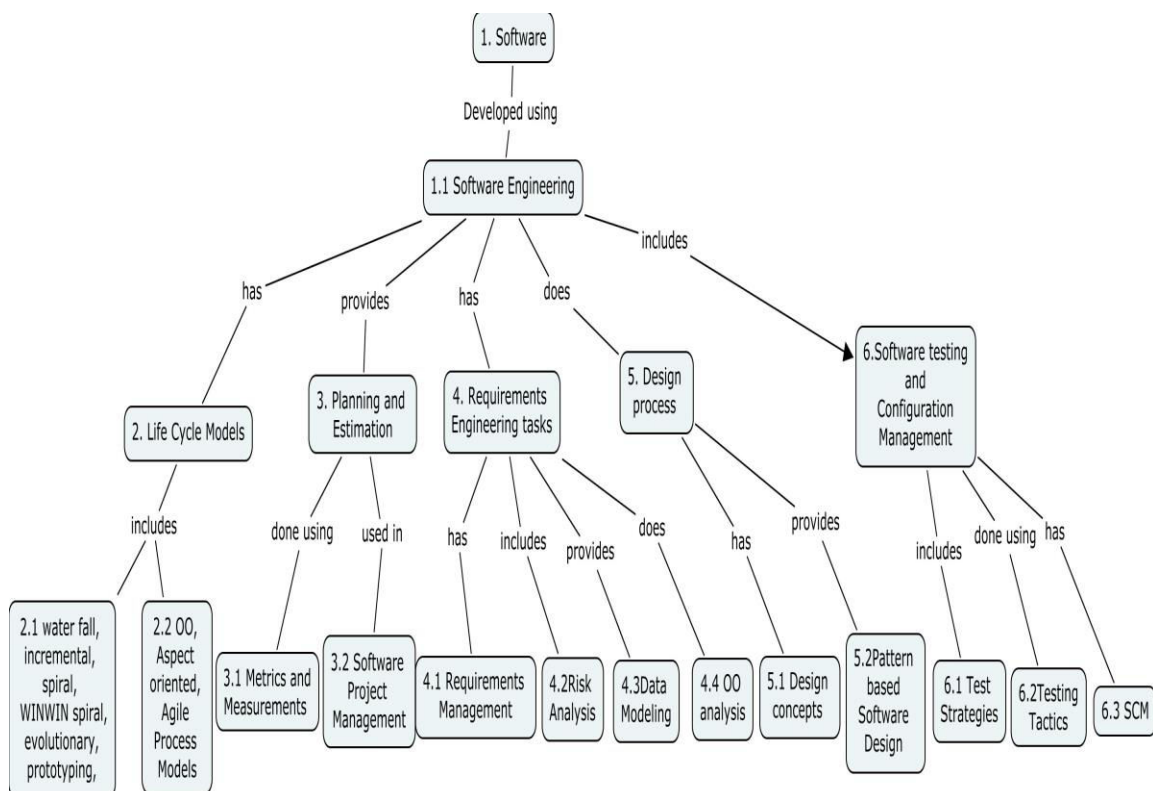
Assume your own complexity level for each of the categories and you're your own values for the 14 questions raised to the customers.

5. Evaluate the developers' efficiency in Delphi Cost estimation model.
6. Using the risk projection table evaluate the highest priority risks in a given software.

## Create

1. Construct a sample risk projection table and assess the risk impact for any one risk.
2. Prepare a data dictionary by creating entries for all the data objects for an 'Online Vehicle Purchase System'
3. Create a RMMM plan for any two risks identified during risk analysis.
4. Construct a Structure chart from a DFD for your own application.
5. For a 'Students Attendance Monitoring System', create a primary use case diagram.
6. Consider 'Online Quiz System', prepare an activity diagram for it.

## Concept Map





**Lecture Schedule**

No.	Topic	No. of Lectures
1	<b>Software</b>	
1.1	Software Engineering	1
2	<b>Life Cycle Models</b>	
2.1	Water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping	3
2.2	Object oriented, Aspect oriented and Agile Process Models	3
3	<b>Planning and Estimation</b>	
3.1	Metrics	2
3.2	Software Project Management	3
4	<b>Requirements Engineering tasks</b>	
4.1	Requirements Management	3
4.2	Risk Management	3
4.3	Data Modeling	2
4.4	OO analysis	3
5	<b>Design process</b>	
5.1	Design concepts	2
5.2	Data design elements	3
5.3	Pattern based Software Design	3
6	<b>Software testing and Configuration Management</b>	
6.1	Test Strategies for conventional and OO software	3
6.2	Testing Tactics	4
6.3	Software Configuration Management	4
	Total	42

**Syllabus**

**Software:** Software Engineering, **Life cycle models:** water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented, Aspect oriented, Agile Process Models, **Planning and Estimation:** Metrics, Project Management, **Requirements Engineering tasks:** Requirements Management, Risk Management, Data Modeling, OO analysis, **Design process:** Design concepts, Data design elements: Pattern based Software Design **Software testing and Configuration Management:** Test Strategies for conventional and OO software, Testing Tactics: SCM Resources, SCM Process/Standards, Version Control.

**References:**

1. Roger S.Pressman, "Software engineering- A practitioner's Approach", McGraw-Hill International Edition, 2010.
2. Ian Sommerville, "Software engineering", Pearson education Asia, 9th edition, 2010.
3. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer Verlag, 3<sup>rd</sup> Edition, 2005.
4. James F Peters and Witold Pedrycz, "Software Engineering – An Engineering Approach", 2<sup>nd</sup> edition, John Wiley and Sons, New Delhi, 2000.

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Sub.Code	Lectures	Tutorial	Practical	Credit
Y35	3	1	-	4

### Y35 - Data Warehousing and Data Mining

**3:1**

**Preamble:** This course aims at facilitating the student to understand the concepts of data warehousing and data mining. Students to understand the various techniques involved in mining the data from the databases.

#### Competencies

1. Understand the life cycle approach for a data warehouse project.
2. Explain the concepts of Data mining and its applications.
3. Preprocess the given raw data for analysis using discretization and normalization.
4. Apply the mining techniques like association, classification and clustering on transactional databases.
5. Perform multi dimensional data mining using association and classification techniques.
6. Distinguish the types of databases like temporal, spatial and sequence.
7. Identify the type of analysis that can be done on the given databases.
8. Explain the concepts of spatial data mining, temporal data mining, text mining, web mining, visual data mining.
9. To perform mining on spatial, temporal and sequence databases.

#### Assessment Pattern

	Bloom's Category	Test 1	Test 2	End-semester examination
1	Remember	20	20	10
2	Understand	40	20	30
3	Apply	40	60	60
4	Analyze	0	0	0
5	Evaluate	0	0	0
6	Create	0	0	0

**Course level learning objectives****Remember**

1. List the various data sources for the data warehouse.
2. Distinguish between Data Mart and Data Warehouse?
3. What do you mean by strong association rule?
4. How to select an attribute for classification?
5. What is cluster analysis?
6. Mention the purpose of correlation analysis

**Understand**

1. What type of processing take place in a data warehouse? Describe.
2. Compare and contrast the clustering and the classification techniques.
3. In what way "Over Fitting" can be avoided?
4. Illustrate the significance of candidate set generation step of level wise algorithm.
5. Describe the importance of pruning in decision tree construction with an example.
6. Given the two vector objects  $X=(1,1,0,0)$  and  $Y=(0,1,1,0)$  identify the similarity between these objects.

**Apply**

1. As the data warehouse administrator, performance enhancement is high on your list. Highlight the techniques you plan to adopt. For each technique, indicate tasks necessary to implement the technique.
2. Suppose a group of 12 sales price records has been stored as follows:  
5, 10, 11, 13, 15, 35, 50, 55, 72, 92, 204, 215. Partition them into 3 bins by equal width binning.

3. For the given database find all the frequent item sets using Apriori method and list all the strong association rules that match the metarule

$$\forall x \in \text{transaction}, \text{buys}(X, \text{item1}) \wedge \text{buys}(X, \text{item2}) \Rightarrow \text{buys}(X, \text{item3}).$$

<i>TID</i>	<i>Items bought</i>	
100	{f, a, c, d, g, i, m, p}	
200	{a, b, c, f, l, m, o}	Minimum Support = 30%
300	{b, f, h, j, o, w}	
400	{b, c, k, s, p}	
500	{a, f, c, e, l, p, m, n}	Minimum Confidence = 70%

4. For the following Database use ID3 algorithm to construct the decision tree and partition the database based on the classification rules obtained from the decision tree.

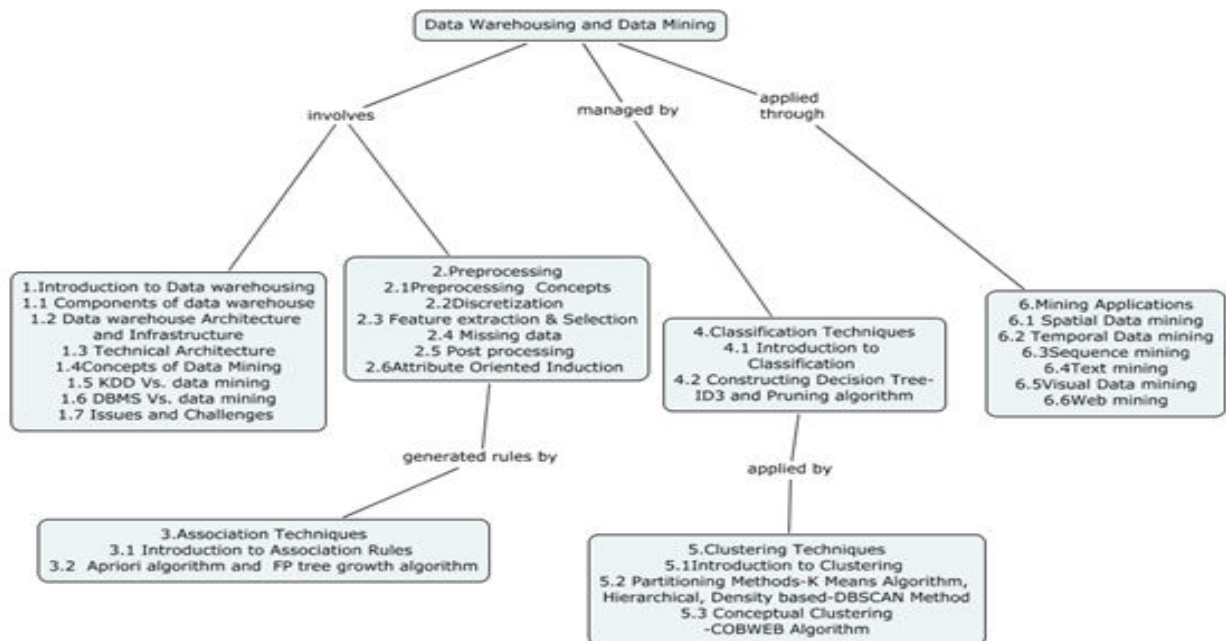
Name	Rank	Years	Turned
Mike	Purchase Manager	3	No
Mary	Purchase Manager	7	Yes
Bill	Sales Manager	2	Yes
Jim	Production Manager	7	Yes
Dave	Purchase Manager	6	No
Anne	Production Manager	3	No

5. For the following Database, apply the entropy-based discretization for the numerical attribute and find the best split.

S.NO	Age	Credit rating
1.	25	Fair
2.	29	Excellent
3.	35	Fair
4.	42	Excellent
5.	47	Fair
6.	49	Excellent
7.	32	Fair
8.	34	Fair
9.	37	Excellent
10.	40	Fair
11.	44	Fair
12.	45	Excellent

6. Given two objects  $A_1(22,1,42,10)$  and  $A_2(20,0,36,8)$  compute the distance by Euclidean measure. The data mining task wants to Cluster the following eight points (with  $(x,y)$  representing locations) into 3 clusters  $A_1(2,10)$ ,  $A_2(2,5)$ ,  $A_3(8,4)$ ,  $B_1(5,8)$ ,  $B_2(7,5)$ ,  $B_3(6,4)$ ,  $C_1(1,2)$ ,  $C_2(4,9)$ . The distance function is Euclidean distance. Initially assign  $A_1$ ,  $B_1$  and  $C_1$  as the center of each cluster respectively. Use K-Means algorithm to show the final three clusters.

### Concept Map



### Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
<b>1</b>	<b>Introduction to Data Warehousing</b>	
1.1	Components of data warehouse	2
1.2	Data warehouse Architecture and Infrastructure	2
1.3	Technical Architecture	1
1.4	Basics	1

1.5	Knowledge Discovery in Databases Vs. data mining	1
1.6	Database Management Systems Vs. data mining	1
1.7	Issues and Challenges	1
<b>2.</b>	<b>Processing</b>	
2.1	Preprocessing Basics	1
2.2	Discretization	1
2.3	Feature extraction & Selection	1
2.4	Missing data	1
2.5	Post processing Basics	1
2.6	Attribute Oriented Induction	1
<b>3.</b>	<b>Association Techniques</b>	
3.1	Introduction to Association Rules	1
3.2	Association Algorithms ( Apriori, FP tree )	4
<b>4</b>	<b>Classification Techniques</b>	
4.1	Introduction to Classification	1
4.2	Classifiers ( Decision tree, Pruning )	4
<b>5</b>	<b>Clustering Techniques</b>	
5.1	Introduction to Clustering	1
5.2	Algorithms ( Partioning, Hierarchical, Density based)	4
<b>6</b>	<b>Mining Applications</b>	
6.1	Spatial Data mining	1
6.2	Temporal Data mining	2

6.3	Sequence mining	3
6.4	Text mining	1
6.5	Visual Data mining	2
6.6	Web mining	1
	Total	40

### Syllabus

**Introduction to Data Warehousing** – Components of data warehouse, Datawarehouse Architecture and Infrastructure. **Data Mining** – Concepts , KDD vs Data mining , DBMS vs Data mining , Issues and Challenges, **Preprocessing** – Concepts , Discretization , Feature extraction & Selection , Missing data , Post processing , Attribute Oriented Induction, **Association Techniques** - Introduction Association Rules , Apriori algorithm , FP tree growth algorithm , Types of association rules, **Classification Techniques** - Introduction to Classification , Constructing decision tree – ID3 algorithm , Pruning. **Clustering Techniques** - Introduction to Clustering , Partitioning Method – K Means algorithm , Hierarchical Method , Density Based Method – DBSCAN method , Conceptual clustering – COBWEB algorithm, **Mining Applications** - Spatial data mining, Temporal data mining, Sequence mining, Text mining, Visual data mining, Web mining.

### References:

1. Jiawei Han, Micheline Kamper, Data Mining: Concepts and Techniques Morgan Kaufman, 2000, ISBN: 1-55860-489-8. Chap1-3, 5-10.
2. K.P.Soman, Shyam Diwakar, V.Ajay, "Insight into Data Mining – Theory and Practice", Prentice Hall of India, 2009. (Modules II, III and VI)
3. Arun K.Pujari, "Data Mining Techniques", Universities Press, 2010. (Modules I, IV, V and VI )
4. M.H Dunham, "Data Mining: Introductory and advanced topics", Pearson Education, 2006.

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Sub.Code	Lectures	Tutorial	Practical	Credit
Y36	-	-	3	1

### Y36 - Internet and Java Programming Laboratory

**0:1**

**Objective:** To enable the students to practice the concepts of java programming language and develop solutions for real world problems.

1. Programs illustrating the use of Objects.
2. Programs using classes and inheritance
3. Programs using JNI concepts.
4. Programs to achieve Inter thread communication and deadlock avoidance.
5. Programs to implement Exception handling
6. Programs implementing packages, access specifiers and interfaces
7. A Game Program implementation using multithreading
8. Programs using streams
9. A JDBC program using different statements
10. An Applet program for Animation text, images and sounds
11. Program for Events and interactivity using Layout Manager.
12. A socket program for network chatting
13. A client server application using RMI techniques
14. Mobile Applications

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Sub.Code	Lectures	Tutorial	Practical	Credit
Y37	-	-	3	1

### **Y37- Data Warehousing and Data Mining Laboratory 0:1**

**Preamble:** In this laboratory, students will implement the various Data Warehousing and Data Mining concepts using Oracle and WEKA tool.

#### **List of Experiments**

1. To perform various commands given in PL/SQL in Oracle 8.0(For brushing up.
2. To perform multi-dimensional data model using SQL queries. E.g. Star, snowflake and Fact constellation schemas
3. To perform various OLAP operations such slice, dice, roll up, drill up, pivot etc.
4. To perform the text mining on the given data warehouse.
5. To perform the correlation ship analysis between for the given data set.
6. To perform the attribute relevance analysis on the given data.
7. To perform the information gain for a particular attribute in the given data.
8. Performing data preprocessing for data mining in Weka tool.
9. Performing clustering in Weka tool.
10. Association rule analysis in Weka tool.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y41	4	--	--	4

**Y41 Electronic Commerce and Electronic Business****4 : 0****Preamble**

To enable the students to gain knowledge in information systems such as Electronic Commerce and provide a customer specific software solution.

**Competencies**

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

- Know current management issues associated with electronic commerce strategies.
- Recognize the Internet's role in the decision process that organizations go through in analyzing and purchasing goods and services.

**Assessment Pattern**

	Bloom's Category	Test 1	Test 2	Test 3/End-Semester Examination
1.	Remember	20	10	10
2.	Understand	30	30	30
3.	Apply	40	40	40
4.	Analyze	10	20	20
5.	Evaluate	0	0	0
6.	Create	0	0	0

**Course Level Learning Objectives:****Remember**

1. Define E- Commerce.
2. State the definition of EDI.
3. What is Credit Transaction Trade Cycle?
4. State any two advantages of Electronic Markets..
5. What is Business to Consumer electronic commerce?
6. What is Internet?
7. Define E-Security.
8. What is Virus?
9. State any two legal and Ethical Issues.
10. What is Electronic Newspaper?

**Understand**

1. Explain the following terms:
  - (i) Supply Chain
  - (ii) Value Chain
  - (iii) Competitive Advantage
  - (iv) Business Strategy
2. Explain in detail Electronic Data Interchange and how it is useful in implementation of E-Commerce.
3. Explain Business to Business E-Commerce in detail with one example.
4. State the advantages and disadvantages of Electronic market.
5. Discuss the various uses of Internet's.
6. Explain different kinds of Threats in E-Security

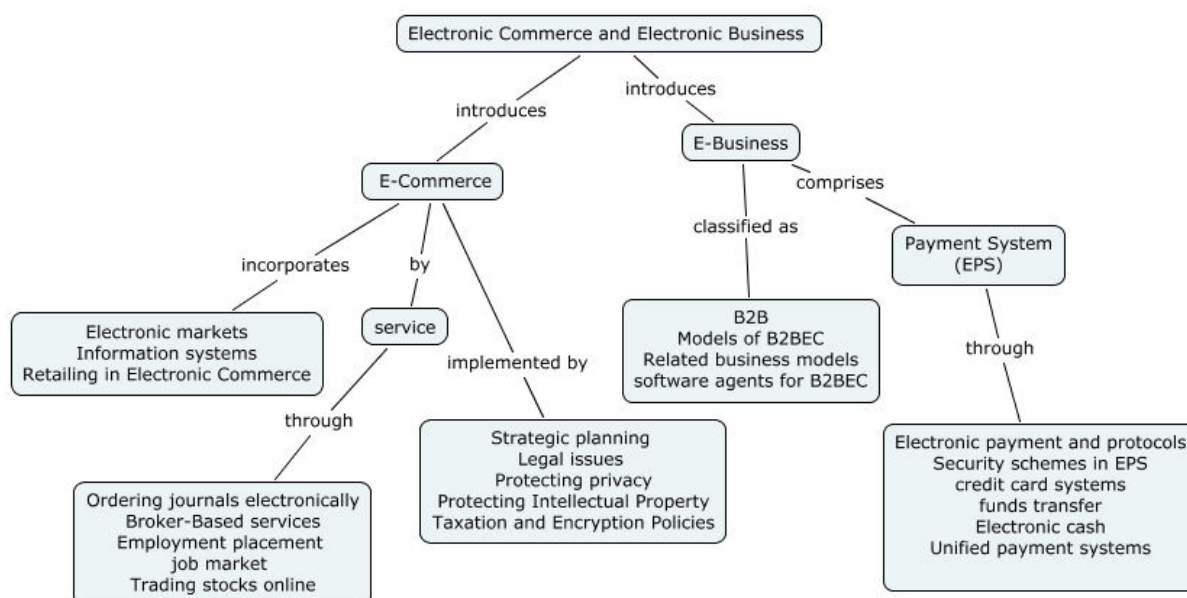
### **Apply**

1. Explain the Web Site Evaluation Model in detail and how do you apply it.
2. Explain in detail E- Security and how it will apply for an e-business.
3. Explain the Major threats to Ethics in detail
4. Explain the following Concepts with one example: Internet Book Shop, Virtual Auction, Online Share Dealing, and Electronic Newspaper
5. How could supply chain management be applied to a online book store.

### **Analyze**

1. Explain in detail Strategy formulation, Implementation Planning, Implementation and Evaluation of E-Commerce.
2. Analyze Business to Consumer E-Commerce in detail with one example.
3. Explain the Online Payments in detail and analyze it.

## Concept Map



## Course Content and Lecture Schedule

S.No	Topics	No. of Lectures
1	<b>Foundations of Electronic Commerce</b>	1
1.1	The EC field, Electronic markets	1
1.2	Information systems, Benefits and limitation of EC	1
1.3	Driving forces of Electronic Commerce, Impact of EC.	1
1.4	Retailing in Electronic Commerce	1
1.5	Overview-Forecast of the B2C Electronic markets, Business models of Electronic marketing	1
1.6	Online customer service, Procedure for internet shopping	2
1.7	Aiding comparison shopping, Impact of EC on traditional retailing systems.	1
2	<b>Electronic Commerce for service industries</b>	
2.1	Ordering journals electronically, Broker-Based services	1
2.2	Travel and tourism services, Employment placement	1
2.3	job market , Trading stocks online,	1

2.4	Cyber banking and personal finance	1
2.5	Electronic Auctions-Types of Auctions-Benefits and limitations-	1
2.6	Business to business Auction-Managerial issues.	2
2.7	Case Studies	2
3	<b>Business-to-Business Electronic Commerce (B2BEC)</b>	1
3.1	Overview, Characteristics of B2BEC	1
3.2	Models of B2BEC, Traditional EDI-Internet based EDI-Roll of software agents for B2BEC Electronic marketing in B2BEC-Solutions of B2BEC-Managerial issues.	2
3.3	Intranet and Extranet-Architecture of the Internet	1
3.4	Intranet, Extranet-Applications, Related business models.	1
3.5	Mobile Commerce in B2B and B2C	2
3.6	Technical aspects of M-Commerce and Case Studies	3
3.6	<b>Electronic Payment Systems (EPS)-Overview</b>	1
3.7	Electronic payment and protocols, Security schemes in EPS-Authentication, Authorization and Access Rights	2
3.8	Electronic credit card systems, Electronic funds transfer, Prospects of EPS	1
3.9	Case Studies	2
4	<b>Electronic Commerce strategy and implementation-</b>	
4.1	Electronic Business's strategy, Strategic planning for Electronic Commerce	1
4.2	Competitive intelligence on the internet, Legal issues to Privacy in Electronic Commerce (EC)	1
4.3	Ethical issues-Protecting privacy, Protecting Intellectual Property-	1
4.4	Taxation and Encryption Policies, Consumer and Seller protection in EC.	1
4.5	Infrastructure for EC-Internet protocols, Client/Server technology-	1
4.6	Internet Security, Selling on the web-Multimedia delivery	1
4.7	Webcasting, Challenges and Opportunities	2
4.8	Case Studies	2
	Total	45

## Syllabus

**Foundations of Electronic Commerce** (EC)-The EC field-Electronic markets-Information systems-Benefits and limitation of EC-Driving forces of Electronic Commerce-Impact of EC. Retailing in Electronic Commerce-Overview-Forecast of the B2C Electronic markets. **Electronic Commerce for service industries**-Ordering journals electronically-services-Employment placement and job market-Trading stocks online-Cyber banking and personal finance-Electronic Auctions. **Business-to-Business Electronic Commerce** (B2BEC)-Models of B2BEC-Traditional EDI-software agents for B2BEC-solutions of B2BEC-Managerial issues. Intranet and Extranet. **Electronic Payment Systems** (EPS)-Electronic payment and protocols-Security schemes in EPS-Electronic credit card systems-Electronic funds transfer-Electronic cash-Unified payment systems-Prospects of EPS. **Electronic Commerce strategy and implementation**-Strategic planning for Electronic Commerce-Competitive intelligence on the internet. Legal issues to Privacy in Electronic Commerce (EC)-Internet protocols-Client/Server technology-Internet Security-Selling on the web-Multimedia delivery-Webcasting-Challenges and Opportunities.

### References:

1. "Electronic Commerce-A Managerial Perspective", Efraim Turban, Jae Lee, David King and H.Micheal Chung, Person Education,2008. Chapters 1, 2, 5, 6, 7, 8, 9, 10 and 11.
2. "Electronic Commerce: A Managers Guide", Ravi Kalakotta and Andrew B. Whinston, Person Education, 2009.
3. "E-Business and IS Solutions: An Architectural Approach to business Problems and Opportunities", William J. Buffan, Person Education, 2009.

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Sub.Code	Lectures	Tutorial	Practical	Credit
Y42	3	1	-	4

## Y42 Object Oriented Analysis And Design

**3 : 1**

**Preamble:** This course aims at facilitating the student to learn the object orientation on real world problems; analyze and design the problem domain using the principles and practices followed in industries in object oriented problem solving by applying Booch notations and UML based modeling.

### Competencies:

**At the end of the course, the students will be able to**

- Identify and implement appropriate object oriented analysis and design models for a given application
- Identify all the trade-offs involved in choosing the different object identification and classification techniques
- Identify the trade-offs involved in selecting the most efficient design document.
- Identify the benefits and risks of applying Object Oriented development.
- Understand the advantages of object oriented analysis and design using Unified Modeling Language and apply them for the given software development.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	Test 3 / End-Semester Examination
1	Remember	10	10	20
2	Understand	10	10	30
3	Apply	20	20	30
4	Analyze	10	10	20
5	Evaluate	0	0	0
6	Create	0	0	0

### Course Level Learning Objectives:

#### Remember

1. What is OOA and OOD?
2. Which tasks are involved in the OOA process?
3. What are the purposes of walkthroughs in OO development?
4. Explain the major elements and minor elements in detail.



5. Write the difference between algorithmic and object oriented decomposition.

**Understand**

1. Differentiate between design patterns and frameworks.
2. Which patterns are applied for structural purpose?
3. Write the steps involved in activity diagram development in Object Oriented Systems. Consider an "Online Medical Insurance System" and draw an activity diagram for it.
4. "OO improves real time problem development" – Justify.
5. How design patterns helps in objects refinement process? Give examples.

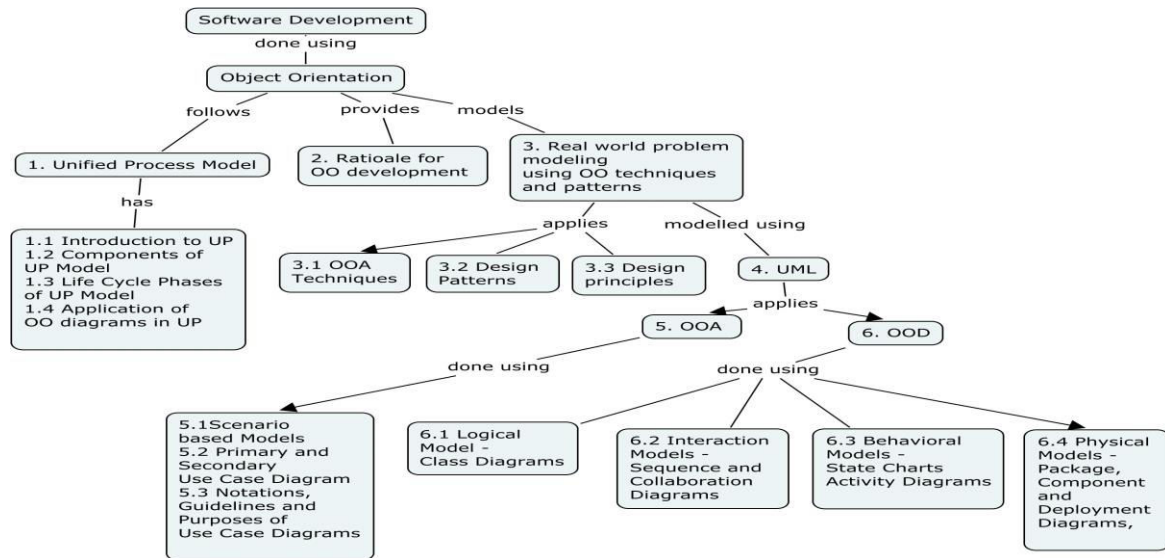
**Apply**

1. Apply the different ways of classifying the objects and classes in OOA for an application.
2. Consider a simple 'Telephone Billing System'. Draw class diagram for it by applying UML notation.
3. Consider an 'Online Vehicle Purchase System'. Apply UML based object oriented analysis and design to draw primary use case diagram, swimlane activity diagram and State Diagram for it.
4. Apply behavioral patterns in your own system development to achieve object orientation.
5. Consider an 'Online Product Purchase System'. Apply design principles in it to identify the classes in it.

**Analyze**

1. Consider an object 'distance' that has coordinate values as (10,10). Analyze the different possibilities of its identity changes in an OO system.
2. Analyze the impact of object orientation over structured approach in industrial strength software development.
3. Consider the "Withdraw amount" module in an ATM application. Analyze this scenario and generate state chart in UML by identifying states and state transitions in it.
4. Which diagrams will you use if you need to show the physical relationship between software components and the hardware in the delivered system?
5. Develop the logical and physical views for an "Online Library Management System".

## Concept Map



## Course Content and Lecture Schedule

No.	Topic	No. of Lectures
1	<b>Unified Process in Object Oriented Software Development</b>	
1.1	Basics of Software Development Process	1
1.2	Introduction to UP	1
1.3	Components of Unified Process Model	1
1.4	Life Cycle Phases of Unified Process Model	3
1.5	Application of OO diagrams in UP	1
2	<b>Rationale for OO development</b>	
2.1	Object Orientation in Software development process	2
2.2	Flavors of Object Orientation	2
2.3	Basic Entities and Constructs of Object Orientation	2
2.4	Structured Approach Vs. Object Orientated Approach	1
3	<b>Modeling the real world problems using OO techniques and Design Patterns</b>	
3.1	OOA - Techniques for Objects Identification	2
3.2	OOD - Design Principles in Class Design	2
3.3	OOD - Design Patterns in Classes and Objects Identification and Refinement	3

No.	Topic	No. of Lectures
4	<b>Modeling with UML</b>	
4.1	Problem Domain Understanding	1
4.2	Traditional Analysis Methods and Models	2
4.3	Characteristics of Good Analysis	1
4.4	Deficiency with the traditional approaches	1
4.5	UML - Introduction	1
4.6	UML diagrams for OOA and OOD	1
5	<b>Object Oriented Analysis</b>	
5.1	Scenario based Models - Use Case Analysis	1
5.2	Primary and Secondary Use Case Diagram	2
5.3	Notations, Guidelines, Purposes of Use Case Diagrams	2
6	<b>Object Oriented Design</b>	
6.1	Logical Model -UML Class Diagram basic and advanced concepts	2
6.2	Interaction Models – Sequence and Collaboration Diagrams	2
6.3	Behavioral Models – State Charts and Activity Diagrams	2
6.4	Physical Models – Package, Component and Deployment Diagrams	2
6.5	Case Study - Tutorial	1
	Total	42

### Syllabus

**Unified Process in Object Oriented Software Development** - Basics of Software Development Process, Introduction to UP, Components of Unified Process Model, Life Cycle Phases of Unified Process Model, Application of OO diagrams in UP, **Rationale for OO development** - Object Orientation in Software development process, Flavors of Object Orientation, Basic Entities and Constructs of Object Orientation, Structured Approach Vs. Object Orientated Approach, **Modeling the real world problems using OO techniques and Design Patterns** - Object Oriented Analysis (OOA) of problem domain, OOA Techniques for Objects Identification, Object Oriented Design (OOD) of problem domain, Design Principles in Class Design, Design Patterns in Classes and Objects Identification and Refinement, **Modeling with UML** - Problem Domain Understanding, Traditional Analysis Methods and Models, Characteristics of Good Analysis, Deficiency with the traditional approaches, UML – Introduction, UML diagrams for OOA and OOD, **Object Oriented Analysis using UML**- Scenario based Models - Use

Case Analysis - Primary and Secondary Use Case Diagram - Notations, Guidelines, Purposes of Use Case Diagrams, **Object Oriented Design using UML**- Logical Model - UML Class Diagram basic and advanced concepts - Interaction Models – Sequence and Collaboration Diagrams, Behavioral Models, State Charts and Activity Diagrams, Physical Models – Package, Component and Deployment Diagrams, Case Study - Tutorial

**References:**

1. Grady Booch, Robert A.Maksmichuk, Michael W.Engle, Bobbi J.Young, Jim Conallen, Kelli A. Houston, "Object-oriented analysis and design with applications", Third edition, Pearson Education, 2011.
2. Martin Fowler, "UML Distilled", Third edition, Pearson Education, 2011.
3. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns: Elements of Reusable Object-Oriented Software", First Edition, Addison-Wesley Professional, 1994.
4. Ali Bahrami, "Object-oriented system development", First Edition, Tata McGraw Hill, 1999.
5. Hans-Erik Eriksson and Magnus Penker , UML toolkit , John Wiley,1998.

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Sub Code	Lectures	Tutorial	Practical	Credit
Y4A	3	--	--	3

## Y4A Component Based Technologies

**3 : 0**

### Preamble

To introduce the development of software components and give in-depth knowledge of the existing software component solutions.

### Competencies

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

- Understand the idea of breaking large, complex software applications into software components
- Develop reusable software components.
- Understand and analyze the component models - CORBA, DCOM and EJB.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	Test 3/End-Semester Examination
1.	Remember	30	30	30
2.	Understand	40	40	30
3.	Apply	30	30	40
4.	Analyze	0	0	0
5.	Evaluate	0	0	0
6.	Create	0	0	0

### Course Level Learning Objectives:

#### Remember

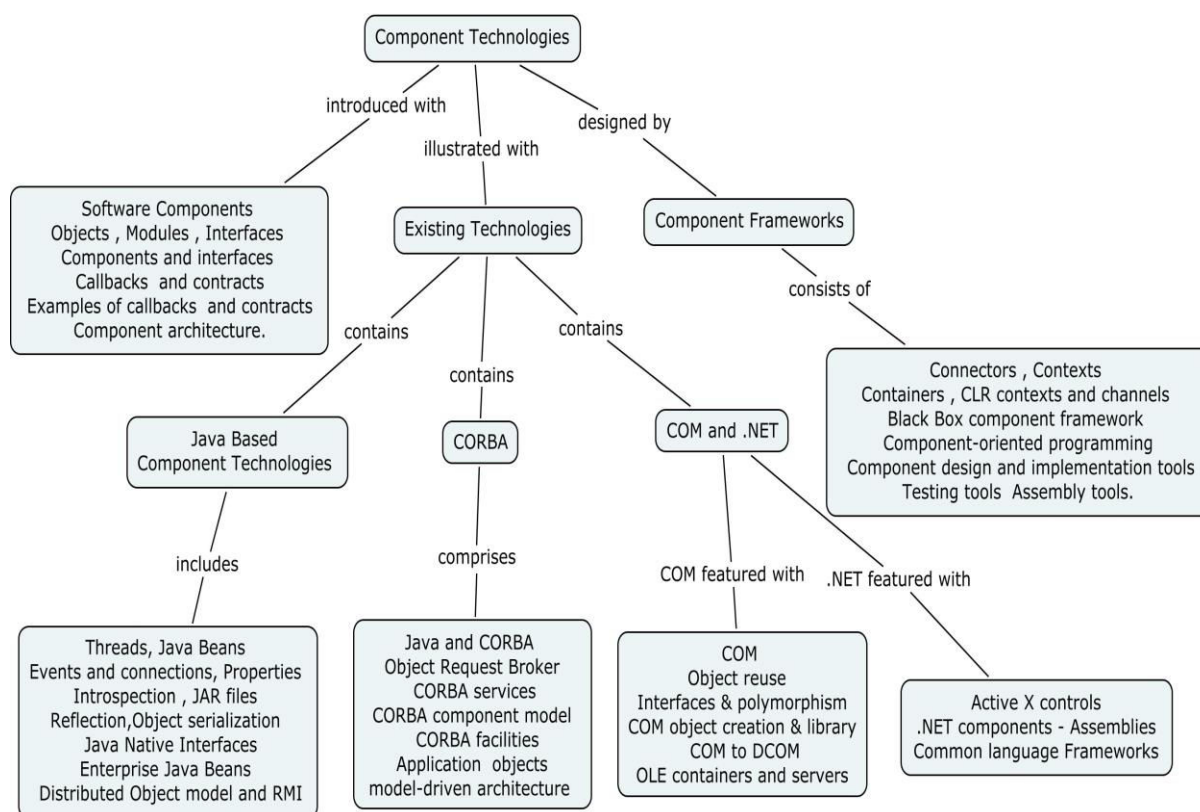
1. Compare Components Vs. Objects.
2. Define Callback, Give an example.
3. Draw the Java thread state transition diagram.
4. What do you mean by object serialization?
5. List down the CORBA services that supports enterprise distributed computing.

#### Understand

1. What are the different aspects of Java Bean, explain with relevant code?
2. Discuss about EJB architecture and different types of Beans with sample code.
3. With neat diagram explain on How Object Request Broker used in CORBA.
4. Write a short note on model driven architecture.
5. Explain the interaction between COM OLE container and server.

**Apply**

1. By applying reflection and object serialization concepts, write a Java program to calculate volume and area for different solids.
2. Generate an application by applying callbacks and contracts.
3. Demonstrate the use of CORBA facilities and portable object broker.
4. By applying anyone of the testing tool carry out testing on any component.
5. Develop a component framework by applying contexts and connectors.

**Concept Map****Course Content and Lecture Schedule**

S.No	Topics	No. of Lectures
1	<b>Introduction to component technologies</b>	
1.1	Software Components	2

1.2	Objects – modules – interfaces	1
1.3	Components and interfaces	2
1.4	Callbacks and contracts– Examples of callbacks and contracts	2
1.5	Component architecture	1
2	<b>Java Component Technologies</b>	
2.1	Threads – Java Beans	2
2.2	Events and connections –Properties	1
2.3	Introspection – JAR files	1
2.4	Object serialization	1
2.5	Reflection -- Java Native Interfaces	2
2.6	Enterprise Java Beans	1
2.7	Distributed Object model and RMI	1
3	<b>Corba Technologies</b>	
3.1	Java and CORBA	2
3.2	Object Request Broker	1
3.3	CORBA services	2
3.4	CORBA component model	1
3.5	CORBA facilities	2
3.6	Application objects– model-driven architecture	1
4	<b>COM And .NET Technologies</b>	
4.1	COM – object reuse	1
4.2	Interfaces and polymorphism	2
4.3	COM object creation and library	2
4.4	From COM to DCOM-OLE containers and servers	1
4.5	Active X controls – .NET components	2
4.6	Assemblies –Common language Frameworks	2
5	<b>Component Frameworks And Development</b>	
5.1	Connectors – Contexts	1
5.2	Containers – CLR contexts and channels	2
5.3	Black Box component framework	1

5.4	Component-oriented programming	2
5.5	Component design and implementation tools- Testing tools- Assembly tools	2
	<b>Total</b>	44

## Syllabus

**Introduction** Software Components – objects – modules – interfaces – components and interfaces- callbacks and contracts- Examples of callbacks and contracts -component architecture.**Java Based Component Technologies** Threads – Java Beans – Events and connections – properties – introspection – JAR files – reflection – object serialization – Java Native Interfaces-Enterprise Java Beans – Distributed Object model and RMI.**Corba Component Technologies** Java and CORBA – Object Request Broker – CORBA services – CORBA component model – CORBA facilities- Application objects- model-driven architecture **COM And. NET Technologies** COM – object reuse – interfaces and polymorphism-COM object creation and library- From COM to DCOM-OLE containers and servers – Active X controls – .NET components - assemblies –Common language Frameworks. **Component Frameworks And Development** Connectors – contexts – containers – CLR contexts and channels – Black Box component framework – component-oriented programming – Component design and implementation tools – testing tools - assembly tools.

## References:

1. Clements Szyperski, Dominik, Stephen "Component Software: Beyond Object-Oriented Programming, 2/E", ACM Press, Reprint: 2011.
2. Jason Pritchard, "COM and CORBA Side by Side: Architectures, Strategies, and Implementations", Pearson Education Publishes, 2008.
3. Ed Roman, "Mastering Enterprise Java Beans", Third Edition, Wiley, Reprint 2009.
4. Mowbray, "Inside CORBA: Distributed Object Standards and Applications", Pearson Education, 2006.
5. Kuth Short, "Component Based Development and Object Modeling", Sterling Software, 1997.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y4B	3	--	--	3

**Y4B Programming In C# Using .Net****3: 0****Preamble**

To understand the syntactical features of C# language and use the design of the language to develop robust software.

**Competencies**

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

- Understand the .NET framework.
- Comprehend and apply the general programming structure of C#
- Develop windows application and web applications in .NET framework
- Learn the advanced features of .NET programming

**Assessment Pattern**

	Bloom's Category	Test 1	Test 2	Test 3/ End-Semester Examination
1.	Remember	20	20	20
2.	Understand	30	20	20
3.	Apply	40	50	50
4.	Analyze	10	10	10
5.	Evaluate	0	0	0
6.	Create	0	0	0

**Course Level Learning Objectives:****Remember**

1. What are the advantages of using .NET?
2. What do you mean by CLR?
3. What is the use of CTS?
4. What is CLS?
5. What do you mean by reference type? Give example.
6. What do you mean by Jagged Arrays?
7. What is the Role of XML Web services?
8. What is string? How strings are declared?
9. What is structure? How it is created in C#?
10. How to compare two objects in C#?

### **Understand**

1. Explain in detail about the activities of CLR.
2. Explain about interfaces in C#.
3. What is dialog box? What are the different types of dialog box? Write the program for creating dialog boxes. What is the difference between the methods open ( ) and openRead ( ) of the class FileInfo?
4. What is OleDbDataReader? How to insert update and delete Records using OleDb command.
5. Explain in detail about various ASP.NET webform controls.

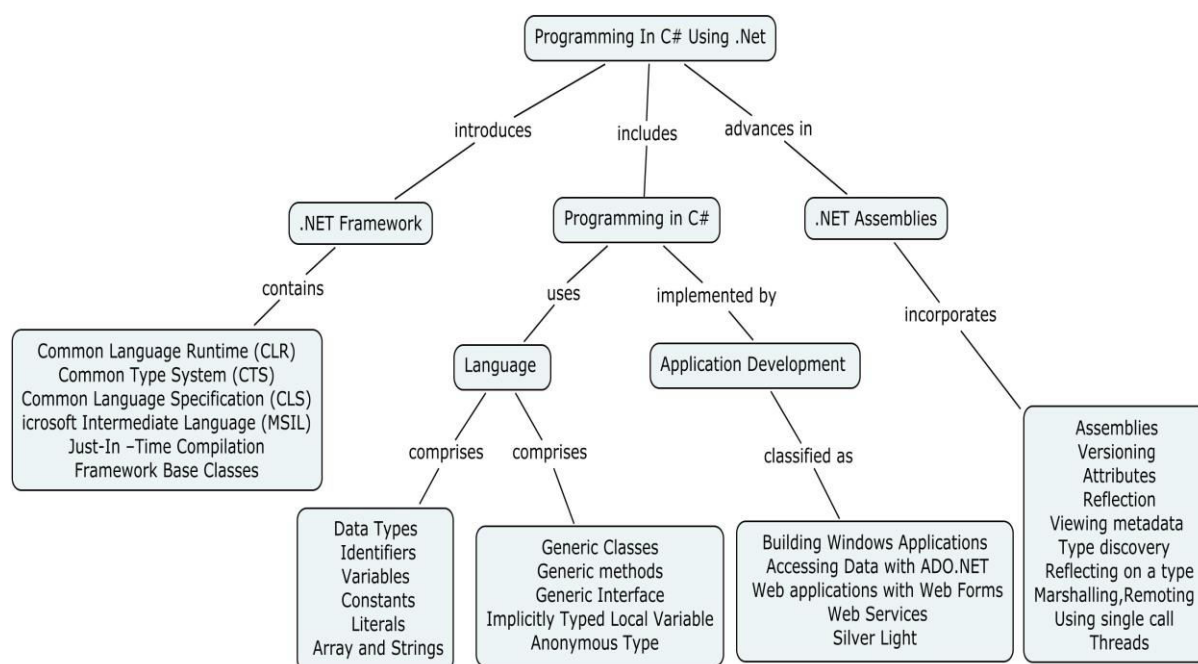
### **Apply**

1. Explain and apply the steps to be followed to create the complete data table.
2. What is the purpose of applying the method Peek ( ) of class TextReader?
3. What is event? How events are created? Give example.
4. Explain in detail about various operators available in C# and apply it in your program.
5. Write a C# code for Exception Handling.

### **Analyze**

1. Analyze the building blocks of an XML web service.
2. What is the use of Binary Reader and Binary Writer? Explain with a suitable program.
3. List out the various ADO.NET Namespaces.
4. Explain about various Namespaces of .NET framework.
5. Justify your argument over using .NET frame work for a distributed application.

## Concept Map



## Course Content and Lecture Schedule

S.No	Topics	No. of Lectures
1	<b>The .Net framework</b>	
1.1	Introduction, The Origin of .Net Technology,.	2
1.2	Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS)	1
1.3	Microsoft Intermediate Language (MSIL), Just-In-Time Compilation	2
1.4	Framework Base Classes	2
2	<b>C -Sharp Language</b>	
2.1	Introduction-Data Types, Identifiers, Variables, Constants, Literals	2
2.2	Array and Strings	2
2.3	OOPS concepts	2
2.4	Delegates and Events	2

2.5	Generic Classes-Generic methods-Generic Interface	2
2.6	Implicitly Typed Local Variable- Anonymous Type	1
3	<b>Application Development on .NET</b>	
3.1	Building Windows Applications	3
3.2	Accessing Data with ADO.NET	3
3.3	Web applications with Web Forms	3
3.4	Web Services	3
4	<b>.NET Assemblies</b>	
4.1	Assemblies-Introduction	2
4.2	Versioning, Attributes	2
4.3	Reflection- Viewing metadata Type discovery – Reflecting on a type	2
4.4	Marshalling – Remoting	2
4.5	Using single call – Threads	2
4.6	Silver Light	2
	Total	42

### Syllabus

**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. **C -Sharp Language:** Introduction-Data Types, Identifiers, Variables, Constants, Literals, Array and Strings,-OOPS concepts-Delegates and Events- -Generic Classes-Generic methods-Generic Interface-Implicitly Typed Local Variable- Anonymous Type. **Application Development on .NET:** Building Windows Applications. Accessing Data with ADO.NET. Web applications with Web Forms, Web Services **.NET Assemblies:** Assemblies- Versioning- Attributes- Reflection- Viewing metadata – Type discovery – Reflecting on a type – Marshalling – Remoting – Using single call – Threads-Silver Light.

### References :

1. Liberty, J., Donald Xie, "Programming C# 3.0", 5th Edition, O'Reilly, 2007
2. Herbert Schildt, C# 3.0 The Complete Reference 3/E., McGraw-Hill, 2008.
3. Andrew Troelsen, "Pro C# with .NET 3.0", APress, 2007.
4. Robinson, "Professional C#", 3rd Edition, Wrox Press, 2004.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y4C	3	--	--	3

## Y4C Software Project Management

**3 : 0**

### Preamble

To provide a sound understanding of

- The application of project management concepts with problem domains.
- Incorporating leadership and management qualities in software project development

### Competencies

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

- Apply software project management principles for successful software project development
- Develop software metrics for successful software project development

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	Test 3/ End-Semester Examination
1.	Remember	20	10	10
2.	Understand	30	20	20
3.	Apply	40	40	40
4.	Analyze	10	20	20
5.	Evaluate	0	10	10
6.	Create	0	0	0

### Course Level Learning Objectives:

#### Remember

1. What is software project management?
2. Define process.
3. List the characteristics of software projects.
4. Define a product breakdown structure.
5. How plans, methods and methodologies differ from each other?
6. How to identify and estimate the cost of project?
7. What are the categories of software projects?
8. What are the activities of project management?
9. What is ROI? How it is calculated?
10. Define activity.

### **Understand**

1. Explain the various activities covered by software project management.
2. Diagrammatically explain the ISO 12207 SDLC activities.
3. List the Outline of stepwise project planning.
4. What is risk management? How the risks are evaluated in software projects?
5. How do you estimate the cost for a project?
6. Write the differences between SLOC and FP.

### **Apply**

1. What is project schedule? Explain the stages of project schedules and apply it for some project.
2. Describe with an example how the effect of risk on project schedule is evaluated using PERT.
3. Using the basic COCOMO model, under all three operating modes, determine the performance relation for the ratio of delivered source code lines per person-month of effort. Determine the reasonableness of this relation for several types of software projects.
4. What are the top 10 software management principles in modern project profile? How can it be applied?
5. Apply the top 10 industrial software metrics in conventional software management performance.

### **Analyze**

1. Analyze outline of step wise planning activities for a project with neat diagram.
2. Explain objectives of activity planning in detail.
3. Define hazard. How are hazards identified and analyzed?
4. Specify, Design, and develop a program that implements COCOMO. Using references [Boehm81] as a guide, extend and analyze the program so that it can be used as a planning tool.

### **Evaluate**

1. Evaluate how cost- benefit evaluation techniques can be used to choose the best among competing project proposal.
2. Consider a project to develop a full screen editor. The major components identified are (1) Screen edit (2) Command language Interpreter (3) file input and output, (4) Cursor movement and (5) screen movement. The sizes are estimated to be 4k, 2k, 1k, 2k and 3k delivered source code lines. Use COCOMO model to evaluate:

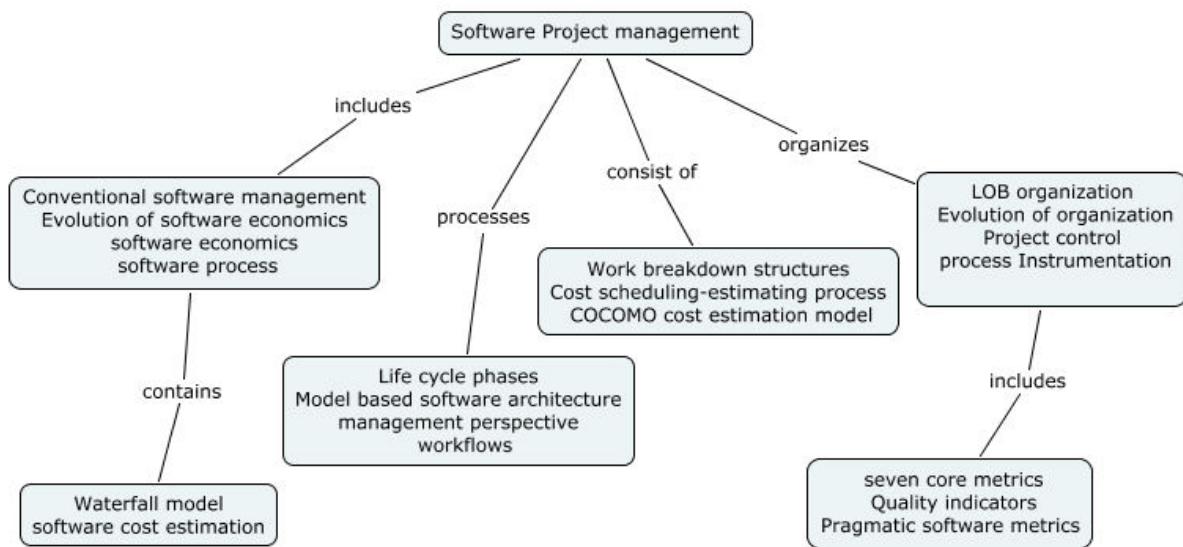
(a) Overall cost and schedule estimates (assume values for different cost drivers, with at least three of them being different from 1.0)

(b) Cost and schedule estimates for different phases.

3. Explain how object-oriented methods and visual modeling help in reducing the project size.

4. Evaluate the different levels of software process.

### Concept Map



### Course Content and Lecture Schedule

S.No	Topics	No. of Lectures
1	<b>Software Management</b>	
1.1	Conventional software management	2
1.2	Waterfall model	2
1.3	Evolution of software economics	1
1.4	Pragmatic software cost estimation	3
1.5	Improving software economics	1
1.6	Improving software process	2
	<b>Software Management process framework</b>	
1.7	Life cycle phases	3



1.8	Model based software architecture-management perspective	1
1.9	Software process workflows	2
2	<b>Software management Disciplines</b>	
2.1	Iterative Process planning	1
2.2	Work breakdown structures	1
2.3	Cost, scheduling-estimating process	2
2.4	COCOMO cost estimation model	1
	<b>Project organizations and responsibilities</b>	
2.5	LOB organization, Evolution of organization	2
2.6	Project control and process Instrumentation – seven core metrics	2
2.7	Quality indicators	1
2.8	Pragmatic software metrics	1
2.9	Case study	3
3	<b>Modern project profiles</b>	
3.1	Continuous integration	1
3.2	Early risk resolution, project risks	3
3.3	Software Management principles	2
3.4	Software Management practices	2
3.5	Case study	3
	Total	40

### Syllabus

**Software Management** - Conventional software management, Waterfall model, Evolution of software economics, Pragmatic software cost estimation, Improving software economics, and improving software process. **Software Management process framework** - Life cycle phases, Model based software architecture-management perspective, Software process workflows. **Software management Disciplines** - Iterative Process planning, Work breakdown structures, Cost, scheduling-estimating process, COCOMO cost estimation model. **Project organizations and responsibilities** - LOB organization, Evolution of organization, Project control and process Instrumentation – seven core metrics, Quality indicators, Pragmatic software metrics.

**Modern project profiles** - Continuous integration, Early risk resolution, project risks, Software Management principles, Software Management practices.

**References:**

- 1.Walker Royce, "Software Project Management", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011.
- 2.Bob Hughes, Mikecatterell, "Software Project Management", Third Edition, Tata McGraw Hill, 2004
- 3.Robert T. Futrell, Donald F. Shefer and Linda I. Shefer, "Quality Software Project Management", Pearson Education, 2003.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y4D	3	--	--	3

**Y4D Information Retrieval****3:0****Preamble:**

This course is intended to explore the practices, issues and theoretical foundations of organizing and analyzing information and information content for the purpose of providing intellectual access to textual and non-textual information resources.

**Competencies**

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

- Explain the principles and process of Information Retrieval
- Understand the process of search system and evaluation in information retrieval.
- Use a set of tools and procedures for organizing information
- Use different theoretical foundations, methods and measurements to analyze and evaluate major types of information retrieval systems and search engine.
- Analyze the crucial role of relevance feedback in IR Systems.

**Assessment Pattern**

	Bloom's Category	Test 1	Test 2	Test 3 / End-Semester Examination
1	Remember	20	20	20
2	Understand	30	30	30
3	Apply	30	30	30
4	Analyze	20	20	20
5	Evaluate	0	0	0
6	Create	0	0	0

**Course Level Learning Objectives:****Remember**

1. Define each of the following concepts, giving an example in the context of the above text if applicable:
  - (i) sure-fire rule;
  - (ii) lexico-semantic template;
  - (iii) inference rule
  - (iv) template learning
2. Illustrate conflation algorithm in detail.
3. Write a note on: a) Single link algorithm b) Single pass algorithm.

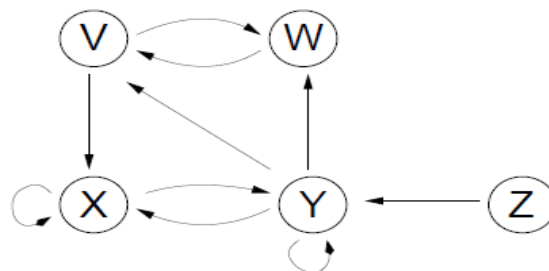
4. Describe the information access process.
5. Write down the Tdf-idf document relevance rating formula.
6. Define the concept of PageRank.
7. What is data centric xml retrieval?

### Understand

1. Describe clustering in detail with example.
2. Describe how the factor of weight is used in IR retrieval.
3. Compare Parallel IR & Distributed IR.
4. Explain how the random surfer moves about the web.
5. Find differences between meta crawler and meta searcher.
6. Why is page ranking relevant for web search?
7. How is term weighting used to position objects in the space? Why is term weighting important for effective document retrieval?

### Apply

1. Provide a table chart to differentiate Data retrieval & Information retrieval.
2. Suggest one way in which the orthogonality assumption could be relaxed.
3. Describe how the random surfer can be modelled as an ergodic Markov chain, and how this leads to the PageRank values being calculated as the principal left eigenvector of the transition probability matrix.
4. Give the linkage matrix A of the network given in the diagram below.



Show the final matrix that will be subjected to the PageRank calculation, if  $q = 0.8$  is used.

5. The figure below shows the output of two information retrieval systems on the same two queries in a competitive evaluation. The top 15 ranks are shown. Crosses correspond to a document which has been judged relevant by a human judge; dashes correspond to irrelevant documents. There are no relevant documents in lower ranks.

System 1		
Rank	Q1	Q2
1	–	X
2	X	–
3	X	–
4	X	–
5	–	–
6	–	–
7	–	–
8	X	–
9	X	–
10	X	–
11	X	–
12	–	–
13	–	X
14	–	X
15	X	–

System 2		
Rank	Q1	Q2
1	X	X
2	X	–
3	X	–
4	–	X
5	X	X
6	X	–
7	–	–
8	–	–
9	–	–
10	–	–
11	X	–
12	X	–
13	–	–
14	–	–
15	X	–

- Give the formula for mean average precision (MAP), and illustrate the metric by calculating System 1's MAP.
- For each system, draw a precision-recall curve. Explain how you arrived at your result. How could one create more informative curves?

### Analyze

- Consider the following text, which gives the input to three different information extraction systems dealing with texts about job succession events.

Last Monday Rajnath resigned his position as CEO of Sparkling Inc., the well-known cleaning supply manufacturer, following recent corruption allegations. This move has been expected for some time now. He is succeeded by his brother, RajPrasath.

The tasks of the three systems are as follows:

- System 1 determines all person and organisation names.
- System 2 determines the employed-by relationship, which holds between employees and employers.

- System 3 fills templates about job successions, in the style of MUC templates (as in the following figure).

<p>START-JOB-EVENT</p> <p>Person:</p> <p>Position:</p> <p>Company:</p> <p>Start Date:</p>	<p>END-JOB-EVENT</p> <p>Person:</p> <p>Position:</p>
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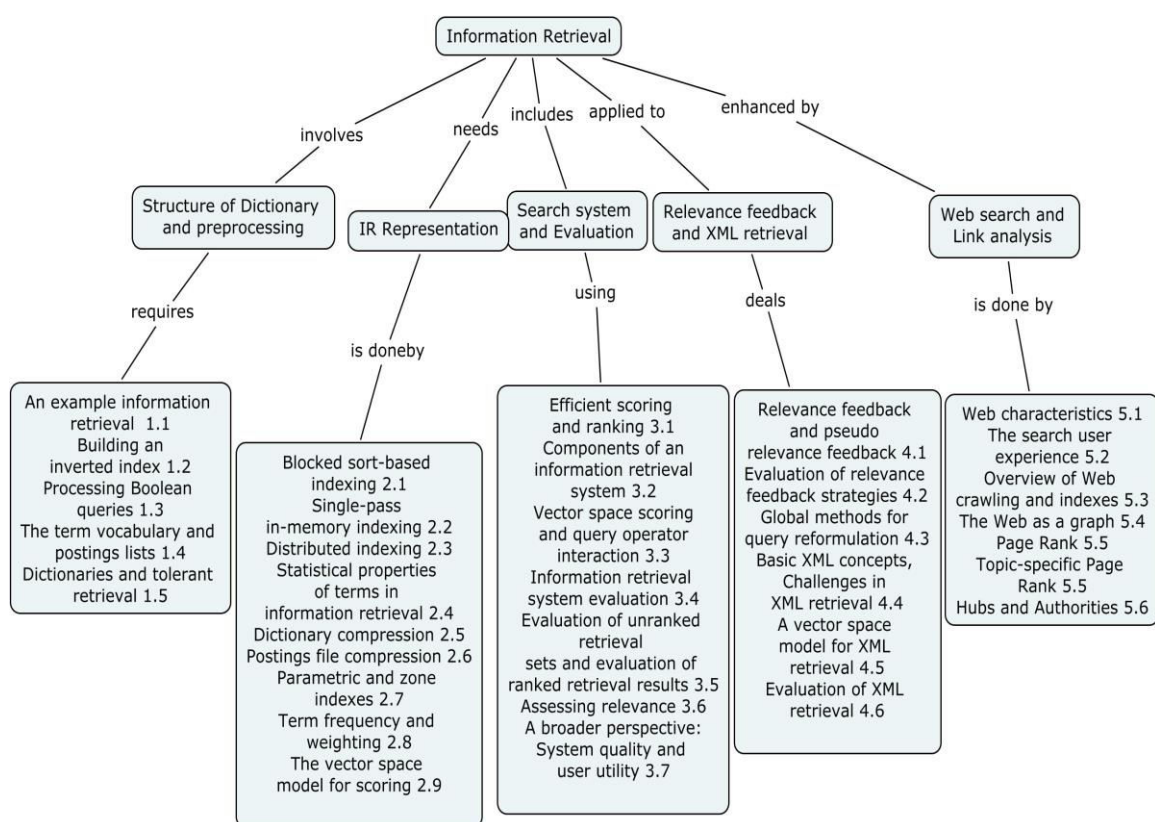
For each system, give a description of how it could plausibly solve its task. What is the most difficult problem each system will encounter? Use examples from the text.

- The figure below shows the output of two information retrieval systems on the same two queries in a competitive evaluation. The top 15 ranks are shown. Crosses correspond to a document which has been judged relevant by a human judge; dashes correspond to irrelevant documents. There are no relevant documents in lower ranks.

System 1			System 2		
Rank	Q1	Q2	Rank	Q1	Q2
1	–	X	1	X	X
2	X	–	2	X	–
3	X	–	3	X	–
4	X	–	4	–	X
5	–	–	5	X	X
6	–	–	6	X	–
7	–	–	7	–	–
8	X	–	8	–	–
9	X	–	9	–	–
10	X	–	10	–	–
11	X	–	11	X	–
12	–	–	12	X	–
13	–	X	13	–	–
14	–	X	14	–	–
15	X	–	15	X	–

- Explicate the following evaluation metrics and give results for query Q1 for both systems.
    - Precision at rank 10.
    - Recall at precision
  - The metrics in part (a) above are not adequate measures of system performance for arbitrary queries. Why not? What other disadvantages do these metrics have?
- Bring out a comparison chart when relevance feedback and pseudo relevance feedback is applied to document retrieval.
  - Analyze the page ranking algorithms used by any one of the popular search engines.

## Concept Map



## Course Content and Lecture Schedule

No	Topic	No of Lectures
<b>1.</b>	<b>Structure of Dictionary and preprocessing (10)</b>	
1.1	An example information retrieval problem	1
1.2	Building an inverted index	1
1.3	Processing Boolean queries	2
1.4	The term vocabulary and postings lists	1
1.5	Dictionaries and tolerant retrieval	1
<b>2.</b>	<b>IR Representation (10)</b>	
2.1	Blocked sort-based indexing	1
2.2	Single-pass in-memory indexing	1
2.3	Distributed indexing	1
2.4	Statistical properties of terms in information retrieval	2

2.5	Dictionary compression	1
2.6	Postings file compression	1
2.7	Parametric and zone indexes	1
2.8	Term frequency and weighting	1
2.9	The vector space model for scoring	2
<b>3.</b>	<b>Search system and Evaluation (10)</b>	
3.1	Efficient scoring and ranking	1
3.2	Components of an information retrieval system	1
3.3	Vector space scoring and query operator interaction	1
3.4	Information retrieval system evaluation	1
3.5	Evaluation of unranked retrieval sets and evaluation of ranked retrieval results	1
3.6	Assessing relevance	1
3.7	A broader perspective: System quality and user utility	1
<b>4.</b>	<b>Relevance feedback and XML retrieval (10)</b>	
4.1	Relevance feedback and pseudo relevance feedback	2
4.2	Evaluation of relevance feedback strategies	2
4.3	Global methods for query reformulation	1
4.4	Basic XML concepts, Challenges in XML retrieval	1
4.5	A vector space model for XML retrieval	1
4.6	Evaluation of XML retrieval	1
<b>5.</b>	<b>Web search and Link analysis (10)</b>	
5.1	Web characteristics	2
5.2	The search user experience	1
5.3	Overview of Web crawling and indexes	1
5.4	The Web as a graph	1
5.5	Page Rank	1
5.6	Topic-specific Page Rank	2
5.7	Hubs and Authorities	2
	<b>Total</b>	<b>42</b>



## Syllabus

**Structure of Dictionary and preprocessing:** An example information retrieval problem , Processing Boolean queries, the extended Boolean model versus ranked retrieval, document delineation and character sequence decoding, obtaining the character sequence in a document determining the vocabulary of terms, tokenization, normalization, Stemming and lemmatization , search structures for dictionaries, general wildcard queries-gram indexes for wildcard queries, k-gram indexes for spelling correction, faster postings list intersection via skip pointers ,positional postings and phrase queries. **IR Representation** : hardware basics, blocked sort-based indexing ,single-pass in-memory indexing, distributed indexing, dynamic indexing, statistical properties of terms in information retrieval, heaps' law, Zipf's law, dictionary compression, parametric and zone indexes, weighted zone scoring, learning weights, term frequency and weighting, inverse document frequency, Tf-idf weighting, the vector space model for scoring. Variant tf-idf functions. **Search system and Evaluation:** efficient scoring and ranking ,inexact top K document retrieval, index elimination ,champion lists ,static quality scores and ordering, components of an information retrieval system ,tiered indexes, query-term proximity. Information retrieval system evaluation, standard test collections, evaluation of unranked retrieval sets, evaluation of ranked retrieval results, assessing relevance, a broader perspective: System quality and user utility, system issues. **Relevance feedback and XML retrieval:** Relevance feedback and pseudo relevance feedback ,the Rocchio algorithm for relevance feedback ,probabilistic relevance feedback ,relevance feedback on the web, evaluation of relevance feedback strategies, basic XML concepts, challenges in XML retrieval, a vector space model for XML retrieval, evaluation of XML retrieval, text-centric vs. data-centric XML retrieval **Web search and Link analysis:** Web search basics, web characteristics, the web graph, the search user experience, web crawling and indexes, features a crawler must provide, features a crawler should provide, crawler architecture, the Web as a graph, anchor text and the web graph, Page Rank, the Page Rank computation, topic-specific Page Rank, hubs and authorities

## References:

1. Christopher D.Manning, Prabhakar Raghavan and Hinrich Schütze, "An Introduction to Information Retrieval", Cambridge University Press Cambridge, England,2009.
2. David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms and Heuristics , Springer (2nd Edition), 2004

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y4E	3	0	--	3

**Y4E Wireless Ad Hoc Networks****3 : 0**

**Preamble:** The course aims at exploring the concepts of wireless networks, protocols, architectures and applications.

**Competencies:**

At the end of the course the student should be able to get

- An understanding of the basic principles of wireless networking and their standards.
- An understanding of wireless network topologies and ability to perform a network planning.
- An understanding of wireless network operations covering mobility and power management.

**Assessment Pattern**

	Bloom's Category	Test 1	Test 2	Test 3/ End-Semester Examination
1	Remember	20	20	10
2	Understand	30	20	10
3	Apply	0	10	10
4	Analyze	50	50	60
5	Evaluate	0	0	10
6	Create	0	0	0

**Course Level Learning Objectives****Remember:**

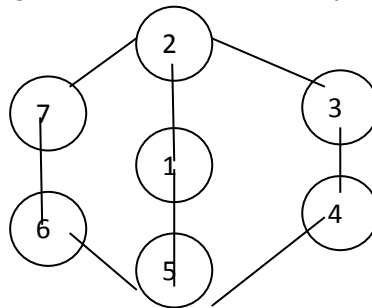
1. List the three important radio propagation phenomena at high frequencies.
2. Identify and list the limitation of Table driven routing protocols.
3. State the advantages of TORA.
4. Define confidentiality.
5. State the different classifications of energy management schemes.

### Understand:

1. Summarize the different issues in Ad hoc wireless networks.
2. Explain the RTS –CTS Mechanism involved in CSMA/CA.
3. Explain the concept of location aided routing.
4. Explain the working of source initiated protocols.
5. Explain the concept of security aware AODV protocol.

### Apply

1. Assume that when the current size of congestion window is 48 KB, the TCP sender experiences a timeout. What will be the congestion window size if the next three transmission bursts are successful? Assume that MSS is 1 KB. Consider TCP tahoe and TCP Reno.
2. For the network shown in figure construct the fisheye routing table for nodes 7 and 5.



3. Calculate the probability of a path break for an eight-hop path, given that the probability of line break is 0.2.
4. In a military vehicular ad hoc wireless network using PRTMAC, formed by 500 nodes distributed uniformly in a battlefield area of 1000 m x 1000 m, calculate the number of nodes contending for the data channel and for control channel. The transmission range of data channel is 250 m.
5. In a military vehicular ad hoc wireless network using PRTMAC, formed by 500 nodes distributed uniformly in a battlefield area of 1000 m x 1000 m, calculate the number of nodes contending for the data channel and for control channel. The transmission range of data channel is 250 m. Also find the probability that a beacon gets collided, when the beacons are generated periodically with a period of 10 seconds. Assume the beacon length to be equal to 1 ms.

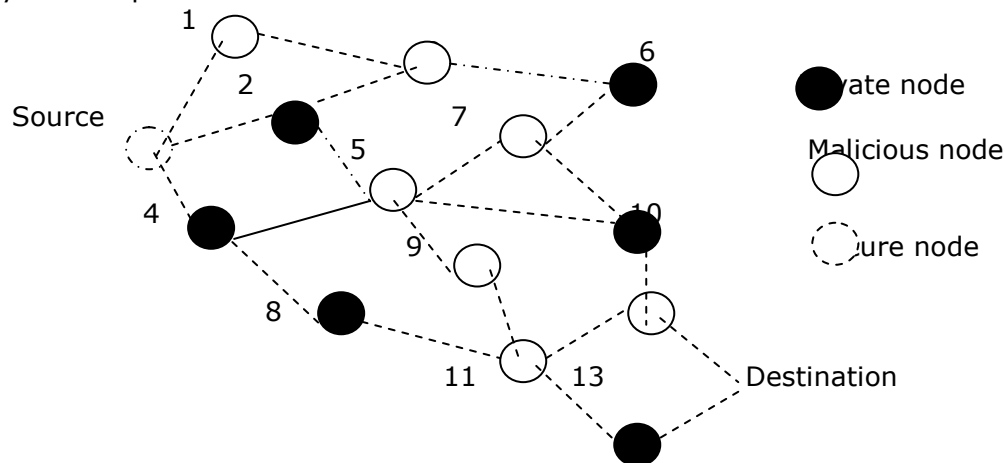
### Analyze:

1. Compare the different TCP solutions for Ad hoc wireless networks.
2. Examine the different phases of Associativity- Based Ad hoc Multicast routing.
3. Compare the various secure routing methods used in Ad hoc networks.
4. Examine the system power management schemes.

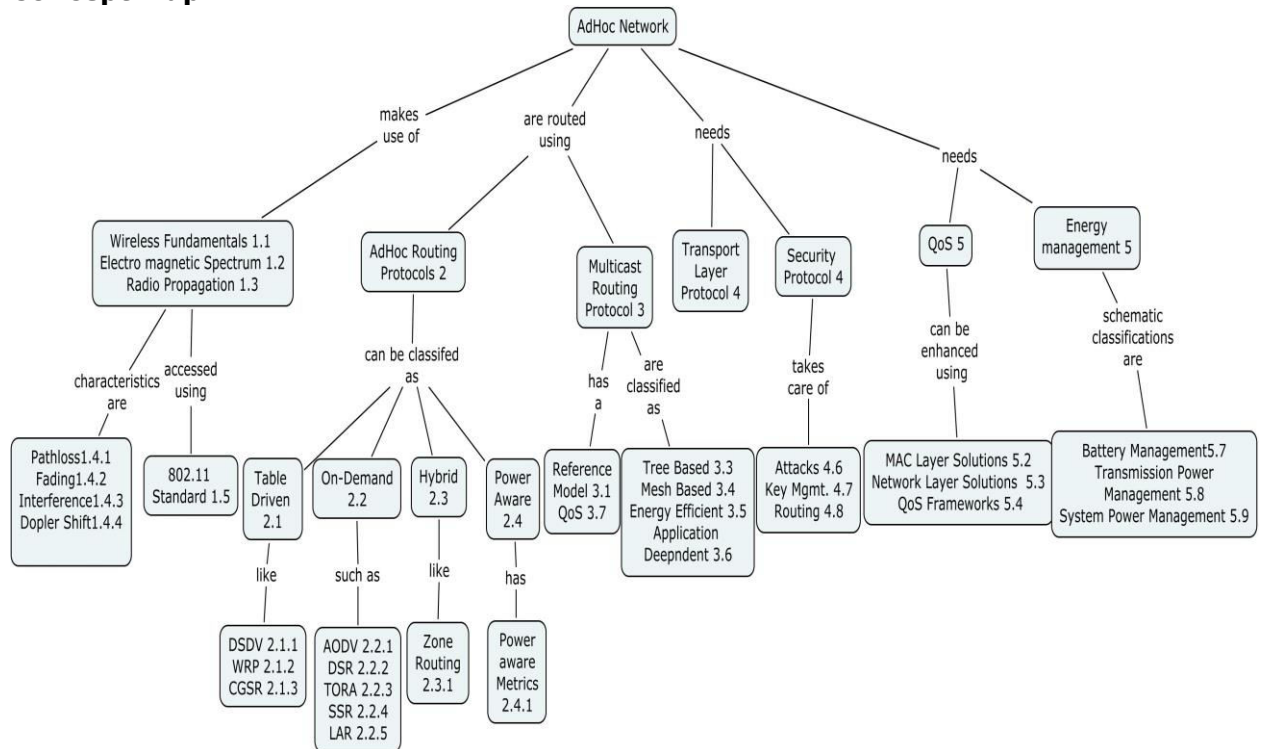
5. With A neat block diagram explain the concept of INSIGNIA Qos framework.

### Evaluate:

- Nodes A and B want to establish a secure communication, and node A generates a random key 11001001. Suppose the functions used by both the nodes A and B for encryption is XOR, and let node A generate a random transport key 10010101 and let node B generate 00101011. Sketch the three pass Shamir protocol exchanges.
- Predict the possible steps of the algorithms executed at the source and the intermediate nodes of an ad hoc wireless network that follow the following strategies: a) random energy b) pay-for-it strategy. Assume a session between source s and destination d. let  $R(s,d)$  be the set containing available routes between s and d,  $\text{sympathy}(k,r)$  be the kth node in route r, and  $\text{credit}(k,r)$  and  $\text{debit}(k,r)$  be the credit and debit of kth node in route r respectively.
- Mark the paths chosen by the following secure-routing protocols for the network topology shown in figure: a) Shortest path routing and b) SAR protocol. Assume that node 2 is secure node. C) If node 2 (which lies in the path chosen by SAR protocol) is suddenly attacked and becomes a malicious node, then mark an alternative path chosen by SAODV protocol.



- Estimate the approximate control overhead for the ODMRP protocol over a 200 second time period. Assume that all nodes are stationary. Number of nodes: 50 . Time period for sending a JoinReq : 2 secs.
- Estimate the approximate control overhead for the DCMP protocol over a 200 second time period. Assume that all nodes are stationary. S1 is a active source and S2 is a passive source. Number of nodes: 50 . Time period for sending a JoinReq : 2 secs.

**Concept Map****Course Content and Lecture schedule**

No	Topic	No of Lectures
<b>1</b>	<b>AdHoc Networks Introduction</b>	
1.1	Fundamentals of Wireless Communication	1
1.2	The Electromagnetic Spectrum	1
1.3	Radio Propagation Mechanisms	1
1.4	Characteristics of the Wireless Channel	1
1.5	IEEE 802.11 Standard	2
<b>2</b>	<b>Ad Hoc Routing Protocols</b>	
2.0	Issues and Challenges	1
2.1	Table-Driven Routing Protocols	2
2.2	On Demand Routing Protocols	2
2.3	Hybrid Routing Protocols	1
2.4	Power-Aware Routing	1
<b>3</b>	<b>Multicast routing In Ad Hoc Networks</b>	

3.1	An Architecture Reference Model for Multicast Routing Protocols	<b>2</b>
3.2	Classifications of Multicast Routing Protocols	1
3.3	Tree-Based Multicast Routing Protocols	2
3.4	Mesh-Based Multicast Routing Protocols	2
3.5	Energy Efficient Routing Protocols	1
3.6	Application Dependent Protocols	1
3.7	Multicasting with QoS Guarantee	1
<b>4</b>	<b>Transport Layer, Security Protocols</b>	
4.1	Designing a Transport Layer Protocol	1
4.2	Design Goals of a Transport Layer Protocol	1
4.3	TCP Over Ad Hoc Wireless Networks	1
4.4	Other Transport Layer Protocols	1
4.5	Security Requirements - Issues and Challenges in Security Provisioning	1
4.6	Network Security Attacks	1
4.7	Key Management	1
4.8	Secure Routing	1
<b>5</b>	<b>Qos and Energy Management</b>	
5.1	Classifications of QoS Solutions	1
5.2	MAC Layer Solutions	1
5.3	Network Layer Solutions	1
5.4	QoS Frameworks	1
5.5	Energy Management	1
5.6	Classification of Energy Management Schemes -	1
5.7	Battery Management Schemes -	1
5.8	Transmission Power Management Scheme	1
5.9	System Power Management Schemes	1
5.10	Case Study	2
	<b>Total</b>	<b>42</b>

## Syllabus:

**Introduction** :Introduction-Fundamentals of Wireless Communication Technology - The Electromagnetic Spectrum - Radio Propagation Mechanisms - Characteristics of the Wireless Channel - IEEE 802.11 Standard -**Ad Hoc Routing Protocols**: Issues and Challenges - Classifications of Routing Protocols-Table-Driven Routing Protocols - On-Demand Routing Protocols - Hybrid Routing Protocols- Power-Aware Routing (PAR) - **Multicast routing In Ad Hoc Networks**: - An Architecture Reference Model for Multicast Routing Protocols -Classifications of Multicast Routing Protocols- Tree-Based Multicast Routing Protocols- Mesh-Based Multicast Routing Protocols-Energy-Efficient Multicasting - Multicasting with Quality of Service Guarantees - Application-Dependent Multicast Routing **Transport Layer, Security Protocols**: Designing a Transport Layer Protocol - Design Goals of a Transport Layer Protocol - Classification of Transport Layer Solutions - TCPOver Ad Hoc Wireless Networks -Other Transport Layer Protocols - Security Requirements - Issues and Challenges in Security Provisioning - Network Security Attacks - Key Management - Secure Routing **Qos and Energy Management**: Classifications of QoS Solutions - MAC Layer Solutions-Network Layer Solutions - QoS Frameworks for Ad Hoc Wireless Networks Energy Management in Ad Hoc Wireless Networks -Introduction - Need for Energy Management in Ad Hoc Wireless Networks - Classification of Energy Management Schemes - Battery Management Schemes - Transmission Power Management Schemes - System Power Management Schemes.

## Reference Books:

1. C. Siva Ram Murthy and B.S. Manoj "Ad Hoc Wireless Networks: Architectures and Protocols", Pearson education, 2008.
2. Charles E. Perkins, Ad Hoc Networking, Addison Wesley, 2000.
3. William Stallings, "Wireless Communications and Networks", Pearson education, 2003
4. J. Schiller, "Mobile Communications", Pearson education, 2003
5. Vijay K. Garg, "Wireless Communications and Networking", Elsevier, 2008.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y4F	3	--	--	3

## Y4F Supply Chain Management

**3 : 0**

### Preamble

Students will learn the basic concepts in supply chain management (SCM) and its related technologies to design an integrated software solution for manufacturing industries.

### Competencies

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

- Understand what a supply chain is and its importance.
- Understand the different phases in supply chain.
- Identify the drivers of supply chain performance.
- Overview the supply chain models and its systems.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	Test 3/ End-Semester Examination
1.	Remember	20	10	10
2.	Understand	30	30	30
3.	Apply	40	40	40
4.	Analyze	10	20	20
5.	Evaluate	0	0	0
6.	Create	0	0	0

### Course Level Learning Objectives:

#### Remember

1. Define supply chain.
2. What are the objectives of supply chain?
3. Identify the three key supply chain decision phases.
4. What types of distribution networks are typically best suited for commodity items?
5. Give example of products that displays seasonality of demand.
6. What is the difference between lot size-based and volume-based quantity discounts?
7. When are quantity discounts justified in supply chain.



### **Understand**

1. Describe the cycle and push/pull view of a supply chain.
2. Explain why achieving strategic fit is critical to a company's overall success.
3. How do you understand the role of network design decision in a supply chain.
4. What are the major cost categories needed as input for aggregate planning?
5. What are the operational parameters to identify in aggregate plan?

### **Apply**

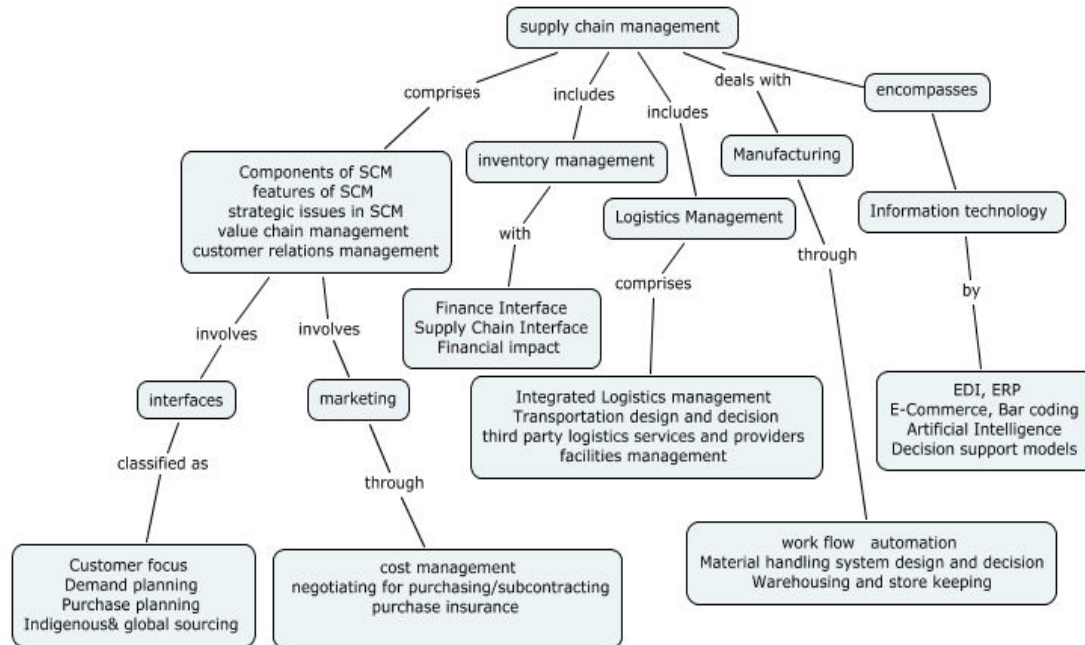
1. Define and apply the key metrics that track the performance of the supply chain in terms of each driver.
2. Is e-business likely to be more beneficial in the early part or the mature part of a product's life cycle? Why?
3. Develop a framework for making network design decisions.
4. A super market has experienced weekly demand of milk of 120,127,114 and 122 gallons over the last four weeks. Forecast demand for period 5 using a four –period moving average. What is the forecast error if demand in period 5 turns out to be 125 gallons.
5. Identify the managerial levers that reduce lot size and cycle inventory in a supply chain without increasing cost.

### **Analyze**

1. Analyze the major drivers of supply chain performance.
2. How do static and adaptive forecasting methods differ?
3. Demand for the Deskpro computer at best buy is 1000 units per month. Best buy incurs a fixed order placement, transportation, and receiving cost of \$4000 each time an order is placed. Each computer cost best buy \$500 and the retailer has a holding cost of 20 percent. Evaluate the no of computers that the store manager should order in each replenishment lot.

4. Discuss key drivers that may be used to tailor transportation. How does tailoring help?
5. Discuss why the high-tech industry has been the leader in adopting supply chain IT systems.

### Concept Map



### Course Content and Lecture Schedule

S.No	Topics	No. of Lectures
1	<b>Introduction to supply chain management (SCM)</b>	1
1.1	concept of SCM – Components of SCM, an overview	1
1.2	features of SCM	1
1.3	strategic issues in SCM, Systems View	1
1.4	SCM current scenario	1
1.5	value chain management and customer relations management	1
2	<b>Marketing and Supply Chain Interface</b>	
2.1	Customer focus in SCM , Demand planning, Purchase planning	1
2.2	Make or Buy decision	1
2.3	Indigenous and global sourcing	1

2.4	Development and management of suppliers – legal aspects of buying	2
2.5	cost management, negotiating for purchasing/subcontracting	1
2.6	purchase insurance – evaluation of purchase performance (performance indices)	1
3	<b>Inventory management-</b> Finance and Supply Chain Interface.	1
3.1	Financial impact of inventory	1
3.2	<b>Manufacturing scheduling</b> – Manufacturing flow	2
3.3	System, work flow automation	1
3.4	Flexibility in manufacturing to achieve dynamic optimization.	1
3.5	Material handling system design and decision.	2
3.6	Warehousing and store keeping.	1
3.7	strategies of warehousing and storekeeping	2
3.8	space management	2
4	<b>Logistics management</b>	
4.1	Role of logistics in SCM	1
4.2	Integrated Logistics management	1
4.3	Transportation design and decision, multi modalism	2
4.4	third party logistics services and providers	1
4.5	facilities management (port/airport.ICD's)	1
4.6	Channels of distribution, logistics and customer service.	1
5	<b>Information technology and SCM</b>	1
5.1	EDI, ERP, Internet and Intranet	1
5.2	E-Commerce, Bar coding	1
5.3	Telecommunication Network, Advanced planning system	1
5.4	Decision support models for Supply Chain Management	1
5.5	Artificial Intelligence for SCM,	1
5.6	Best practice in supply chain management	1
5.7	Organizational issues to implement SCM.	1
	Total	41

## Syllabus

**Introduction to supply chain management** (SCM) – concept of SCM – Components of SCM, an overview – features of SCM – strategic issues in SCM – Systems View - SCM current scenario – value chain management and customer relations management.

**Marketing and Supply Chain Interface** – Customer focus in SCM – Demand planning Purchase planning – Make or Buy decision – Indigenous and global sourcing – Development and management of suppliers – legal aspects of buying – cost management – negotiating for purchasing/subcontracting – purchase insurance – evaluation of purchase performance (performance indices)

**Inventory management** – Finance and Supply Chain Interface. Financial impact of inventory.

**Manufacturing scheduling** – Manufacturing flow system – work flow automation – Flexibility in manufacturing to achieve dynamic optimization. Material handling system design and decision. Warehousing and store keeping – strategies of warehousing and storekeeping – space management.

**Logistics management** – Role of logistics in SCM – Integrated Logistics management – transportation design and decision – multi modalism – third party logistics services and providers – facilities management (port/airport.ICD's) channels of distribution – logistics and customer service.

**Information technology and SCM** – EDI, ERP, Internet and Intranet, E-Commerce, Bar coding, Telecommunication Network, Advanced planning system, Decision support models for Supply Chain Management, Artificial Intelligence for SCM- Best practice in supply chain management – organizational issues to implement SCM.

## References:

1. Chopra, S, and P. Meindl, "Supply Chain Management: Strategy, Planning and Operation", 2nd edition, Pearson Education, 2010.
2. David Simchi-Levi, Philip Kaminsky, and Edith Simchi-Levi, "Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies", McGraw-Hill, New York, 2009.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y4G	3	--	--	3

**Y4G Managerial Economics****3 : 0**

**Preamble :** To familiarize the students with concepts & analytical tools in Managerial Economics, applied in a variety of day-to-day business situations

**Competencies:** At the end of the course the student should be able to

- Get an understanding to compute the relevant costs of any decision.
- Get an understanding to Use marginal analysis to make extent(how much) decisions.
- Make investment decisions that increase firm value.
- Set optimal prices and price discriminate.

**Assessment Pattern**

	Bloom's Category	Test 1	Test 2	Test 3 / End-Semester Examination
1	Remember	20	20	20
2	Understand	20	20	20
3	Apply	60	60	60
4	Analyze	-	-	-
5	Evaluate	-	-	-
6	Create	-	-	-

**Course level learning Objectives:****Remember**

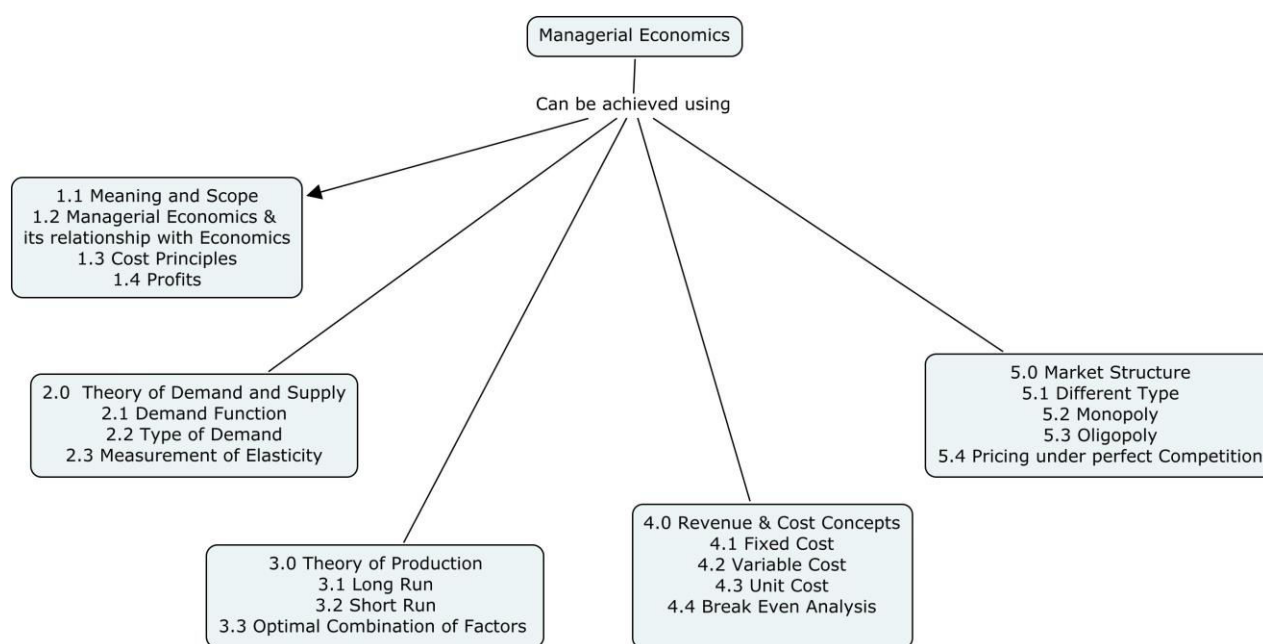
1. What is Managerial Economics?
2. Elucidate on the characteristics and scope of managerial economics
3. What is monopoly
4. list the various types of Demand
5. Define Break even analysis.

**Understand**

1. Using relevant examples, explain the distinction between macroeconomics and
2. Microeconomics
3. When effort and productivity are not directly observable, it is more likely that a firm will be charged with discrimination
4. Why do economies of scale affect the horizontal boundaries of an organization?
5. Why Production function is needed in long run?

**Apply**

1. "Managerial economics uses less than completely realistic models." Is this necessarily bad?
2. What is the own price elasticity when  $P_x$  is Rs150: Is the demand elastic or In-elastic? What will happen to the revenue if we were to increase the price?
3. Apply Elasticity of Demand for Business Applications

**Concept Map****Course contents and lecture schedule**

S. No	Topics	Periods
1.1	<b>Meaning and scope of Managerial Economics</b>	1
1.2	Managerial Economics & its relationship with Economics	2
1.3	Fundamental Concepts, Opportunity	2
1.4	Cost Principle – Equi-marginal Principle	2
1.5	Marginal & Incremental Principle - Discounting Principle	1
1.6	Economic Profit & Accounting Profit	2
2.1	<b>Theory of Demand &amp; Supply:</b> Law of Demand	1
2.2	Demand Function- Demand Curves	2
2.3	Types of Demand - Elasticity of Demand	2

2.4	Measurement of Elasticity	1
2.5	Business applications –	2
2.6	Law of Supply – Elasticity of Supply	2
3.1	<b>Theory of Production:</b> Production Function	1
3.2	Short run & Long run	2
3.3	Optimal Combination of Factors of Production.	2
4.1	<b>Revenue &amp; Cost Concepts:</b> Fixed Costs	1
4.2	Variable Costs - Unit Costs -	1
4.3	Cost Curves	2
4.4	Decision Making Costs	1
4.5	Break Even Analysis	2
4.6	Case Study	2
5.1	<b>Market Structure:</b> Different types of Markets	1
5.2	Different types of Markets	2
5.3	Pricing under Perfect Competition	1
5.4	Monopoly,	1
5.5	Monopolistic competition and Oligopoly	1
5.6	Case Study	2
	Total	42

## Syllabus

**Meaning and scope of Managerial Economics:** Managerial Economics & its relationship with Economics - Fundamental Concepts; Opportunity, Cost Principle – Equi-marginal Principle - Marginal & Incremental Principle - Discounting Principle – Economic Profit & Accounting Profit. **Theory of Demand & Supply:** Law of Demand – Demand Function- Demand Curves -Types of Demand - Elasticity of Demand – Measurement of Elasticity- Business applications – Law of Supply – Elasticity of Supply.**Theory of Production:** Production Function; Short run & Long run – Optimal Combination of Factors of Production. **Revenue & Cost Concepts:** Fixed Costs – Variable Costs - Unit Costs - Cost Curves - Decision Making Costs – Break Even Analysis. **Market Structure:** Different types of Markets – Pricing under Perfect Competition, Monopoly, Monopolistic competition and Oligopoly.

**References :**

1. G.S. Gupta, "Managerial Economics ", Tata Mc Graw-Hill, 2010
2. Joel Dean, "Managerial Economics", PHI.2, 2009.
3. Varshiney, R.L. & : Managerial Economics, S. Chand & Son, 2008.
4. Maheshwari. K.I. Mote, Paul & Gupta, Managerial Economics, Tata Mc-Graw Hill, 2010
5. Koutsoiannis. A, Modern Micro Economics, Mc-Millan., 2010

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y4H	3	--	--	3

**Y4H Software Architecture****3 : 0****Preamble**

This course aims at facilitating the students to introduce Software Architecture and understand various architectural styles and able to design an architecture for software product.

**Competencies**

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

- Understand the idea of Software Architecture
- Develop an Architectural design from data
- Design a Software Architecture for an User Interface

**Assessment Pattern**

	Bloom's Category	Test 1	Test 2	Test 3/ End-Semester Examination
1.	Remember	20	20	20
2.	Understand	30	30	20
3.	Apply	30	30	30
4.	Analyze	20	20	30
5.	Evaluate	0	0	0
6.	Create	0	0	0

**Course Level Learning Objectives:****Remember**

1. What are the notions of software architecture?
2. Give an example for a visual notation
3. List down the architectural complexities ?
4. Write down the factors that affecting the design?
5. Define OCL?

### **Understand**

1. Discuss about the different types of architectural styles and patterns?
2. Explain on how to map data flow into a software architecture?
3. Narrate the stepwise refinement process?
4. Explain Jackson structured Programming with an example?
5. How to design conventional Components, Discuss?

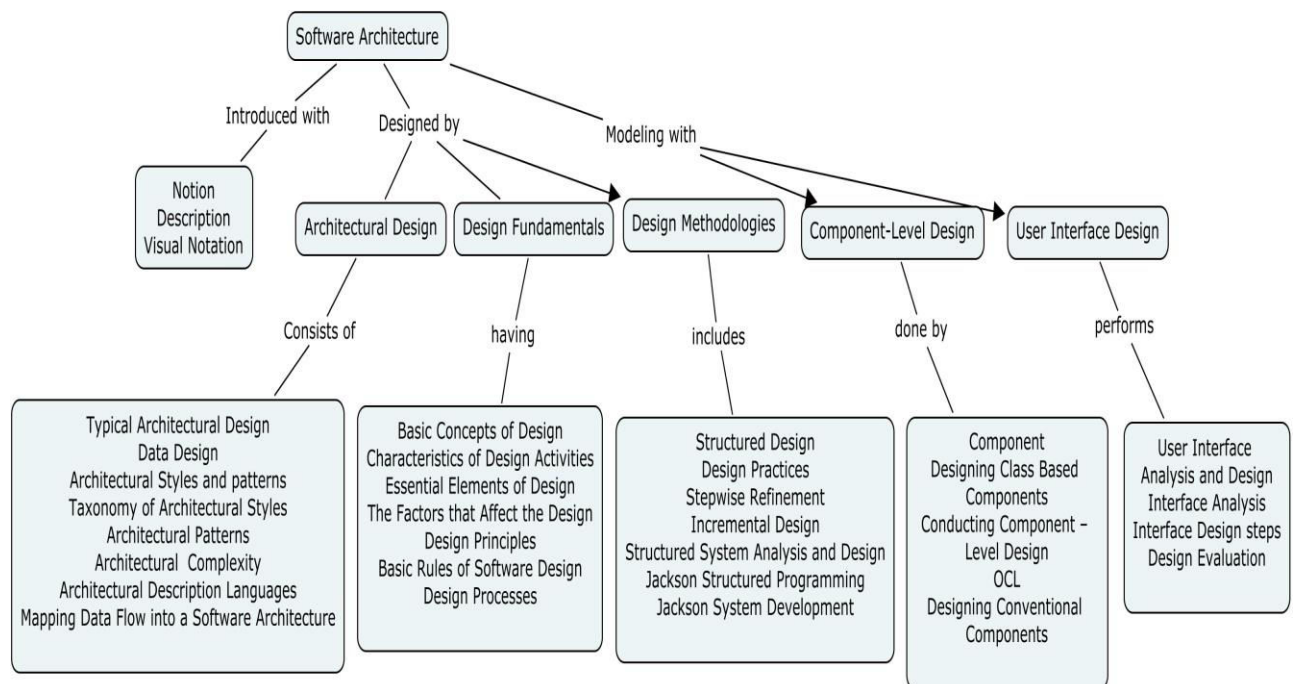
### **Apply**

1. Using a DFD and a processing narrative, describe a computer based system that has distinct transform flow characteristics. Define flow boundaries and map the DFD into a software architecture?
2. Apply different types of Interface analysis for an application?
3. Apply Stepwise refinement for an architectural design?
4. Apply different types of basic design principles for an architectural design?
5. Apply different types of coupling for an architectural design

### **Analyze**

1. Take three components and analyze the types of cohesion each exhibits?
2. Analyze the role of interfaces in a class based component-level design?
3. Analyze the reason that why problem domain components should never exhibit external coupling?
4. Analyze the user display content?
5. Analyze the user and task involved in an Interface?

## Concept Map



## Syllabus

**Introduction To Architecture:** Notion of Software Architecture - Description of Software Architecture - Visual Notation - Examples

**Architectural Design :** Typical Architectural Design - Data Design - Architectural Styles and patterns - Taxonomy of Architectural Styles - Architectural Patterns - Architectural Complexity - Architectural Description Languages - Mapping Data Flow into a Software Architecture

**Design Fundamentals:** Basic Concepts of Design - Characteristics of Design Activities - Essential Elements of Design - The Factors that Affect the Design - Design Principles - Basic Rules of Software Design - Design Processes

**Design Methodologies :** Structured Design - Design Practices - Stepwise Refinement - Incremental Design - Structured System Analysis and Design - Jackson Structured Programming - Jackson System Development

**Modeling Component - Level Design :** Component-Designing Class Based Components - Conducting Component - Level Design - OCL -Designing Conventional Components

**User Interface Design :** User Interface Analysis and Design - Interface Analysis - Interface Design steps - Design Evaluation.

**Course Content and Lecture Schedule**

<b>S.No</b>	<b>Topics</b>	<b>No. of Lectures</b>
<b>1</b>	<b>Introduction To Architecture</b>	
1.1	Notion of Software Architecture	1
1.2	Description of Software Architecture	2
1.3	Visual Notation- Examples	2
<b>2</b>	<b>Architectural Design</b>	
2.1	Typical Architectural Design	1
2.2	Data Design	1
2.3	Architectural Styles and patterns	2
2.4	Taxonomy of Architectural Styles	2
2.5	Architectural Patterns	2
2.6	Architectural Complexity	1
2.7	Architectural Description Languages	1
2.8	Mapping Data Flow into a Software Architecture	1
<b>3</b>	<b>Design Fundamentals</b>	
3.1	Basic Concepts of Design	1
3.2	Characteristics of Design Activities	1
3.3	Essential Elements of Design	1
3.4	The Factors that Affect the Design	1
3.5	Design Principles	2
3.6	Basic Rules of Software Design	2
3.7	Design Processes	2
<b>4</b>	<b>Design Methodologies</b>	
4.1	Structured Design	1
4.2	Design Practices	2
4.3	Stepwise Refinement	1
4.4	Incremental Design	1
4.5	Structured System Analysis and Design	1
4.6	Jackson Structured Programming	1

4.7	Jackson System Development	1
5	<b>Modeling Component – Level Design</b>	
5.1	Component	1
5.2	Designing Class Based Components	2
5.3	Conducting Component – Level Design	2
5.4	OCL	1
5.5	Designing Conventional Components	1
6	<b>User Interface Design</b>	
6.1	User Interface Analysis and Design	1
6.2	Interface Analysis	1
6.3	Interface Design steps	1
6.4	Design Evaluation	1
	<b>Total</b>	45

**References:**

1. Len Bass, Paul Clements, and Rick Kazman, "Software Architecture in Practice", 2nd Ed. Addison-Wesley Longman, Inc., Reading, MA, 2009.
2. Jacobson, Ivar, Griss, Martin, Jonsson, and Patrik, "Software Reuse, Architecture, Process and Organization for Business Success", Addison-Wesley Longman, Inc., Harlow, UK, 2008.
3. Hong Zhu, "Software Design Methodology From Principles to Architectural Styles", Elsevier, 2005.
4. David Budgen, "Software Design", Second Edition, Pearson Education, 2004.
5. Mary Shaw David Garlan, "Software Architectural Perspectives on an emerging discipline ", EEE, PHI 1996.
6. John Robinson, "Software Design for Engineers and Scientists", Newnes, 2004.
7. R. S. Pressman, "Software Engineering", Sixth Edition, McGraw Hill Inc., 2005.
8. A. G. Sutcliffe, "Human Computer Interface Design", Second Edition Macmillan, 1995.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y4K	3	--	--	3

**Y4K Cloud Computing****3 : 0****Preamble**

This course is aimed at introducing cloud computing ,the services offered by the cloud, building cloud networks, virtualization, distributed storage and security.

**Competencies**

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

- Explain the evolution of cloud computing and the web services offered
- Explain the building of a cloud network
- Discuss about virtualization , cloud security and cloud storage

**Assessment Pattern**

	Bloom's Category	Test 1	Test 2	Test 3/ End-Semester Examination
1.	Remember	30	20	20
2.	Understand	30	30	20
3.	Apply	40	50	60
4.	Analyze	0	0	0
5.	Evaluate	0	0	0
6.	Create	0	0	0

**Course Level Learning Objectives:****Remember**

1. What are the key characteristics of cloud computing?
2. What is a cloud data center?
3. List the benefits of virtualization?
4. What are the security challenges in cloud computing?
5. What is data foot print reduction?

**Understand**

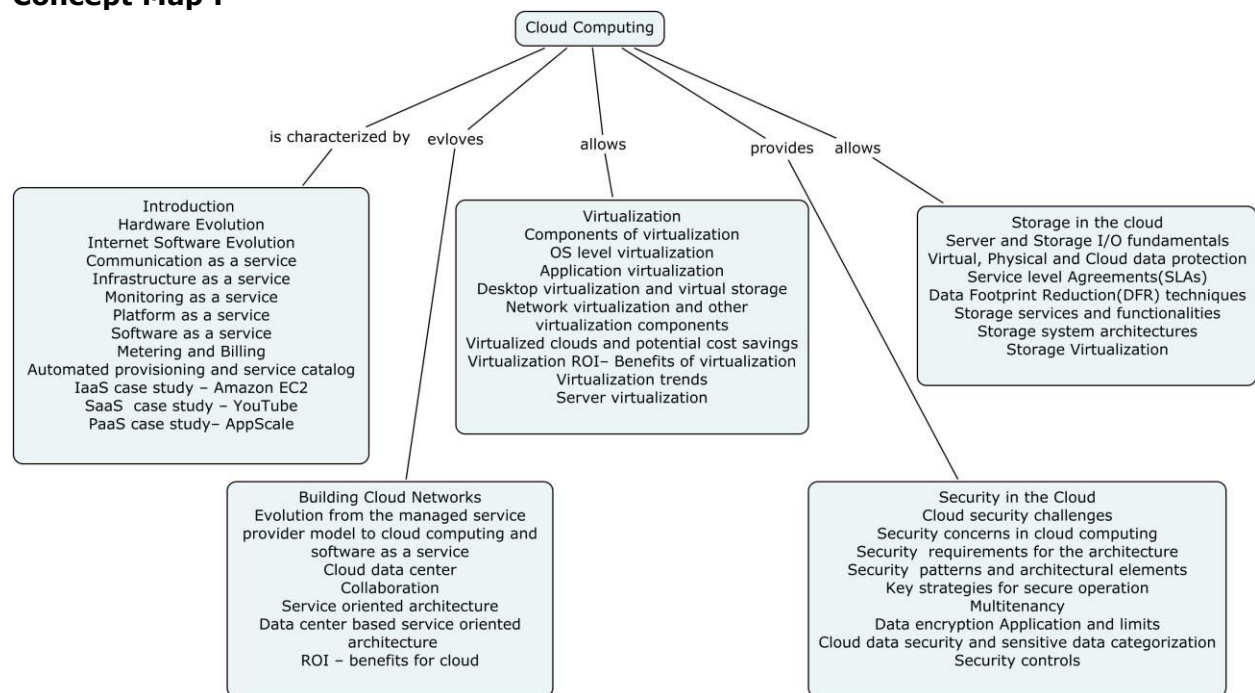
1. Describe in detail the web services delivered from the cloud?
2. Explain in detail about data center based service oriented architecture?
3. Discuss in detail the different types of virtualization?

4. Explain sensitive data categorization to provide cloud data security?
5. Discuss in detail about DFR techniques?

### Apply

1. Apply monitoring-as-a-service to real time log monitoring
2. Explain how your company can build highly automated private cloud networks that can be managed from a single point?
3. Assume that a company ABC wants to offer services such as starting a policy and payment policy on a service oriented architecture over the cloud. Explain the implementation details of this scenario.
4. Consider Ubuntu virtual machine installed over a windows machine. Explain the SNAT and DNAT configuration that needs to be applied to enable the Ubuntu virtual machine communication with the Ubuntu virtual machine.
5. Explain how the DFR techniques can be applied to your cloud to provide capacity optimization?

### Concept Map :



### Syllabus

**Introduction** - Hardware Evolution - Internet Software Evolution – Communication as a service – Infrastructure as a service – Monitoring as a service – Platform as a service – Software as a service – Metering and Billing – Automated provisioning and service catalog – IaaS case study – Amazon EC2 – SaaS case study – YouTube – PaaS case

study – AppScale – **Building Cloud Networks** – Evolution from the managed service provider model to cloud computing and Software as a service - cloud data center – Collaboration - service oriented architecture – data center based service oriented architecture – ROI – benefits for cloud – **Virtualization** – components of virtualization – OS level virtualization – Application virtualization – Desktop virtualization and virtual storage – Network virtualization and other virtualization components – virtualized clouds and potential cost savings – virtualization ROI – Benefits of virtualization – virtualization trends – Server virtualization – **Security in the Cloud** – Cloud security challenges – security concerns in cloud computing - security requirements for the architecture - security patterns and architectural elements – key strategies for secure operation – Multitenancy – Data encryption Application and limits – Cloud data security and sensitive data categorization- security controls – **Storage in the cloud** – Server and Storage I/O fundamentals – Virtual,physical and cloud data protection – Service level Agreements(SLAs) – Data Footprint Reduction(DFR) techniques – Storage services and functionalities – Storage system architectures – Storage Virtualization.

### Course Content and Lecture Schedule

S.No	Topics	No. of Lectures
1	<b>Introduction</b>	
1.1	Hardware Evolution	1
1.2	Internet Software Evolution	1
1.3	Communication as a service	1
1.4	Infrastructure as a service	1
1.5	Monitoring as a service	1
1.6	Platform as a service	1
1.7	Software as a service	1
1.8	Metering and Billing	1
1.9	Automated provisioning and service catalog	1
1.10	IaaS case study – Amazon EC2	1
1.11	SaaS case study – YouTube	1
1.12	PaaS case study– AppScale	1
2	<b>Building Cloud Networks</b>	



2.1	Evolution from the managed service provider model to cloud computing and software as a service	2
2.2	Cloud data center	1
2.3	Collaboration	1
2.4	Service oriented architecture	1
2.5	Data center based service oriented architecture	1
2.6	ROI – benefits for cloud	1
3	<b>Virtualization</b>	
3.1	Components of virtualization	1
3.2	OS level virtualization	1
3.3	Application virtualization	1
3.4	Desktop virtualization and virtual storage	1
3.5	Network virtualization and other virtualization components	1
3.6	Virtualized clouds and potential cost savings	1
3.7	Virtualization ROI– Benefits of virtualization	1
3.8	Virtualization trends	1
3.9	Server virtualization	1
4	<b>Security in the Cloud</b>	
4.1	Cloud security challenges	1
4.2	Security concerns in cloud computing	1
4.3	Security requirements for the architecture	1
4.4	Security patterns and architectural elements	1
4.5	Key strategies for secure operation	1
4.6	Multitenancy	1
4.7	Data encryption Application and limits	1
4.8	Cloud data security and sensitive data categorization	1
4.9	Case Study	1
5	<b>Storage in the cloud</b>	
5.1	Server and Storage I/O fundamentals	1

5.2	Virtual, Physical and Cloud data protection	1
5.3	Service level Agreements(SLAs)	1
5.4	Data Footprint Reduction(DFR) techniques	2
5.5	Storage services and functionalities	1
5.6	Storage system architectures, Storage Virtualization	1
5.7	Case Study	1
	<b>Total</b>	45

**References:**

1. John Rittinghouse, James Ransome , " Cloud Computing : Implementation, Management and Security", CRC Press 2010.
2. Gail La Grouw, " Getting to Cloud: Discovering New Business Opportunities with Cloud Computing", Coded Vision Limited, 2010.
3. Vi(J.R) Winkler, "Securing the Cloud: Cloud Computer Security Techniques and Tactics", Elsevier 2011.
4. Greg Schulz, "Cloud and Virtual Data Storage Networking", CRC Press 2012.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y46	1	--	3	2

**Y46 Web Technology Laboratory****1 : 1**

**Objective:** Enable the students to know techniques involved to support web site development.

**I-Static HTML**

1. Develop a static pages using HTML of an online Departmental Store. The website should be user friendly and should have the following pages:

- \_ Home page
- \_ Registration and user login
- \_ User profile page
- \_ Items catalog
- \_ Shopping cart
- \_ Payment by credit card
- \_ Order confirmation

**II-Dynamic HTML**

1. Develop a page using Cascading Style Sheets
2. Develop a page using Object Model and Collections
3. Develop a page using Event Model
4. Develop a page using Filters and Transitions

**III-XML**

5. creating xml documents,
6. xml style sheet,
7. xml document object model,
8. Xml query language

**IV-Scripting Language**

Using javascript & vbscript

9. Develop a site for user authentication
10. Develop a site for creating a new email-id after checking the necessary validation

**V-ASP**

11. Develop a page using Server side Activex components
12. Develop a page using File System objects
13. Develop a page using Session tracking
14. Develop a site for simple online reservation

**VI-JSP**

15. Develop a page using request, response, session, application
16. Develop a site for simple online banking

**Software required:**

- Languages: Html, DHTML, XML, Java Script, VBScript, JSP, ASP.
- Browser (Internet Explorer, Netscape).
- User Interface Design tool (like Front Page, Visual Inter Dev)
- Web Server: IIS (or) PWS, Tomcat, IBM WSAD
- Backend tool (Oracle, Ms-Access, SQL Server, IBM DB2)

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y47	-	-	3	1

**Y47 Software Engineering Laboratory****0 : 1**

**Preamble:** This course aims at facilitating the student to practice the Software Development Life Cycle (SDLC) phases for a given application.

**I. Study of various phases of different life cycle Models.**

1. Study of Water Fall, Incremental, Evolutionary and Agile Models

**II. Planning and Analysis**

2. Develop Time-line chart / Gantt and project table.
3. Prepare SRS for the given domain problem.
4. Using COCOMO model to estimate effort for the given domain problem.
5. Calculate effort using FP oriented estimation model
6. Analyze the Risk related to the project and prepare RMMM plan.
7. Draw E-R diagram, DFD for the project.
8. Develop Use Case (Primary) diagram using UML

**III. Software Design**

9. Develop Use Case ( Secondary/ Detailed ) using UML
10. Develop Class Diagram using UML
11. Develop Interaction Diagrams using UML
12. Develop State Chart and Activity Diagrams using UML
13. Develop Component, Package and Deployment Diagrams using UML

**IV. Implementation of the Software**

- 14.a Units / Components Development
- 14.b Integration of components and Results generation

**V. Testing the Developed System**

- 15.a. White Box Testing / Structural Testing - Design of the test cases for Unit Testing – JUnit / NUnit
- 15.b. Black Box Testing / Functional Testing - System / GUI Testing- WinRunner, AppPerfect

**VI. Prepare FTR. version control and change control for software configuration items.**

16. Documentation of SCIs in SCM repository

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Sub. Code	Lectures	Tutorial	Practical	Credit
<b>Y51</b>	<b>4</b>	<b>-</b>	<b>-</b>	<b>4</b>

## Y51 MOBILE APPLICATIONS

**4 : 0**

**Preamble:** This course aims to develop scalable, good-looking enterprise-class applications for mobile handsets and other small footprint devices. The topics covered will focus on the tools and environments which exist to help develop mobile applications that run on mobile and wireless devices. This course has been developed for real-world, commercial scenarios based on industry requirement.

**Competencies:** At the end of the course the student should be able to

1. Install, develop, and distribute mobile applications. As mobile environments are changing rapidly, this course provides a broader understanding for specialization in one of these major platforms.
2. Deal with the challenges of application development for the mobile market including limited screen size and memory, gesture based GUI, connectivity, and the variety of available phones. This hands-on class provides unique and valuable content on how to contrast the approaches taken by the major mobile players.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	End-semester examination
1	Remember	30	30	30
2	Understand	30	30	30
3	Apply	40	40	40
4	Analyze	0	0	0
5	Evaluate	0	0	0
6	Create	0	0	0

### Course Level Learning Objectives:

#### Remember

1. Define WML authoring
2. Describe session tracking
3. Write the meaning of Configurable converter.
4. List out any 4 Wireless device constraints
5. What do you mean by conversion by source modification?

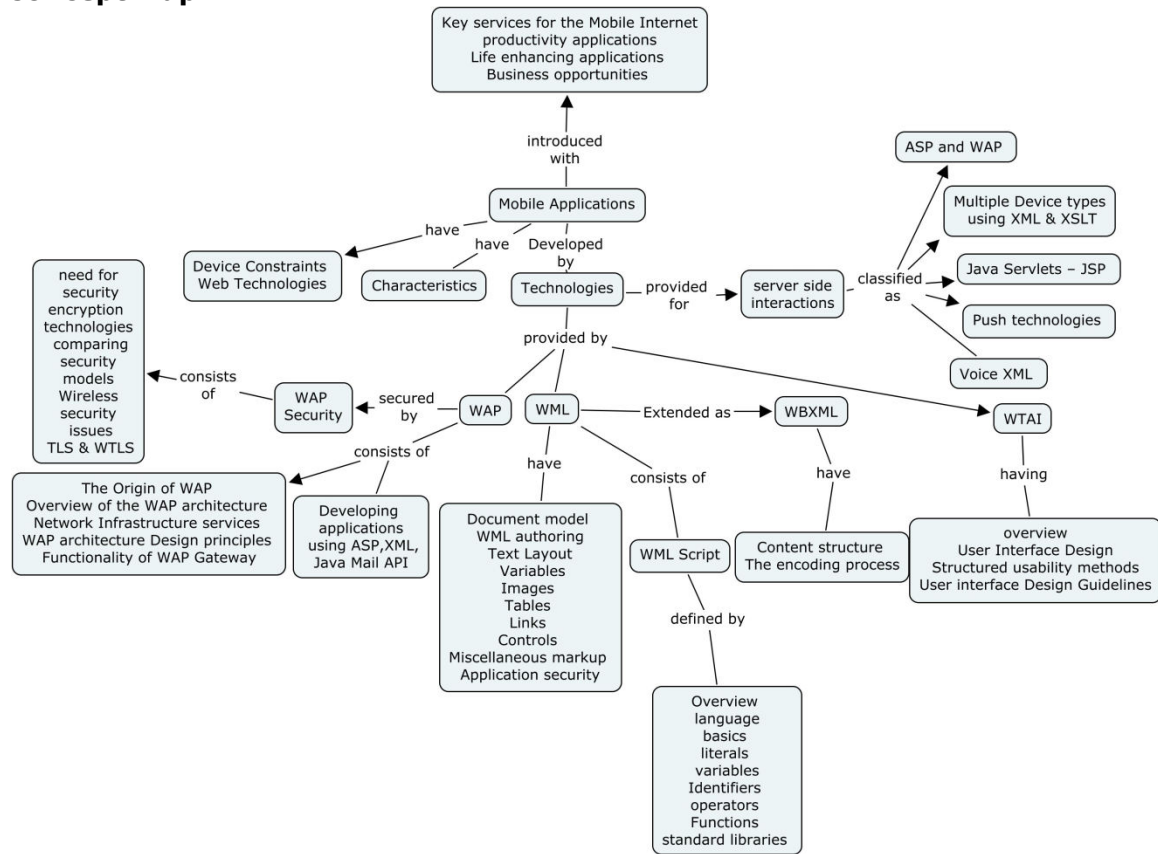
**Understand**

1. Generate a wml code using Timer event
2. Describe the meaning of Wireless Binary Extensible markup language?
3. What do you mean by ActiveX Data Object
4. List out the the business opportunities of Mobile Application.
5. Compare wap technology with web technology
6. Explain the key services for the Mobile Internet.
7. Explain the Wap architecture design principles
8. Explain the Functionality of wap gateway
9. Distinguish symmetric ciphers with asymmetric ciphers
10. Explain the architecture of voice XML with the overview voice xml markup language.

**Apply**

1. How will you support Multiple device types using XML and XSLT
2. Construct the architecture of wireless telephony application with its interface & state model.
3. Write a wml program for currency conversion
4. List out the guideline to design a WML Application.
5. What do you mean by structured usability methods?
6. Create a mobile Application for online ticket reservation using wml, wml script and jsp/asp. ( front end validation and back end retrieval is must)
7. Construct Document structure & Encoding process of wireless binary extensible markup language
8. Prepare the architecture of E-mail System with its protocol and write a program for E-mail system using javax mail package.

## Concept Map



## Lecture Schedule

No.	Topic	No. of Lectures
1	Introduction	
1.1	Key services for the Mobile Internet	2
1.2	productivity applications	1
1.3	Life enhancing applications	1
1.4	Business opportunities	1
1.5	WAP Versus WEB.	1
2	Mobile Internet	
2.1	Characteristics of the Mobile Internet	1
2.2	Wireless Device Constraints	1



<b>No.</b>	<b>Topic</b>	<b>No. of Lectures</b>
2.3	Web Technologies	1
2.4	the Origin of WAP	1
2.4.1	Overview of the WAP architecture	1
2.4.2	Network Infrastructure services	1
2.4.3	WAP architecture Design principles –	1
2.4.4	Functionality of WAP Gateway	1
3	Wireless Markup Language	
3.1.1	Document model	1
3.1.2	WML authoring, Text Layout, Variables, Images	1
3.1.3	Tables, Links, Controls	1
3.2	Miscellaneous markup	1
3.3	application security	1
3.4	Wireless Binary Extensible Markup Language –	1
3.4.1	Content structure.	1
3.4.2	encoding process	1
3.5	WML Script & WTAI – Overview	1
3.5.1	language basics, literals, variables, Identifiers, operators	1
3.5.2	Functions, standard libraries	1
3.5.3	WTAI – overview	1
3.5.4	User Interface Design	1
3.5.5	Structured usability methods	1
3.5.6	User interface Design Guidelines	1
4	Other Technologies	
4.1.	ASP and WAP	1
4.1.1	ADO (Activex Data Objects)	1

No.	Topic	No. of Lectures
4.2	Multiple Device types using XML & XSLT	1
4.2.1	XML, XSLT, XHTML	1
4.3	Java Servlets	1
4.4	JSP	1
4.5	Converting existing websites to WAP	1
4.6	WAP and e-mail	1
4.7	Java Mail API – vCard.	2
4.8	J2ME	2
5	WAP security, push technologies, voice XML	
5.1.1	WAP Security – need for security – encryption technologies –	1
5.1.2	Comparing security models – Wireless security issues – TLS & WTLS.	1
5.2	Push technologies – push model – push framework – problems implementation – Overview.	1
5.3	Wireless Telephony applications (WTA) – WTA state model – fundamentals – WTA Interface – Scenarios –	1
5.4	Voice XML – Introduction –elements of	1
	Total	<b>46</b>

## Syllabus

Introduction-Key services for the Mobile Internet – productivity applications – Life enhancing applications – Business opportunities – WAP Versus WEB. Characteristics of the Mobile Internet – Wireless Device Constraints – Web Technologies – the Origin of WAP – Overview of the WAP architecture – Network Infrastructure services – WAP architecture Design principles – Functionality of WAP Gateway. Wireless Markup Language – document model – WML authoring – Text Layout – Variables – Images – Tables – Links – Controls – Miscellaneous markup – application security – Wireless Binary Extensible Markup Language – Content structure – the encoding process. WML Script & WTAI – Overview – language basics – literals – variables – Identifiers – operators – Functions – standard libraries – WTAI – overview – User Interface Design – Structured usability methods – User interface Design Guidelines.ASP and WAP – ADO (Activex Data Objects) – Multiple Device types using XML & XSLT – XML, XSLT, XHTML – Java Servlets – JSP – Converting existing websites to WAP – WAP

and e-mail - Java Mail API - J2ME - vCard.WAP Security - need for security - encryption technologies - comparing security models - Wireless security issues - TLS & WTLS.

Push technologies - push model - push framework - problems - Wireless Telephony applications (WTA) - WTA state model - fundamentals - WTA Interface - Scenarios - Voice XML - Introduction - elements of implementation - Overview.

**References:**

1. Sandeep Singal, Thomas Bridgman et al., "The Wireless Application protocol: Writing applications for the Mobile Internet", Pearson Education, 3<sup>rd</sup> edition, 2006.
2. Charles Arehart, Nirmal Chidambaram et al., "Professional WAP"; WROX Press Ltd., 2000.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y52	4	--	--	4

## Y52 BUSINESS PROCESSES

**4: 0**

### Preamble:

To enable the students to learn the concepts in business process management, business modeling and principles of management to enable them to develop a software solution to manage business process complexities.

**Competencies:** At the end of the course the student should be able to

1. To know and understand by the students concepts of organization structures, modern business Process and practices.
2. To gain working knowledge of Business Accounting, Regulatory aspects of business and business practices in IT Fields.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	Test 3 / End-Semester Examination
1	Remember	20	20	20
2	Understand	20	20	30
3	Apply	30	30	30
4	Analyze	30	30	20
5	Evaluate	-	-	-
6	Create	-	-	-

### Course level learning Objectives:

#### Remember

1. Name some applications of computer science which enable an organization to improve its performance.
2. Compare Organization Structure and Culture.
3. What is meant by the term "Reengineering"?
4. What is an Information System?
5. What is Electronic Data Interchange (EDI)?
6. What is forward engineering?
7. What is Enterprise Application Integration (EAI)?

### Understand

1. What is Business Activity Monitoring (BAM)?
2. How will you define the term "organization"?
3. What is meant by formal organization?
4. Define the following terms and give one example for each concept:  
E-Commerce, E-Business, CRM and Electronic Banking.
5. What are the activities involved when you apply BPR to managerial process and software process?

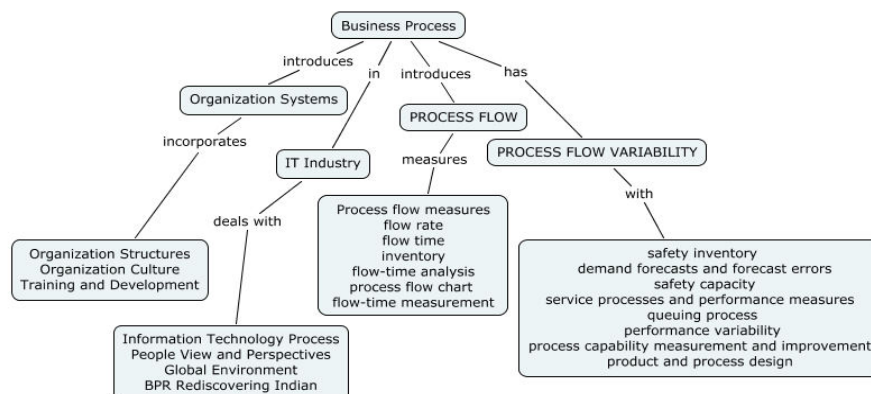
### Apply

1. Explain the various organizational components that need to be managed.
2. Why do you think managers would like to be able to predict the behaviours of people in organizations?
3. What is Business Process Reengineering? How will you carryout BPR to an organization? Explain with an example.
4. Describe about process capability measurement and improvement.
5. Explain briefly about creating and sustaining Culture.

### Analyze

1. Define the term "Organizational effectiveness". How would you assess the organizational effectiveness of a government organization?
2. Explain the various technologies that aid the BPR.
3. What will be the future trends and issues in management?
4. How do you analyze demand forecasts and forecast errors.
5. Analyze about the Managing Change in the Global Environment

### Concept Map



**Course contents and lecture schedule**

<b>S.No</b>	<b>Topics</b>	<b>Periods</b>
1.1	<b>ORGANIZATIONAL System</b> - Types of Business Organizations	1
1.2	Organizational Structures	1
1.3	Elements-Definition; Selection Practices	1
1.4	Complexity	1
1.5	Formulization-Size -Outcomes-Explanations of Structures	1
1.6	IT Industry and Organizational Structures	1
1.7	creating and sustaining Culture	1
1.8	Learning Culture- Training and development program	1
1.9	Purpose of performance evaluation-methods of performance evaluation	1
1.10	Case Studies	1
2.1	<b>BUSINESS PROCESS MANAGEMENT IN INFORMTION TECHNOLOGY (IT)</b>	2
2.2	People View and Perspectives	1
2.3	Empowering People through IT	1
2.4	Managing Change in the Global Environment	1
2.5	BPR Rediscovering Indian Paradigm	1
2.6	Need of Reengineering-Case Studies.	1
2.7	Business Process Outsourcing (BPO)	1
3.1	<b>PROCESS FLOW MEASUREMENT</b>	1
3.2	Process flow measures	1
3.3	flow rate - flow time	1
3.4	inventory - flow-time analysis	1
3.5	process flow chart	1
3.6	managing flow-time	1
3.7	flow-rate and capacity analysis	1
3.8	resources and resource pools	1
3.9	flow-rate measurement	1
3.10	process capacity - inventory analysis	1
4.1	<b>PROCESS FLOW VARIABILITY</b>	2
4.2	Managing flow variability	1

4.3	safety inventory - demand forecasts and forecast errors	1
4.4	optimal services level	1
4.5	lead time demand variability	1
4.6	safety capacity - service processes and performance measures	1
4.7	queuing process - buffer capacity	1
4.8	synchronization and capacity and demand	1
5.1	<b>process control and capability</b>	2
5.2	performance variability -- product and process design	1
5.3	process capability measurement and improvement	1
5.4	process synchronization and improvement.	1
5.5	Case Study	2
	Total	43

## Syllabus

**Organizational System**-Types of Business Organizations-organizational Structures-Elements-Definition-Complexity-Formulization-Size-Outcomes-Explanations of Structures-IT Industry and Organizational Structures-Technology-creating and sustaining Culture-Learning Culture- Forms; Selection Practices-Training and development program-purpose of performance evaluation-methods of performance evaluation-Case Studies. BPR AND IT INDUSTRY -BPR and Information Technology Process-People View and Perspectives-Empowering People through IT-Managing Change in the Global Environment-BPR Rediscovering Indian Paradigm-Need of Reengineering-Case Studies.

**Process Flow Measurement**-Process flow measures-flow rate-flow time-inventory-flow-time analysis-process flow chart-flow- time measurement-CPM-managing flow-time-flow-rate and capacity analysis-resources and resource pools-flow-rate measurement-process capacity-inventory analysis. **Process Flow Variability**-Managing flow variability-safety inventory-demand forecasts and forecast errors-optimal services level-lead time demand variability-safety capacity-service processes and performance measures-queuing process-buffer capacity-synchronization and capacity and demand-process control and capability-performance variability-process capability measurement and improvement-product and process design-process synchronization and improvement.

## References:

1. Richard H.Hall, Organizations-Structures, Processes and Outcomes", Pearson Education, 2004
2. M.S.Jayaraman et. Al, "Business Process Reengineering", Tata Mc Graw Hill Publications, 2001

3. Ravi Kalakota and Marcia Robinson, "E-Business; Roadmap for Success; Pearson Education, 2000.

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Sub.Code	Lectures	Tutorial	Practical	Credit
Y53	3	1	-	4

## Y53 SOFTWARE QUALITY AND TESTING

**3 : 1**

**Preamble:** This course aims at facilitating the student to learn the best practices followed in industries to do effective software testing and quality management activities.

### Competencies:

**At the end of the course, the students will be able to**

1. Understand the basic concepts and the processes that lead to software quality
2. Identify and implement appropriate testing methods for a given application
3. Identify the mechanisms involved in selecting the most efficient testing technique for different life cycle phases.
4. Apply various test case design techniques in achieving quality software.
5. Understand the metrics and reports related to software testing.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	End-semester examination
1	Remember	10	10	20
2	Understand	10	10	30
3	Apply	20	20	30
4	Analyze	10	10	20
5	Evaluate	-	-	-
6	Create	-	-	-

### Course Level Learning Objectives:

#### Remember

1. Define: Quality and Software testing.
2. What are the phases involved in PDCA life cycle in continuous quality improvement? Explain.
3. List the various types of products based on their criticality.
4. What are software quality audits?
5. Define: Error, Defect and Failure.

**Understand**

1. What are the challenges involved in developers becoming testers?
2. Discuss the factors affecting the cost of testing.
3. Consider the following code and which test adequacy criteria are satisfied by the given test set : Test set  $T = \{t1: \langle x = -3, y = -2 \rangle, \langle x = 2, y = -4 \rangle\}$

```
begin
    int x,y;
    if(x<0) && (y<0)
        printf("Both x and y are 0");
    else
        printf("x or y is 0 or non zero");
end;
```

4. Consider the following code. Given that, the test suite T contains  $\{n=3$  for all test cases  $t1: \langle a=2, b=3, c=2 \rangle, t2: \langle a=1, b=2, c=-1 \rangle, t3: \langle a=-1, b=2, c=-4 \rangle\}$ . Find out the MC/DC percentage of T by considering feasible and infeasible conditions in the code:

```
void main()
{
    int a, b, c,d, n;
    scanf("%d",&n);
    while(n>0)
    {
        scanf("%d,%d,%d", &a,&b,&c);
        if (a>b) && (b>c) d=a+b;
        else if(a>c) && (c>b)
            { d=a+c;
              if (c>a && (b>c)) d+=b;
            }
        else d=0;
        n-=1;
    }
    printf("Calculated Value is %d",d);
}
```

5. What is white box testing? Consider the following program code. Construct a control flow chart and a control flow graph for it and list down all the independent paths in it. Also, identify infeasible paths in it.

```
begin
    int x, y,z;
    input(x,y);
    if(x>0)&& (y>0)
        z=pow(x,y)
    else if (x<0) && (y>0)
        z=pow((-x),y);
    else if(x>0) && (y<0)
        z=pow(x,(-y));
    else if(x<0) && (y<0)
        z=0;
    while(y>0){
        z+=1;
        y--;}
    if(z>0) {
        z-=1;}
```

### Apply

1. Apply the regression testing to identify the side effects in a software after release.
2. Show how test selection is done using execution trace with an example.
3. Explain mutation testing in detail and construct at least five 1<sup>st</sup> order mutants for the following code and find out mutation score for the following test suite:

Given that, the test suite T contains {n=3 for all test cases t1:<a=2,b=3,c=2>, t2:<a=1,b=2,c=-1>, t3:<a=-1,b=2,c=-4>}

```
void main()
{
    int a, b, c,d, n;
    scanf("%d",&n);
    while(n>0)
    {
        scanf("%d,%d,%d", &a,&b,&c);
```

```

if (a>b) && (b>c) d=a+b;
else if(a>c) && (c>b)
    { d=a+c;
      if (c>a && (b>c)) d+=b;
    }
else d=0;
n-=1;
}
printf("Calculated Value is %d",d);
}

```

4. An application takes two inputs x and y where  $x \leq y$  and  $-5 \leq y \leq 4$ . Apply Equivalence partitioning to (i) Partition the input domain using uni-dimensional and multidimensional partitioning. (ii) Derive test sets based on the partitions created in (i)

5. Consider an 'Online Product Purchase System'. Apply Category Partition method in it to derive test cases.

### Analyze

1. Classify the different test minimization techniques applied in regression testing with an example.

2. Illustrate cause-effect graphing by constructing a CE-Graph and a Decision table for the following requirement: (8)

Consider a Income Tax Calculation System. The employee's income tax is calculated based on two constraints: (i) Gender (ii) Gross Pay / Annum

There are two genders : Male, Female

- If the Gender is Male and the Gross Pay/Annum < 1,50,000 then No Tax
- If the Gender is Male and the Gross Pay/Annum > 1,50,000 and <2,50,000 then 12% Tax
- If the Gender is Male and the Gross Pay/Annum > 2,50,000 and <3,50,000 then 18% Tax
- If the Gender is Male and the Gross Pay/Annum > 3,50,000 then 20% Tax
- If the Gender is Female and the Gross Pay/Annum < 1,90,000 then No Tax

- If the Gender is Female and the Gross Pay/Annum  $> 1,90,000$  and  $< 3,00,000$  then 10% Tax
  - If the Gender is Male and the Gross Pay/Annum  $> 3,00,000$  and  $< 4,50,000$  then 12% Tax
  - If the Gender is Male and the Gross Pay/Annum  $> 4,50,000$  then 18% Tax.
3. Consider the "Withdraw amount" module in an ATM application. Analyze this scenario and generate test cases by using BVA.
4. Calculate Linear Code Sequence and Jump Coverage of the test cases derived from the following program based on the LCSAJs in it:

```

begin
    //compute pow(x,y)
    int x,y,p;
    input(x,y);
    p=1;
    count = y;
    while(count > 0){
        p=p*x;
        count-=1;
    }
    output(p);
end

```

5. Calculate the block coverage and condition coverage for the Test set  $T = \{t1: <y = -3, n = -2>, <y = 2, n = -4>, <y = 2, n = 2>\}$

```

main()
{
    int x,y,n,prod;
    read y,n;
    x=1; prod=y;

```

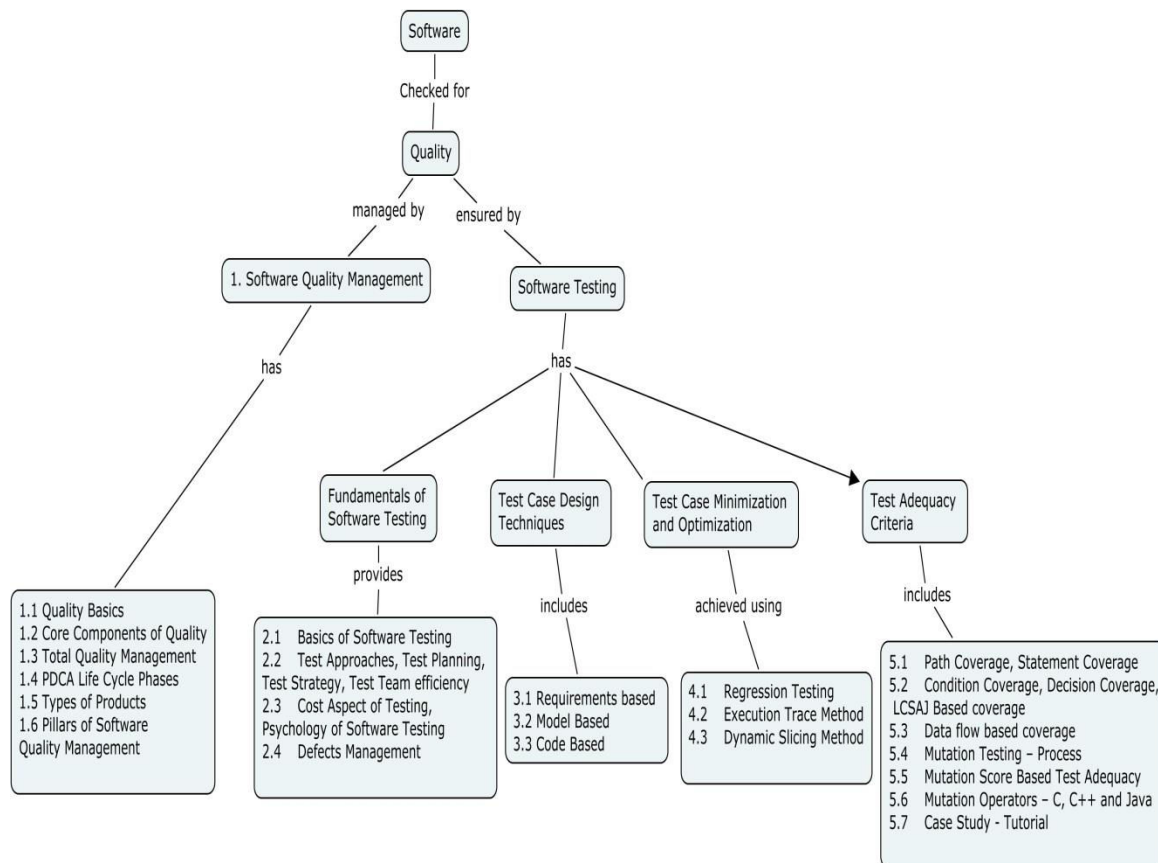
```

while(n>0)
{
    prod=x*y;
    display (x,y,prod);
    x+=1;
    n-=1;
}

if (prod<1) display("Error in input");
else display("Final Value=",prod);
}

```

### Concept Map



**Lecture Schedule**

No.	Topic	No. of Lectures
1	<b>Software Quality Management</b>	
1.1	Basics of Quality	1
1.2	Core Components of Quality	1
1.3	Total Quality Management	1
1.4	PDCA Life Cycle Phases of continuous quality improvement	2
1.5	Types of Products based on criticality	1
1.6	Pillars of Software Quality Management	1
2	<b>Fundamentals of Software Testing</b>	
2.1	Basics of Software Testing	2
2.2	Test Approaches, Test Planning, Test Strategy, Test Team efficiency	2
2.3	Cost Aspect of Testing, Psychology of Software Testing	2
2.4	Defects Management	1
3	<b>Test Case Design Techniques</b>	
3.1	Requirements based test case generation - Equivalence Portioning, Boundary value analysis, Category Partition method, Cause effect graphing	5
3.2	Model Based Test Case Generation -Finite State Machine based test case generation - W-Categorization, UIO Sequence method	4
3.3	Code Based Test Case Generation - CFG, PDG, CDG, DDG	2
4	<b>Test Case Minimization and Optimization</b>	
4.1	Regression Testing	2
4.2	Execution Trace Method	2
4.3	Dynamic Slicing Method	2

No.	Topic	No. of Lectures
5	<b>Test Adequacy Criteria</b>	
5.1	Path Coverage, Statement Coverage	1
5.2	Condition Coverage, Decision Coverage, LCSAJ Based coverage	3
5.3	Data flow based coverage	2
5.4	Mutation Testing – Process	2
5.5	Mutation Score Based Test Adequacy	2
5.6	Mutation Operators – C, C++ and Java	2
5.7	Case Study - Tutorial	1
6.0	Open Source Software Testing Tools	2
	Total	46

## Syllabus

**Software Quality Management** - Basics of Quality, Core Components of Quality, Total Quality Management, PDCA Life Cycle Phases of continuous quality improvement, Types of Products based on criticality, Pillars of Software Quality Management, **Fundamentals of Software Testing**- Basics of Software Testing, Test Approaches, Test Planning, Test Strategy, Test Team efficiency, Cost Aspect of Testing, Psychology of Software Testing, Defects Management, **Test Case Design Techniques**- Requirements based test case generation , Equivalence Portioning, Boundary value analysis, Category Partition method, Cause effect graphing, Model Based Test Case Generation –Finite State Machine based test case generation – W-Categorization, UIO Sequence method, Code Based Test Case Generation CFG, PDG, CDG, DDG, **Test Case Minimization and Optimization** - Regression Testing, Execution Trace Method, Dynamic Slicing Method, **Test Adequacy Criteria** - Path Coverage, Statement Coverage, Condition Coverage, Decision Coverage, LCSAJ Based coverage, Data flow based coverage, **Mutation Testing** - Mutation Testing Process, Mutation Score Based Test Adequacy, Mutation Operators – C, C++ and Java, Case Study – Tutorial – Open Source Software Testing Tools .

## References:

1. Limaye M.G., "Software Testing Principles, Techniques and Tools", Second Reprint, TMH Publishers, 2010.
2. Aditya P.Mathur, "Foundations of Software Testing", 1<sup>st</sup> Edition, Pearson Education, 2008.



3. Srinivasan Desikan, Gopalswamy Ramesh, "Software Testing – Principles and Practices", 7<sup>th</sup> Reprint, Pearson Education, 2009.
4. Boriz Beizer, Software Testing, International Thomson Computer Press, 1990.

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Sub Code	Lectures	Tutorial	Practical	Credit
Y5A	3	0	--	3

## Y5A NETWORK SECURITY

**3 : 0**

**Preamble:** Network Security is the discipline which studies the theoretical, practical and managerial aspects of securing Information against threats when it transmits over the network. The course will enable the students to understand, develop, and deploy countermeasures to mitigate the risks inherent in the transmission, storage and retrieval of sensitive information over the network.

### Competencies

1. Analyze threats and vulnerabilities of information systems including databases, networks, applications, internet-based communication, web services, and mobile technologies.
2. Deploy measures that protect and defend information and information systems by ensuring their availability, integrity, authentication, confidentiality, and non-repudiation.
3. Determine the strength of a given algorithm used for security service.

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	Test 3/End-semester examination
1	Remember	20	20	10
2	Understand	40	30	30
3	Apply	30	40	50
4	Analyze	10	10	10
5	Evaluate	0	0	0
6	Create	0	0	0

### Course Level Learning Objectives

#### Remember:

1. Define Confidentiality, Integrity and Non repudiation.
2. What is Crypt analysis?
3. Explain Brute force attack with an example.
4. Develop the model for network security.
5. Depict by a table the relationship between security and mechanisms.
6. What is Markov model?

**Understand:**

1. Distinguish between diffusion and confusion.
2. Enlist the differences between active and passive attacks.
3. Differentiate MAC and Hash functions.
4. How does public key cryptosystem provide authentication?
5. Enumerate the differences between strong and weak collision resistance of hash functions.
6. Which three independent dimensions characterize the cryptographic system?
7. What are the various types of crypt analytic attacks on encrypted systems?
8. What do 'unconditionally secure' and 'computationally secure' imply?
9. Compute the  $P_w$  and  $Q_w$  values of RC4 algorithm for  $w=16, 32, 64$ .

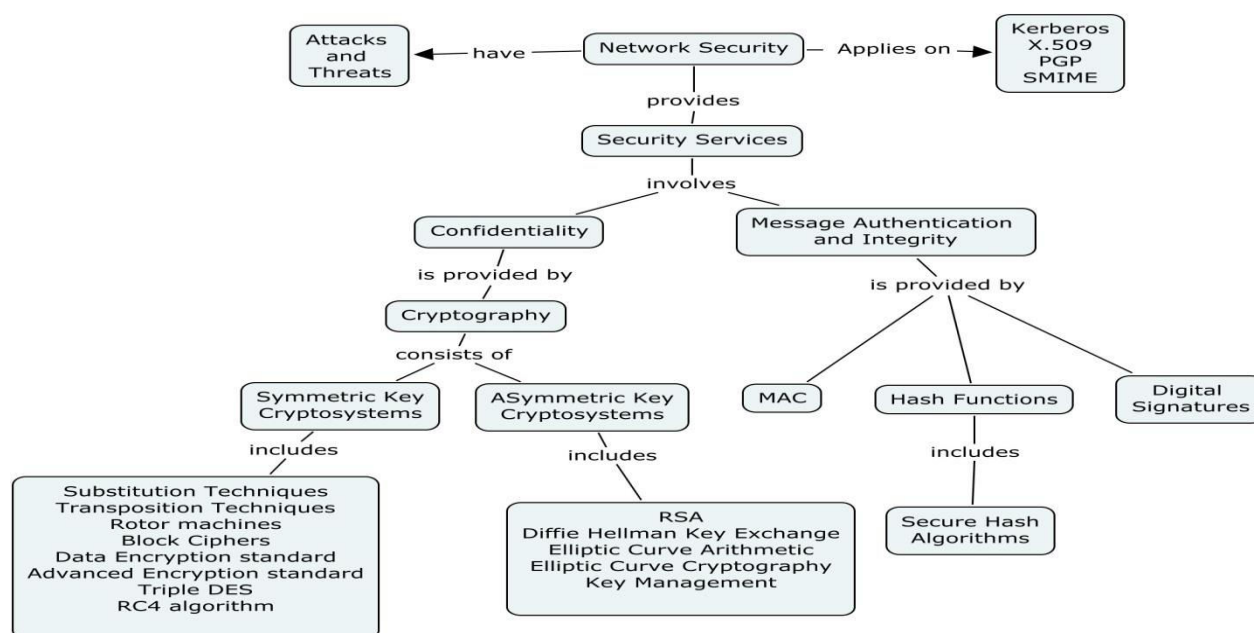
**Apply**

1. Apply Hill cipher to the message "TCE" with key  
17 7 5 ; 21 18 21 ; 12 2 19
2. Apply Vignere cipher to message DONKEY with key "DIVINE".
3. Perform encryption and decryption using RSA algorithm for the following:  
a.  $n=33, M=5$  (b)  $n=55, M=9$  (c)  $n=77, M=8$  (d)  $n=143, M=7$  (e)  $n=527, M=2$
4. Given a message TO and a key K, apply the Feistel cipher for 3 rounds. Use ASCII Hex representation for the alphabets.
5. Given a 64 bit key THEQUICK determine the first and second round sub keys for use in DES.
6. Given a 64 bit message CLIMATEC, perform the initial permutation IP and then apply the IP-1, to recover the original message.
7. Given that the round key for the 4th round is e2f467893153f560292f8d7fec2d3712, determine the first 4 bytes of round 5 in AES.
8. Given a message DONKEYSVERSATILE, apply one round of AES and determine the cipher text using the initial key K=MADURAIDESTINATI.
9. The message "DONE" is concatenated with its Frequency Check Sum. This combination is encrypted with the symmetric key K="RUSTE" and transmitted to host B. At the receiving end host B decrypts it using the symmetric key and segregates  $M||F(M)$ . He then re-computes  $F(M)$  and compares it with the received  $F(M)$ , thereby authenticating the message. Illustrate the above steps. Use ASCII Hex for alphabets.

**Analyze:**

1. Analyze the key management issues involved in symmetric key cryptosystems with respect to public key Cryptosystems.
2. Can the following matrix be used as key in Hill cipher? Justify your answer.  

$$\begin{matrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{matrix}$$
3. You intercept the message 'FBRTLWUGATEPHBNXSW' which was encoded using a Hill Cipher System with a 3 X 3 key matrix in a 26 letter alphabetic system. The last nine letters are the sender's signature 'JAMESBOND'. Find the enciphering matrix, deciphering matrix and read the message.
4. If an adversary is using 2 X 2 enciphering matrix with a 29 letter alphabet, where AZ have the usual numerical equivalents, underscore=26, ?=27, !=28, and the cipher text received is "GFPYJP\_X?UYXSTLADPLW", Crypt analyze the message. (Hint: Last five letters of plain text corresponds to the adversary signature "KARLA").
5. Comment on the strength of mono alphabetic cipher if the language used is Tamil with respect to the number of mappings (Keys).
6. Analyze the threats and vulnerabilities involved in an online examination system.

**Concept Map**

**Course Contents and Lectures Schedule**

<b>S.No</b>	<b>Topic</b>	<b>No of Lectures</b>
<b>1.0</b>	<b>Introduction</b>	
1.1	Basics of Network Security	2
1.2	Attacks and Threats	1
1.3	Security Services and mechanisms	1
<b>2.0</b>	<b>Symmetric Key Cryptosystems</b>	
2.1	Substitution Techniques	2
2.2	Transposition Techniques	2
2.3	Rotor machines	1
2.4	Block Ciphers	2
2.5	Data Encryption standard	2
2.6	Advanced Encryption standard	2
2.7	Triple DES	1
2.8	RC4 algorithm	1
<b>3.0</b>	<b>ASymmetric Key Cryptosystems</b>	
3.1	RSA	2
3.2	Diffie Hellman Key Exchange	1
3.3	Elliptic Curve Arithmetic	2
3.4	Elliptic Curve Cryptography	2
3.5	Key Management	2
<b>4.0</b>	<b>Message Authentication and Integrity</b>	
4.1	MAC	2
4.2	Hash Functions	2
4.2.1	Secure Hash Algorithms	2
4.3	Digital Signatures	2

<b>5.0</b>	<b>Applications</b>	
5.1	Kerberos	1
5.2	X.509	1
5.3	PGP	1
5.4	SMIME	1
5.5	Watermarking	2
	<b>Total</b>	<b>40</b>

**Syllabus:**

**Basics of security- Attacks and Threats:** Security Architecture , Active and passive attacks, Services and Mechanisms, Model for network security **Symmetric Key Cryptosystems:** Model, Substitution Techniques, Transposition Techniques, Rotor machines, Block Ciphers, Data Encryption standard, Advanced Encryption standard, Triple DES, RC4 algorithm **Asymmetric Key Cryptosystems:** RSA, Diffie Hellman Key Exchange, Elliptic Curve Cryptography, Key Management **Message Authentication and Integrity:** Message Authentication code, Hash functions – Secure Hash Algorithm, Digital Signatures **Applications:** Kerberos, X.509, PGP, SMIME – Watermarking.

**Reference Books:**

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson, 5<sup>th</sup> Edition, 2012.
2. Behrouz A. Forouzan, "Cryptography and Network Security", TMH 2007.
3. Atul Kahate, "Cryptography and Network Security", TMH, 2<sup>nd</sup> edition, 2009

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Sub.Code	Lectures	Tutorial	Practical	Credit
Y5B	3	0	--	3

## Y5B JAVA TECHNOLOGIES

**3 : 0**

**Preamble:** One of the roles of the IT professional is to design and build systems and integrate them into an organization. The role of the IT professional is to select, deploy, integrate and administer platforms or components to support the organization's IT infrastructure. This course covers the skills in the fundamentals of hardware and software and how they integrate to form essential components of IT systems. It also enables the students to develop components of IT Systems.

### Competencies

1. Understand the working principle of Java Virtual Machine and the structure of Class Files
2. Develop applications by using the Java libraries
3. Understand the workings of the fundamental Android architecture, platform framework and emulator.
4. Apply the main components of Android APIs to develop Android Applications.
5. Create a database in SQLite and access it through Android platform

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	End-semester examination
1	Remember	20	20	20
2	Understand	40	40	30
3	Apply	30	30	40
4	Analyze	0	0	0
5	Evaluate	0	0	0
6	Create	10	10	10

### Course Level Learning Objectives

#### Remember

1. What is the role of heap in JVM?
2. What is a ClassLoader?
3. What are the characteristics of mobile operating systems?
4. Distinguish Symbian S60 OS and Android

5. List out design goals of Android platform
6. What is Dalvik?
7. Differentiate Dalvik and JVM.

**Understand:**

1. When the JVM creates a frame?
2. Why is it important to maintain system compatibility for older applications?
3. What is the name of the interface used to represent collections that maintain non-unique elements in order? Select the one correct answer.
  - Collection
  - Set
  - SortedSet
  - List
  - Sequence
4. What will be the output from the following program?

```
import java.util.*;
public class Iterate {
public static void main(String[] args) {
    List l = new ArrayList();
    l.add("A"); l.add("B"); l.add("C"); l.add("D"); l.add("E");
    ListIterator i = l.listIterator();
    i.next(); i.next(); i.next(); i.next();
    i.remove();
    i.previous(); i.previous();
    i.remove();
    System.out.println(l);
};
};
```

5. Count the number of words in a sentence "This is a sample" using map API?
6. Why write a Class Loader?
7. Why we need a mobile operating system?

**Apply:**

1. Write java program to create a class "student" and derive the corresponding class structure.
2. Implement a simple event driven Java program using the Swing libraries
3. Write a java program to find out the list of students who have scored more than 80 percentage in a subject "Operating Systems" using JDBC.
4. Write an Android application to display the exam results in a table layout.
5. Define an intent object and invoke the components of Android platform.
6. How do you add sound and vibrate in your application using Android platform.



**Create**

1. Write a Java program to develop a basic shopping cart application that would allow the program user to add items to a shopping cart while browsing through a list of priced items. Once the user stops browsing and filling the cart, the program should produce the list of items ordered along with quantity and extended prices (price \* quantity) plus an order total.

**Input**

Item file: A list of a dozen or more authentic priced items for sale (e.g. 401 Levi 501 19.95).

Item orders from keyboard or screen selection: User item choices including the quantity of each item to be purchased.

**Output:**

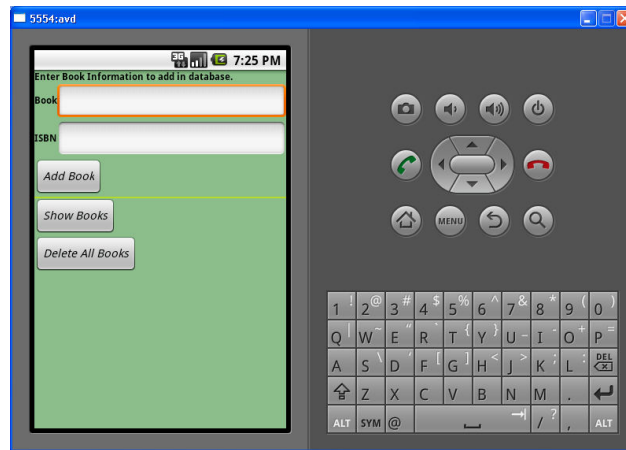
- i. List of priced items for sale;
- ii. View of the shopping cart;
- iii. Final order.
- iv. Processing:

Provide an interface that allows the user to browse through a list of items for sale, choose an item and specify quantity to add to the cart, view the cart, allow more items to be added and items to be deleted from the cart, and choose to check out and view the final order with a detailed list of items ordered and the total amount to pay.

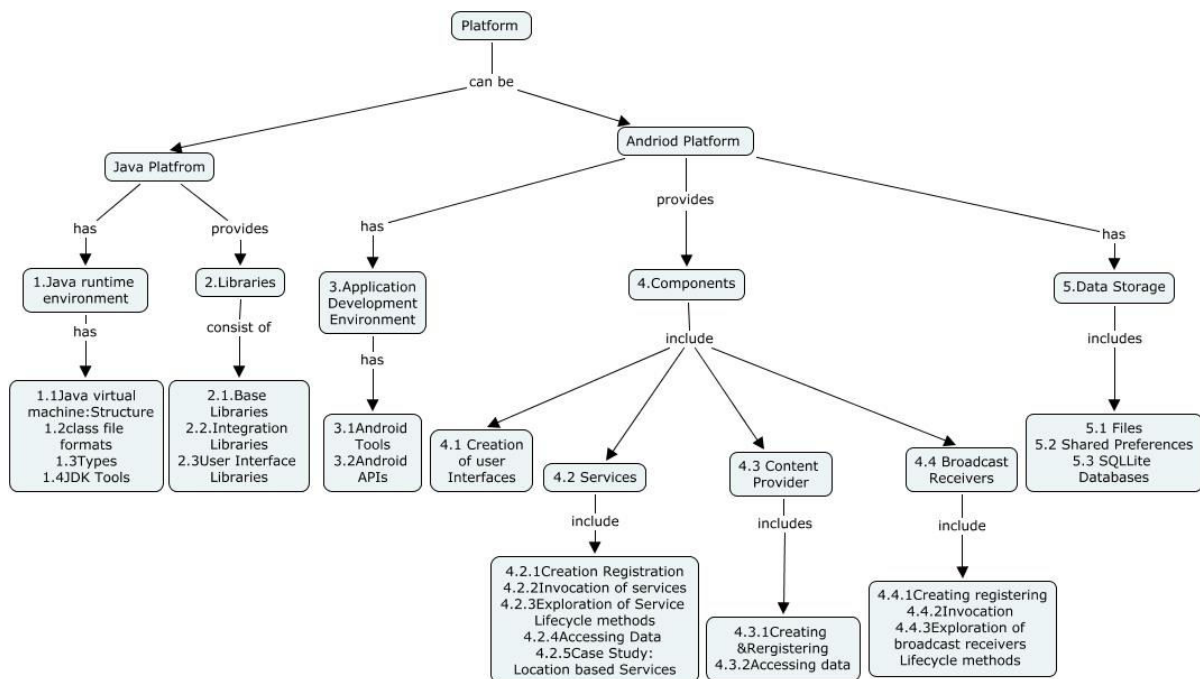
2. Design a user interface to demonstrate the various features of a product "car" using java2D.
3. Create a service named "MyService" to provide time service and define its life cycle. Create an Activity to interact with the created Service.
4. There are 20 staffs in the IT department. When a meeting is scheduled, a message "Meeting" is to be sent to all staffs. Implement a Broadcast Receiver in Android platform.
5. Design an Interactive interface to collect the information from a user in the registration form by using Alert Dialog and Progress Dialog components.  
Create an interface to perform the following tasks

- i. Enter the Name of the book and ISBN number and click on Add Book.
- ii. Data will be added to Sqlite database.
- iii. Add multiple entries into database.

- iv. Click on Show Books to view the contents added so far.
- v. Click on Delete All Books button to delete the contents of database



## Concept Map



**Course contents and Lecture Schedule:**

No.	Topic	No.of Lectures
<b>1</b>	<b>Java Platform</b>	
1.1	Java virtual Machine : Structure	2
1.2	Class file formats	2
1.3	Types : Server VM and Client VM	1
1.4	JDK Tools: Basic Tools, Security Tools, Java Deployment Tools, Java Plug-in Tools, Java Profiler, Java ANT	2
<b>2</b>	<b>Libraries</b>	
2.1	<b>Base Libraries</b>	
2.1.1	Collections Framework, Reflection, Java Archive (JAR) Files	2
2.1.2	Logging, Monitoring and Management	1
2.1.3	Package Version Identification	1
<b>2.2</b>	<b>Integration Libraries</b>	
2.2.1	Java Database Connectivity (JDBC) API	1
2.2.2	Java Naming and Directory Interface (JNDI) API	1
<b>2.3</b>	<b>User Interface Libraries</b>	
2.3.1	Swing	1
2.3.2	Java 2D Graphics and Imaging	1
2.3.3	Sound , Accessibility	1
<b>3</b>	<b>Android Application Development Environment</b>	
3.1	Architecture	1
3.2	Application Development Environment	1
3.3	Android Tools: DDMS, Emulator, ADB, ADT, AVD	2
3.4	Android APIs	2
<b>4</b>	<b>Android Components</b>	
4.1	Creation of User Interfaces	1
<b>4.2</b>	<b>Services</b>	
4.2.1	Creation, registration	1
4.2.2	Invocation of services	1
4.2.3	Exploration of Service Lifecycle methods	1

No.	Topic	No.of Lectures
4.2.4	Accessing data	1
4.2.5	Case Study: Location Based Services	
4.3	<b>Content Providers</b>	
4.3.1	Creating and registering a content provider	1
4.3.2	Accessing data from content provider	1
4.4	<b>Broadcast Receivers</b>	
4.4.1	Creating and registering broadcast receivers	1
4.4.2	Invocation of broadcast receivers	1
4.4.3	Exploration of broadcast receivers Lifecycle methods	1
<b>5</b>	<b>Data Storage Mechanisms</b>	
5.1	Files	2
5.2	Shared Preferences	2
5.3	<b>SQLite database</b>	
5.3.1	Creating SQLite Database	2
5.3.2	Using databases in Android applications	2
	TOTAL	40

## Syllabus

**Java Platform** - Java runtime environment - **Java virtual Machine** : Structure, Class file formats, Types : Server VM and Client VM , Java Vs .NET, **JDK Tools** : Basic Tools, Security Tools, Java Deployment Tools, Java Plug-in Tools Java Profiler, Java ANT, Java meet **Libraries** : **Base Libraries**: Collections Framework, Reflection, Java Archive (JAR) Files, Logging, Monitoring and Management, Package Version Identification **Integration Libraries** : Java Database Connectivity (JDBC) API, Java Naming and Directory Interface (JNDI) API **User Interface Libraries** : Springs , Java 2D Graphics and Imaging, Sound, Accessibility **Android Platform**: Architecture, Application Development Environment, Android Tools: DDMS, Emulator, ADB, ADT, AVD, Android APIs – Creation of User Interfaces **Android Services**: Creation, registration, invocation of services, Exploration of Service Lifecycle methods, Definition and use of a service interface, **Content Providers**: Creating and registering a content provider, Accessing data from content provider **JDK Case Study**:Location based Services **Broadcast Receivers**: Creating and registering broadcast receivers, Invocation of broadcast receivers, Exploration of broadcast receivers Lifecycle methods **Data Storage Mechanisms** : Files, Shared Preferences, SQLite database : Creating SQLite Database, Using databases in Android applications.

**References**

1. The Java™ Virtual Machine Specification”, Tim Lindholm, Frank Yellin, second edition, Sun Microsystems Press 2001
2. “Java: The Complete Reference, Seventh Edition”, Herbert Schildt, McGraw-Hill Publications 2004
3. Professional Android Application Development, Reto Meier, Wrox, November 2008
4. Beginning Android, Mark Murphy, Apress, June 2009
5. Pro Android, Sayed Y Hashimi, Apress, June 2009
6. Android – Application Development, Rick Rogers et.al, O’Reilly, May 2009
7. “Hello, Android”, Introducing Google’s Mobile Development Platform, Ed Burnette, The Pragmatic Bookshelf, 2008

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y5C	3	--	--	3

## Y5C CUSTOMER RELATIONSHIP MANAGEMENT (CRM) 3 : 0

### Preamble:

The Customer Relationship Management (CRM) course is designed to introduce students to both CRM fundamentals and the utilization of technology in managing customers. The curriculum will introduce students to CRM concepts and functionality for professionals whose organizations utilize CRM or want to gain an understanding of the role of CRM in service management.

### Competencies:

After successfully completing the course, students are able to:

1. Gain an understanding of key concepts, technologies and best practices of CRM
2. Get a view of the organization of business and its integration with CRM
3. Have an understanding of the CRM value proposition for different vertical markets.
4. Acquire knowledge of CRM customer data acquisition, management, research, analysis and use

### Assessment pattern

	Bloom's Category	Test 1	Test 2	Test 3/ End Semester Examination
1	Remember	30	30	20
2	Understand	30	30	20
3	Apply	40	40	60
4	Analyze	--	--	--
5	Evaluate	--	--	--
6	Create	--	--	--

### Remember:

1. What is termed as industry segment?
2. What is significance of Customer Relationship?
3. Discuss on the software support for Customer Relationship Management?
4. List out the criteria for selecting profitable customers.
5. Write down the strategies for customer acquisition.

### Understand:

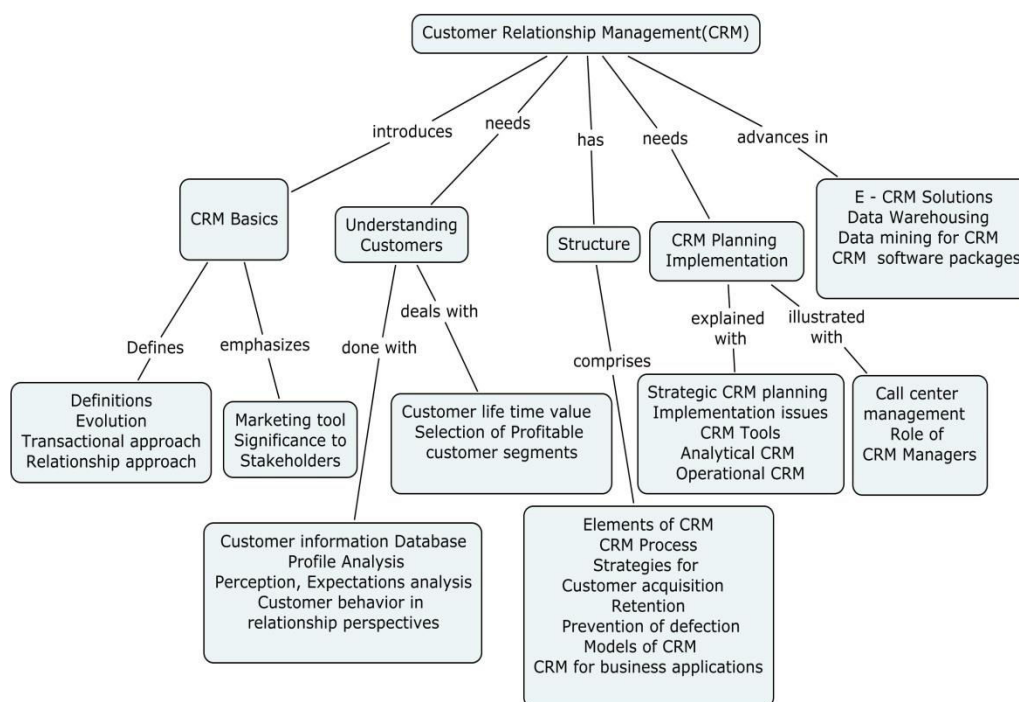
1. How are contracts and warranties managed in Organizations?
2. Explain the executive information system followed in an Organization for the different departments.
3. How could Data Mining helpful in the process of Customer Relationship management?

4. Discuss the role of CRM managers.
5. Draw the differences between analytical CRM and operational CRM.

### Apply:

1. If you have a telemarketing department, how are call lists assembled, how are orders taken?
2. How is time managed within the sales department? Single user or group calendar? Scheduling email? Others?
3. How does your customer service department function in terms of incident assignment, tracking, reporting, problem management and resolution, and other functions?
4. What is the executive information system followed in a telecommunication company for the above departments?
5. Discuss of application of E-CRM solutions to an online auction Organization.

### Concept Map:



### Course Contents:

No.	TOPIC	No. of Lecture periods
<b>1. Introduction to Customer Relation Management</b>		
1.1	Definitions - Concepts and Context of relationship Management	<b>1</b>
1.2	Evolution	<b>2</b>
1.3	Transactional Vs Relationship Approach	<b>2</b>

1.4	CRM as a strategic marketing tool	<b>1</b>
1.5	CRM significance to the stakeholders	<b>2</b>
<b>2. Understanding Customers</b>		
2.1	Customer information Database	<b>1</b>
2.2	Customer Profile Analysis	<b>2</b>
2.3	Customer perception, Expectations analysis	<b>2</b>
2.4	Customer behavior in relationship perspectives; individual and group customer's	<b>1</b>
2.5	Customer life time value	<b>1</b>
2.6	Selection of Profitable customer segments	<b>2</b>
<b>3. CRM Structure</b>		
3.1	Elements of CRM	<b>2</b>
3.2	CRM Process	<b>1</b>
3.3	Strategies for Customer acquisition	<b>1</b>
3.4	Retention and Prevention of defection	<b>2</b>
3.5	Models of CRM	<b>1</b>
3.6	CRM road map for business applications	<b>1</b>
<b>4. CRM Planning and Implementation</b>		
4.1	Strategic CRM planning process	<b>1</b>
4.2	Implementation issues	<b>1</b>
4.3	CRM Tools	<b>1</b>
4.4	Analytical CRM – Operational CRM	<b>2</b>
4.5	Call center management	<b>2</b>
4.6	Role of CRM Managers	<b>1</b>
<b>5. TRENDS in CRM</b>		
5.1	E - CRM Solutions	<b>1</b>
5.2	Data Warehousing	<b>1</b>
5.3	Data mining for CRM	<b>1</b>
5.4	Open source CRM tools	<b>2</b>
5.5	CRM Analytics	<b>2</b>
	<b>Total</b>	<b>40</b>

**Syllabus:**

**Introduction** Definitions - Concepts and Context of relationship Management – Evolution - Transactional Vs Relationship Approach –CRM as a strategic marketing tool – CRM significance to the stakeholders. **Understanding Customer** Customer information Database – Customer Profile Analysis – Customer perception, Expectations analysis – Customer behavior in relationship perspectives; individual and group customer's – Customer life time value – Selection of Profitable customer segments. **CRM Structure** Elements of CRM – CRM Process – Strategies for Customer acquisition – Retention and Prevention of defection – Models of CRM – CRM road map for business applications. **CRM Planning and Implementation** Strategic CRM planning process – Implementation issues – CRM Tools - Analytical CRM – Operational CRM – Call center management – Role of CRM Managers **TRENDS in CRM** E - CRM Solutions – Data Warehousing – Data mining for CRM – Open source CRM tools – CRM analytics.



**References:**

1. G.Shainesh, Jagdish, N.Sheth, Customer Relationships Management Strategic Prespective, Macmillan 2010.
2. Alok Kumar et al, Customer Relationship Management : Concepts and applications, Biztantra, 2011
3. H.Peeru Mohamed and A.Sahadevan, Customer Relation Management, Vikas Publishing 2008
4. Kumar, Customer Relationship Management - A Database Approach, Wiley India, 2007
5. Buttle, Francis., Customer Relationship Management, (2<sup>nd</sup> Edition). Elsevier Publishing, 2009.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y5D	3	--	--	3

## Y5D ENTERPRISE RESOURCE PLANNING (ERP)

**3 : 0**

**Preamble:** Students will learn ERP and its related technologies to design an integrated software system for an enterprise.

**Competencies:** At the end of the course the student should be able to

- Understand ERP concepts.
- Develop web-based ERP applications.
- Conduct business cycles using the ERP simulation game.
- Demonstrate the ability to configure ERP processes.
- Conduct analysis using business intelligence tools

### Assessment Pattern

	Bloom's Category	Test 1	Test 2	Test 3 / End-Semester Examination
1	Remember	20	20	20
2	Understand	20	20	20
3	Apply	30	30	30
4	Analyze	30	30	30
5	Evaluate	-	-	-
6	Create	-	-	-

### Course level learning Objectives:

#### Remember

1. Define ERP
2. What is meant by BPR?
3. Define Data warehousing
4. What is supply chain?
5. What is EDI?
6. What is 'SAP AG'?
7. What is 'Baan'?
8. What is 'Oracle'?
9. Name the modules of ERP.
10. What is meant by e-commerce?

### Understand

1. List the reasons for growth of ERP.
2. Explain the advantages of ERP.
3. What is meant by Re-engineering?
4. List the sub-systems of HR module.
5. Explain Oracle ERP Product.
6. Explain ERP and Internet.

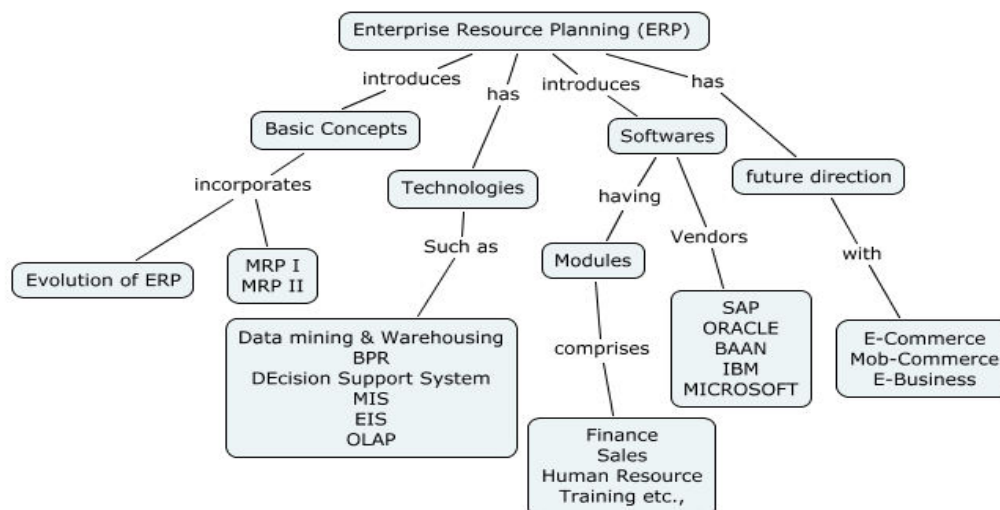
### Apply

1. Explain Integrated Data Model and how it applies to ERP.
2. Elucidate the different phases of BPR.
3. Explain supply chain management
4. With the help of diagram explain ERP system and apply it for School management.
5. How will you apply order management in sales and distribution module
6. Suggest any four future directions in ERP.

### Analyze

1. There is no linkage with the ERP, BPR and IT of the system. Are you agreed with the system. Justify the answer.
2. What is business engg? And explain the process of business engg. Explain the direct and indirect benefits of ERP.
3. Analyze the SWOT Analysis of PeopleSoft and Oracle Apps.
4. Web Enabling and Market Snapshot feature of ERP-Analyze.
5. What are the necessary actions to be taken after ERP implementation?
6. Explain technologies used in data mining

### Concept Map



**Course contents and lecture schedule**

<b>S. No</b>	<b>Topics</b>	<b>Periods</b>
1.1	<b>Introduction</b> - Enterprise Resource Planning (ERP)	1
1.2	Basic concepts	1
1.3	Evolution of ERP	1
1.4	Materials Requirements Planning (MRP)-Manufacturing Resource Planning (MRP II)	2
1.5	Business modeling	1
2.1	<b>ERP and its related technologies</b>	1
2.2	Data Mining-Data Warehousing	1
2.3	Business Process Reengineering	1
2.4	Decision Support System (DSS)	1
2.5	Management Information System (MIS)	1
2.6	Executive Information System (EIS)	1
2.7	OLAP	1
3.1	<b>Supply Chain Management (SCM)</b>	1
3.2	ERP from a manufacturing perspective	1
3.3	Distribution requirements planning (DRP)	1
4.1	Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM)	1
4.2	Made to Order and Made to Stock	1
4.3	Assemble to Order-Engineer to Order-Configure to Order	1
4.4	Master production	1
5.1	<b>ERP Software-</b> selection process	2
5.2	Issues and risks factors	1
5.3	ERP Products	1
5.4	Benefits of ERP software	1
5.5	Limitations of ERP software	1
6.1	<b>Challenges-</b> ERP implementation	1
6.2	Success and failure factors of an ERP implementation	1
6.3	ERP implementation choices	1
6.4	Formulation of ERP team-Role of consultants.	1

7.1	<b>Modules</b> in an ERP package	1
7.2	Quality management	1
7.3	Finance-Sales & distribution-Plant maintenance	1
7.4	Human resource management & Materials management	1
7.5	Training & Maintenance	1
8.1	<b>Future directions of ERP</b>	1
8.2	Electronic commerce	1
8.3	Mobile commerce and Electronic business using ERP-	1
8.4	ERP using Internet, Intranet and Extranet.	1
8.5	Case Study	2
	Total	42

### Syllabus

**Introduction** - Enterprise Resource Planning (ERP) - Basic concepts-Evolution of ERP - Materials Requirements Planning (MRP) - Manufacturing Resource Planning (MRP II) - Business modeling. **ERP and its related technologies** - Data Mining-Data Warehousing-Business Process Reengineering-Decision Support System (DSS)-Management Information System (MIS) - Executive Information System (EIS)-OLAP. **Supply Chain Management** (SCM) - ERP from a manufacturing perspective-Distribution requirements planning (DRP)-Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM)-Made to Order-Made to Stock-Assemble to Order-Engineer to Order-Configure to Order - Master production schedule. **ERP Software**- selection process-issues-risks factors-ERP Products. Benefits of ERP software-Limitations of ERP software. **Challenges**- ERP implementation-Success and failure factors of an ERP implementation-ERP implementation choices-Formulation of ERP team-Role of consultants. **Modules** in an ERP package - Finance-Sales & distribution-Plant maintenance - Human resource management - Materials management-Quality management - Training & Maintenance. **Future directions of ERP**-Electronic commerce, Mobile commerce and Electronic business using ERP-ERP using Internet, Intranet and Extranet. **Case Studies** of ERP implementation-Problems-challenges and opportunities for the enterprises-ERP software solution for the enterprise-Solutions-Performance indicators of an ERP package.

**References:**

1. "Enterprise Resource Planning", Alexis Leon, TataMcGraw-Hill, 2007
2. "Enterprise Resource Planning", Bret Wagner, Ellen Monk, Cengage Learning, 3rd Edition, 2009.
3. "Enterprise Resource Planning–Concepts and Practice", Vinod Kumar Garg and N. K. Venkita Krishnan, Prentice-Hall, India, 2003.

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Sub. Code	Lectures	Tutorial	Practical	Credit
<b>Y5E</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

## **Y5E BUSINESS PROCESS RE-ENGINEERING (BPR) 3 : 0**

### **Preamble**

To enable the students to gain knowledge in business process re-engineering and develop business models to improve the performance of an organization.

### **Competencies**

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

- Know the current state of Business Process Reengineering
- To know the origami process and purchase order process based on Computer Aided Process Reengineering.

### **Assessment Pattern**

	<b>Bloom's Category</b>	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3/End-Semester Examination</b>
1.	Remember	10	10	10
2.	Understand	30	30	30
3.	Apply	30	20	30
4.	Analyze	30	40	30
5.	Evaluate	0	0	0
6.	Create	0	0	0

### **Course Level Learning Objectives:**

#### **Remember**

1. List out the process parameters?
2. What is the goal of CPI and TQM?
3. Define origami process?
4. What do you mean by CAPR method of documentation?
5. What do you mean by process drivers?
6. What do you mean by conditional processing?
7. What do you mean by iconic blocks?
8. Define hierarchical lock libraries.
9. What is software support process?

## Understand

1. Briefly explain SEI process maturity model?
2. Give short notes of purchase order process reengineering?
3. What are the functionalities of process reengineering facilitator?
4. What do you mean by process metrics?
5. What are the uses of Activity or Delay block?
6. What is requirements-based analysis?
7. How can you use modeling and simulation to determine schedules?

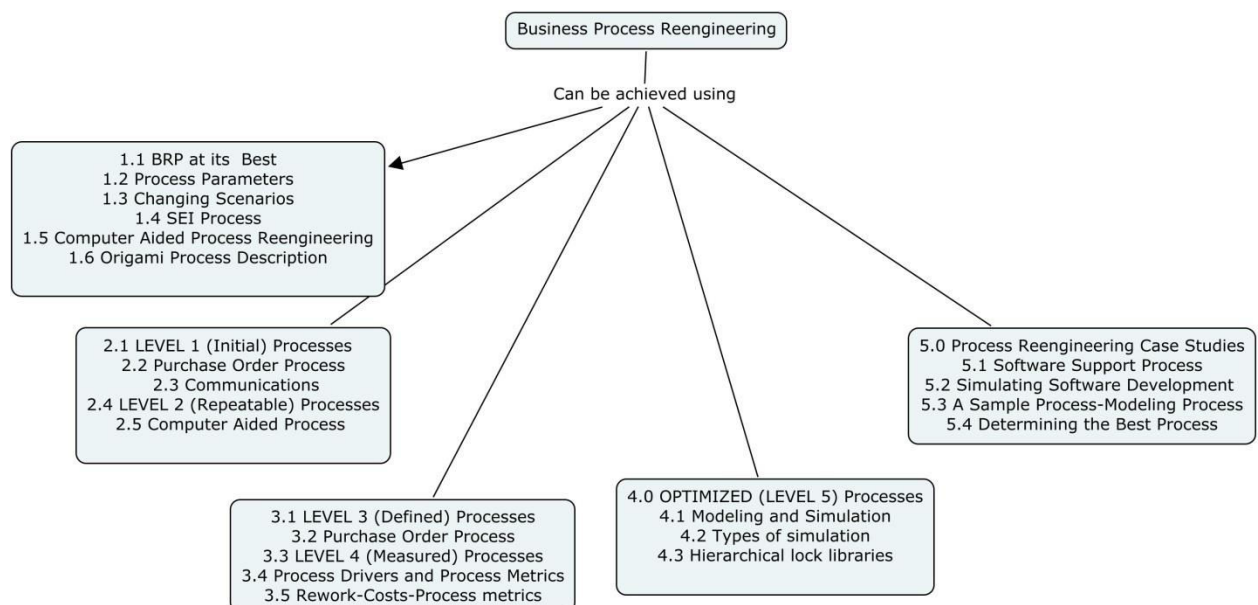
## Apply

1. Explain the origami Process at level 1 and purchase order process at first Attempt?
2. How to apply TQM to level 1 Process? Explain
3. How to apply Process Drivers and Process Metrics in defined processes
4. Describe the migration of the origami process in level 2 to level 3 and purchase Process third attempt at reengineering?
5. Describe BPR modeling and simulation terminology and techniques.
6. How to CAPRE tools where utilized in simulating software development schedules?

## Analyze

1. How it will differ from Deming's theories of continuous improvement and sense's theories of casual analysis?
2. Briefly explain the different types of simulation like discrete, Continuous and Hybrid simulations?
3. Explain Applications of Computer Aided Process Reengineering with illustrated example.

## Concept Map





**Course Content and Lecture Schedule:**

<b>S.No</b>	<b>Topics</b>	<b>No. of Lectures</b>
1	<b>Introduction to BPR (Business Process Reengineering)</b>	1
1.1	BPR at its Best	1
1.2	Process Parameters-Disturbing Plot	1
1.3	Changing Scenarios.	1
1.4	A New Perspective on Change in Business	1
1.5	The state of Business Process Reengineering	1
1.6	Computer Aided Process Reengineering-	1
1.7	The SEI Process Maturity Model-Deming's Theories of Continuous Improvement-Sense's Theories of Causal Analysis.	1
1.8	Origami Process Description	1
1.9	Purchase Order Process Description.	1
2	<b>LEVEL 1 (Initial) Processes:-</b> The Origami Process at Level 1	1
2.1	The Purchase Order Process: First Attempt at Reengineering.	1
2.2	TQM-Appling it to Level 1 Processes.	1
2.3	Communications:- The foundation of Process Reengineering.	2
2.4	<b>LEVEL 2 (Repeatable) Processes:-</b> Migration of the Origami Process to Level 2	2
2.5	Purchase Order Process: Second attempt at Reengineering	1
2.6	The Computer Aided Process Reengineering Method of Documentation.	1
3	<b>LEVEL 3 (Defined) Processes:-</b> Migration of the Original Process to Level 3-	1
3.1	Purchase Order Process: Third Attempt at Reengineering.	1
3.2	<b>LEVEL 4 (Measured) Processes:-</b> Measuring the Origami Process-	1
3.3	Purchase Order Process: Fourth Attempt at Reengineering	1
3.4	Process Drivers and Process Metrics	1

3.5	Input to Tasks-Staff Required for the task	1
3.6	Time Required to perform the task-	1
3.7	Conditional Processing-Task Initiation	1
3.8	Rework-Costs-Process metrics.	1
4	<b>OPTIMIZED (LEVEL 5) Processes:-</b> Origami Process Migration to Level 5.	1
4.1	Modeling and Simulation Terminology and Techniques:- An Overview-	1
4.2	Visual Paradigm-Icons-Iconic Blocks	1
4.3	Types of Simulation-Discrete & Continuous-Hybrid Simulation	1
4.4	Object Orientation – Requirements – Based Analysis -	1
4.5	Hierarchical lock libraries-Open Architecture.	1
5	<b>Process Reengineering Case Studies-</b> Applications of Computer Aided Process Reengineering	1
5.1	Software Support Process	2
5.2	Simulating Software Development Schedules	1
5.3	A Sample Process-Modeling Process	2
5.4	Determining the Best Process.	1
5.5	Case Studies on BPR for different business sectors	2
5.6	Comparing CMM levels with BPR levels	2
	<b>Total</b>	<b>45</b>

### Syllabus:

**Introduction to BPR (Business Process Reengineering)**-BPR at its Best-Process Parameters-Disturbing Plot-Changing Scenarios. A New Perspective on Change in Business-The state of Business Process Reengineering-Computer Aided Process Reengineering-The SEI Process Maturity Model-Deming's Theories of Continuous Improvement-Sense's Theories of Causal Analysis-Process Examples-Origami Process Description-Purchase Order Process Description. **LEVEL 1 (Initial) Processes:-** The Origami Process at Level 1-The Purchase Order Process: First Attempt at Reengineering. TQM-Applying it to Level 1 Processes. Communications:- The foundation of Process Reengineering. **LEVEL 2 (Repeatable) Processes:-** Migration of the Origami Process to Level 2-Purchase Order Process: Second attempt at Reengineering-The Computer Aided Process Reengineering Method of Documentation. **LEVEL 3 (Defined) Processes:-** Migration of the Original Process to Level 3-Purchase Order Process: Third Attempt at Reengineering. **LEVEL 4**

**(Measured) Processes:-** Measuring the Origami Process-Purchase Order Process: Fourth Attempt at Reengineering-Process Drivers and Process Metrics-Input to Tasks-Staff Required for the task-Time Required to perform the task-Conditional Processing-Task Initiation-Rework-Costs-Process metrics. **OPTIMIZED (LEVEL 5) Processes:-** Origami Process Migration to Level 5. Modeling and Simulation Terminology and Techniques:- An Overview-Visual Paradigm-Icons-Iconic Blocks-Types of Simulation-Discrete & Continuous-Hybrid Simulation – Object Orientation – Requirements – Based Analysis – Hierarchical lock libraries-Open Architecture. **Process Reengineering Case Studies-**Applications of Computer Aided Process Reengineering-Software Support Process-Simulating Software Development Schedules-A Sample Process-Modeling Process-Determining the Best Process. Case Studies on BPR for different business sectors – Comparison of CMM Levels with BPR Levels.

### Reference Books:

1. Gregory A.Hansen, "Automating Business Process Reengineering", Prentice Hall, 2005.
2. Dennis E. Wisnosky and Rita C. Feeney, "A Practical Guide to BPR Project Management", Wisdom Systems, Inc.; Book and CD-ROM edition (June 12, 2001)
3. G. Darnton and M. Darnton, Business Process Analysis, Intern. Thompson Business Press, Boston, MA, 2007

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y5F	3	--	--	3

## Y5F SOFT COMPUTING

**3: 0**

### Preamble

Soft Computing represents a collection or set of computational techniques in computer science and engineering, which investigate, simulate, and formalize the human ability to make rational decisions in an environment of uncertainty, imprecision, partial truth, and approximation. The course is designed to introduce students to soft computing concepts and techniques and foster their abilities in designing and implementing soft computing based solutions for real-world problems.

### Competencies

After successfully completing the course, students are able to:

1. Identify and describe soft computing techniques and their roles in building intelligent machines
2. Understand the ideas of fuzzy sets, fuzzy logic and use of fuzzy inference systems
3. Acquire the knowledge of unsupervised and supervised neural networks and their applications in approaching real world problems
4. Apply genetic algorithms to combinatorial optimization problems
5. Recognize the feasibility of applying a soft computing methodology for a particular problem

### Assessment pattern

	Bloom's Category	Test 1	Test 2	Test 3/ End Semester Examination
1	Remember	20	20	10
2	Understand	40	20	20
3	Apply	40	40	40
4	Analyze	-	20	20
5	Evaluate	-	-	10
6	Create	-	-	-

### Remember

1. Give some common applications of fuzzy logic?
2. What are the different methods of De-fuzzification?
3. What are the parameters to be considered for the design of membership function?

4. Define: optimization
5. Mention the different methods selection.
6. What are the genetic operators used in GA?
7. What are the types of learning?
8. Mention the linear and non-linear activation functions used in ANN.
9. What is perceptron?
10. What is feed forward network? Give example.

### Understand

1. Find differences between Mamdani and Sugeno Fuzzy models.
2. Compare Supervised neural networks with unsupervised neural networks.
3. Explain back propagation algorithm in detail.
4. Describe the learning expressions in the back propagation network.
5. What is competitive learning? How does it differ from signal Hebbrian learning?
6. Explain multilayer perceptron with its architecture. How is it used to solve XOR Problem?
7. Explain the various steps involved in GA in detail
8. Demonstrate the application of Soft computing in Image Processing.
9. How are IR systems improved with Soft Computing?

### Apply

1. Find the fuzzy max and fuzzy min of A and B

Let  $A = \{(x_1, 0.2), (x_2, 0.7), (x_3, 0.4)\}$  and  $B = \{(y_1, 0.5), (y_2, 0.6)\}$  be two fuzzy sets defined on the universe of discourse  $X = \{x_1, x_2, x_3\}$  and  $Y = \{y_1, y_2, y_3\}$  respectively. Find the Cartesian product of the A and B and fuzzy relation R.

2. A realtor wants to classify the houses he offers to his clients. One indicator of comfort of these houses is the number of bedrooms in them. Let the available types of houses be represented by the following set.  
 $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

The houses in this set are described by u number of bedrooms in a house. The realtor wants to describe a "comfortable house for a 4-person family," using a fuzzy set. Derive a solution for this.

3. Explain the algorithm for Back propagation training and explain about the update of weights. (12)
4. What are the design steps to be followed for using ANN for your problem?
5. What are the two approaches to add a bias input?
6. Explain the method pruning by weight decay to minimize the neural network size.

### Analyze

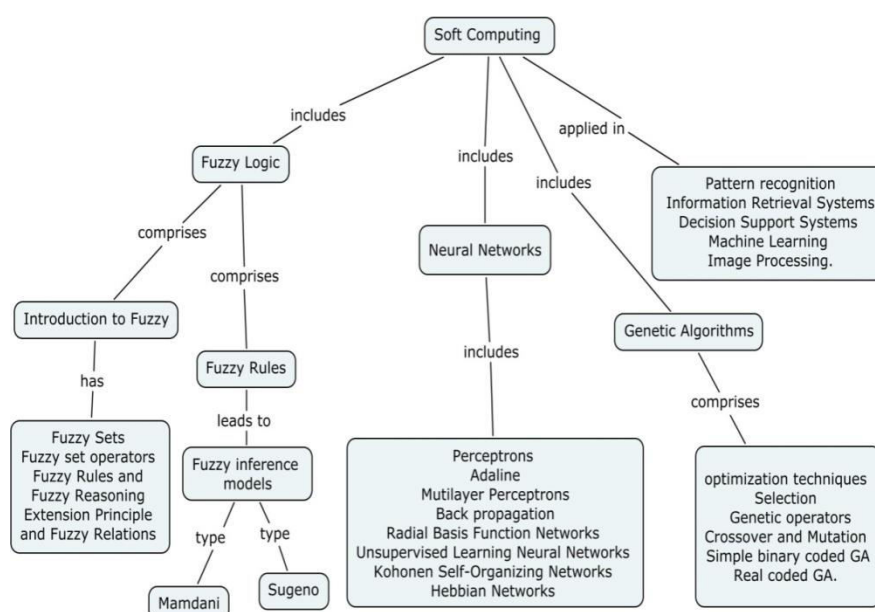
1. A two layer network is to have four inputs and six outputs. The range of the outputs is to be continuous between 0 and 1. What can you tell about the network architecture? Specifically,

- (a) How many neurons are required in each layer?
- (b) What are the dimensions of the first-layer and second layer weight matrices? (Hidden layer neurons are 5)
- (c) What kinds of transfer functions can be used in each layer?
2. Analyze the different methods of generating the population in genetic algorithms and make a comparison study.
3. Probe two different scenarios where binary coded and real coded GA apply themselves.
4. Discuss on Printed character recognition and demonstrate the application of Soft Computing in it.
5. Analyze how a MATLAB fuzzy tool box could be used to produce a fuzzy inference system based on Mamdani and Sugeno fuzzy models.

### Evaluate

1. Consider a 4 input, 1 output parity detector. The output is 1 if the number of inputs is even. Otherwise, it is 0. Is this problem linearly separable? Justify your answer.
2. Perform two generations of simple binary coded and real coded genetic algorithm to solve the following optimization problem. Maximize  $f(x) = |x| \sin(x)$   $-5 \leq x \leq 5$ ,  $x$  is real number. Use proportionate selection, single point crossover, and binary mutation for simple GA and proportionate selection, Arithmetic crossover, and Gaussian mutation for RGA .Use population size of six for both SGA and RGA. Evaluate the performance of SGA and RGA after two generations.

### Concept Map



**Course Contents**

No.	Topic	No. of Lecture periods
<b>1. Fuzzy Set Theory (10)</b>		
1.1	Introduction to Soft Computing	1
1.2	Fuzzy sets – Basic Definition and Terminology	1
1.3	Fuzzy Set operators	1
1.4	Fuzzy Rules and Fuzzy Reasoning	2
1.5	Extension Principle and Fuzzy Relations	2
1.6	Fuzzy Inference Systems – Mamdani Fuzzy Models	2
1.7	Sugeno Fuzzy Models – Fuzzy Modeling	1
<b>2. Optimization Techniques (9)</b>		
2.1	Introduction to optimization techniques	2
2.2	Genetic Algorithms	1
2.3	Selection - Genetic operators	2
2.4	Crossover and Mutation	2
2.5	Simple binary coded GA-Real coded GA.	2
2.6	Heuristics Techniques	3
<b>3. Neural Networks (12)</b>		
3.1	Introduction - Supervised Learning Neural Networks	1
3.2	Perceptrons - Adaline	1
3.3	Mutilayer Perceptrons	1
3.4	Back propagation	2
3.5	Radial Basis Function Networks	2
3.6	Unsupervised Learning Neural Networks	2
3.7	Kohonen Self-Organizing Networks	2
3.8	Hebbian Networks	1
<b>4 . Applications of soft computing (12)</b>		
4.1	Decision Support Systems	2
4.2	Machine Learning	4
	Total	43

**Syllabus**

**FUZZY SET THEORY** Introduction to Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Fuzzy set operators – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Fuzzy Modeling. **OPTIMIZATION TECHNIQUES:** Introduction to optimization techniques - Genetic Algorithms - Selection - Genetic operators- Crossover and Mutation –Simple binary coded GA-Real coded GA – Heuristics Techniques. **NEURAL NETWORKS:** Introduction - Supervised Learning Neural Networks – Perceptrons - Adaline – Mutilayer Perceptrons – Back propagation - Radial Basis Function Networks – Unsupervised Learning Neural Networks –

Kohonen Self-Organizing Networks – Hebbian Networks **APPLICATIONS OF SOFT COMPUTING:** Decision Support Systems – Machine Learning.

**References:**

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing- A Computational Approach to Learning and Machine Intelligence", Prentice-Hall of India, 2009.
2. Hans-Jürgen Zimmermann, "Fuzzy Set Theory - and Its Applications", Springer, 4<sup>th</sup> edition, 2012.
3. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Education., 2007.
4. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 2008.
5. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer, 2007.
6. S.N.Sivanandam · S.N.Deepa, "Introduction to Genetic Algorithms", Springer, 2007.

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Sub. Code	Lectures	Tutorial	Practical	Credit
Y56	1	-	3	2

## Y56 COBOL PROGRAMMING LABORATORY

1 : 1

### Preamble:

This course is designed to give students a basic understanding of COBOL Programming and it will help them quickly get up to speed developing efficient COBOL programs.

### List of Experiments:

1. **Beginners Programs** - Simple programs using ACCEPT, DISPLAY and some arithmetic verbs. – Discount Calculation
2. **Selection and Iteration** - Selection (IF, EVALUATE) and Iteration (PERFORM) example programs. – Count of Students based on their Gender.
3. **Sequential Files** - Programs that demonstrate how to process sequential files. – Employee Pay Report Calculation.
4. **Sorting and Merging** - Examples that use INPUT Procedure's and the SORT and MERGE verbs – Students Marks Processing.
5. **COBOL Tables** - Example programs using tables. – Income Tax Calculation.
6. **CALLing sub-programs** - Example programs that Demonstrate contained, and external, sub-programs. – Purchase Requirement Report Preparation.
7. **The COBOL Report Writer** - Example programs using the COBOL Report Writer. – Report on Yahoo.com Web Site.
8. **Master and Transaction Files** - Example programs that show how to process Master and Transaction files. – Stock Maintenance.
9. **String handling** - Example programs that show how to use Reference Modification, INSPECT and UNSTRING. – Cable Operator Schemes.
10. **Project**

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Sub.Code	Lectures	Tutorial	Practical	Credit
<b>Y57</b>	-	-	<b>3</b>	<b>1</b>

**Y57 APPLICATION DEVELOPMENT LABORATORY****0:1**

**Preamble:** This course aims at facilitating the student to practice the development of different kinds of applications ranging from simple desktop application to mobile based application development.

1. Desktop Application Development – Address Book Maintenance
  - a. Data Base Design
  - b. Module Development
  - c. Testing the application
2. Client / Server Application Development – Hospital Management System
  - a. Data Base Design
  - b. Module Development
  - c. Testing the application
3. Web Application Development – Online Airlines Reservation System
  - a. Data Base Design
  - b. Module Development
  - c. Testing the application
4. Web Service Development – Credit Card Validation
  - a. Service Creation
  - b. Service Registration
  - c. Service Invocation
5. Mobile Application Development – Phone Book Maintenance
  - a. Data Base Design
  - b. Module Development
  - c. Testing the application

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